CHANGING OUR ENVIRONMENT, CHANGING OURSELVES

Nature, Labour, Knowledge and Alienation

Edited by JAMES S. ORMROD

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Preface

This book emerges from a festschrift symposium held in honour of the British sociologist Peter Dickens at the University of Brighton in July 2013. A few years ago now, Peter admitted to me that he was at a hiatus. Having finished a number of projects (some of which we co-authored) around the sociology of the universe, he was unsure of his next move. With the 40th anniversary of his first lecturing appointment then on the horizon, it seemed to me the perfect time to take stock of his contribution to the social sciences.

However, with the exception of the first two chapters, the other papers in the festschrift are, by Peter's typically humble request, not papers centrally discussing his work, but papers that address issues that have also been of concern to him. All of the contributors to this volume were suggested by Peter as people whose work has inspired him, although they would no doubt return the compliment. The reader will find relatively little in this volume that is retrospective, but for those unfamiliar with Peter's career, I offer a necessarily brief summary in what follows.

Having trained as an architect at the University of Cambridge, and then worked as a researcher there in Land Use and Built Form Studies, Peter took his first lecturing appointment in Urban Studies at the University of Sussex in 1973. He returned to Cambridge in 2000 to take up the position of Director of Social and Political Studies at Fitzwilliam College. Whilst in that role, he was also appointed Visiting Professor in

the sociology department at the University of Essex. He was subsequently made Visiting Professor of Sociology at the University of Brighton, and is currently Senior Research Associate at the University of Cambridge. Peter's major books include: *Housing, States and Localities* (1985, with Duncan et al.), *One Nation?* (1988), *Urban Sociology* (1990), *Property, Bureaucracy and Culture* (1992, with Savage et al.), *Society and Nature* (1992, 2004), *Reconstructing Nature* (1996), *Social Darwinism* (2000) and *Cosmic Society* (2007, with me).

These wide-ranging texts have in common a central concern with the relationship between internal and external nature: That is, the way in which human subjectivity, health and psychological well-being are changed as we work collectively on our environment, and how these changes in turn affect how we understand and interact with the environments we shape. Peter's focus has, however, continually shifted to grapple with contemporary social issues as they have appeared on the horizon, from the privatisation of public housing, to genetic engineering, to the commodification of space resources. His path through these issues has been guided by a critical realist philosophy, Red–Green or ecosocialist politics and insights from structuration theory and psychoanalysis. His application of critical realist principles to the sociology of the environment in particular has been well recognised (see, for example, Hartwig 2007).

After 40 years in social science, there are a number of reasons why Peter Dickens is thought of with such affection and admiration. The first, which will be evident to all those who have met him, is his remarkable humility. He delights, for example, in those who confuse him with Peter Dicken, author of *Global Shift*. But more important is his continual openness to new ideas from everyone he meets: undergraduate students and members of the public as much as fellow academics. And this is true even when he is with those with very different views and when discussing areas in which he is expert. His work emphasises the need to combine abstract and specialist knowledge with everyday practical knowledge and memory, and he exemplifies this in his own social relations.

Peter's writing is infused with this same character. His books on urban sociology, the environment, social Darwinism and outer space have all the breadth expected of student texts whilst avoiding the dispassionate

sequence of summaries that can so often go along with this (see Murphy 2005; Adams 2006; Lawrence 2006). Instead the reader is guided through key debates, and past different theoretical positions, led by particular kinds of philosophical, theoretical and political commitments. Reading Peter's work, as is the case with the best writers, you get the sense that you are exploring the terrain together with him, rather than hearing him report back on some already completed journey.

Central to the way in which Peter synthesises material is his ability to rehabilitate classical theoretical perspectives to tackle the pertinent issues with which he grapples (reflected, in context, in Dunlap et al 2002). He clearly owes the greatest debt to Marx, but his work is punctuated with references to Durkheim, Weber, Simmel, Spencer, Veblen and others, all of whom he engages with in a scholarly but also wonderfully familiar way. For all Peter's humility, these are not ideas we are encouraged to reify or revere as they are turned to contemporary social problems. More recent theorists are picked up along the way and integrated into these projects: David Harvey, Manuel Castells, Pierre Bourdieu, Anthony Giddens and many others (including some of the contributors to this volume).

Thinking beyond sociology in its most reductionist forms, Peter's work has also been marked by a rejection of dualistic conceptions of the biological or social sciences. This has necessitated no little courage in exploring arguments distasteful to the late twentieth-/early twenty-first-century sociological imagination. As Murphy puts it, he 'carefully picks his way through a biological minefield where most social scientists fear to tread' (2005, p. 546). Peter has refused, from 'inside' the sociological worldview, to label either the disciplines or subject matter of the natural and physical sciences as 'good' or 'bad'. Instead, he has encouraged us, often in what Klein might recognise as a necessarily depressive mode, to take on the 'difficult task of combining the kinds of analysis offered by sociology with those offered by psychology and biology' (Dickens 1990, p. 112). Such business is inevitably 'complex and messy'.

Whilst, as he has emphasised, the transition between his different fields of study has been inspired by personal or public transformations, Peter has always brought forward and built upon key concerns from previous work. It is therefore possible to identify certain themes at the heart of Peter's sociology. These are the foci of this collection, and it is hoped

that they reflect and inspire contemporary scholarship in these areas (an example of this ongoing work is Jeremy Evans's doctoral research on local ecological knowledge and inshore fishers). One thing that is very apparent over the course of this book is that these issues are at the same time both philosophically deep-rooted and transformed, recast and problematised by contemporary social changes as they unfold.

Acknowledgements There are some important acknowledgements to be made in respect to the original symposium. The papers included here were first presented at the symposium in July 2013, with the exception of Chaps. 5 and 7, and benefited from the responses they received there. This was funded by the School of Applied Social Science, University of Brighton. Sallie White and Sinnet Weber assisted with arrangements, and I am also grateful to the catering department and the library for their services. Dante Holdsworth shot the portrait of Peter at the front of this book (reproduced with permission), and Carly Mayer designed excellent publicity material. Stuart Laing introduced proceedings, partly in his then capacity as Pro-Vice-Chancellor of the University of Brighton, but also able to reflect fondly on the time spent working with Peter at the University of Sussex. Presentations were ably chaired by Neil Curry, Stephen Brown and Mark Bhatti. The book also benefited from being presented as a poster at the 2014 conference of the American Society for Environmental History. Sincerest thanks are also due to those working at Palgrave Macmillan who assisted in the preparation of this book—Lani Oshima, Holly Tyler, Dominic Walker, Rachael Ballard and Chloe Fitzsimmons—and to an anonymous reviewer who offered useful feedback on the initial proposal. Finally, of course, the biggest thanks must be reserved for Peter, for his continuing friendship as well as his intellectual stimulation and nurturing.

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Notes on Contributors

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Ted Benton is Professor Emeritus in Sociology at the University of Essex, UK. He has written extensively on Marxist theory, realist philosophy, history and philosophy of the life sciences, animal rights and other topics. His central interest has been to bring together ecological understanding and critical social theory. His most recent publication is *Alfred Russel Wallace: Explorer, Evolutionist and Public Intellectual. A Thinker for Our Own Time?* (2013). Forthcoming is *Naturalists' Handbook: Solitary Bees* (2016, Pelagic).

Brett Clark is Associate Professor of Sociology and Sustainability Studies at the University of Utah, USA. His research focuses on the political economy of global environmental change and the philosophy, history and sociology of science. He is co-author of *The Ecological Rift* (2011) and co-editor of *Ecology and Power* (2013).

Kathryn Dean is a Research Associate with the Department of Political and International Studies, School of Oriental and African Studies, University of London. Her most recent publication is *Capitalism, Citizenship and the Arts of*

Thinking. She is working on a book about citizenship and digital epistemologies.

Pat Devine is Honorary Research Fellow at the University of Manchester and the Convenor of the Red–Green Study Group. His research interests are the political economy of Britain since 1945, Antonio Gramsci and Karl Polanyi, ecological economics, and models of (eco)socialist economies. He is the author of *Democracy and Economic Planning* (1988/2010) and, most recently, 'Planning for Freedom' (forthcoming in a collection of essays on Polanyi's 'Freedom in a Complex Society').

Peter Dickens is Senior Research Associate, Department of Sociology, University of Cambridge, UK. His main research interest is in the changing relationships between society and the cosmos. His most recent book is *The Palgrave Handbook of Society, Culture and Outer Space* (Palgrave Macmillan, 2016), co-edited with James S. Ormrod.

John Bellamy Foster is Professor of Sociology at the University of Oregon and editor of *Monthly Review*. His research is devoted to critical inquiries into theory and history, focusing primarily on the economic, political and ecological contradictions of capitalism and imperialism. His books include *Marx and the Earth* (2016) and *Marx's Ecology* (2000).

James S. Ormrod is Principal Lecturer in Sociology, University of Brighton, UK. His research interests are in social movements and the relationships human beings have with their environment and the universe in general. He is the author of *Fantasy and Social Movements* (Palgrave, 2014) and, with Peter Dickens, *Cosmic Society* (2007).

Graham Sharp recently retired from the University of Brighton, UK, where he was Senior Lecturer in Sociology. For a number of years Graham taught two third-year modules, one entitled 'Environment and Society', the other entitled 'The Sociology of Food'. He is currently preparing a book around these themes. Graham is an active member of the London based Red–Green Study Group which is preparing a book on ecosocialist alternatives to capitalism.

Kate Soper is Emerita Professor of Philosophy at London Metropolitan University. She has published widely on environmental philosophy, theory of needs and consumption, and cultural theory. Recent writings include *What Is Nature? Culture, Politics and the Non-Human* (1995), *Citizenship and Consumption* (co-editor, Palgrave, 2007) and *The Politics and Pleasures of Consuming Differently* (co-editor, Palgrave, 2008).

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Introduction: Changing Our Environment, Changing Ourselves

James S. Ormrod

'Changing Our Environment, Changing Ourselves' was the subtitle to Peter Dickens's award-winning 2004 book, *Society and Nature*, as well as the title of a 2003 paper. This relationship has been his central concern across many wide-ranging texts. This book celebrates his interest in how human subjectivity, health, and psychological well-being are changed as we work collectively on our environment.

A few years ago, Dickens was asked to select his favourite sociological quotation. This is the quote he chose:

> Labour is first of all a process between man and nature, a process by which man, through his own actions, mediates, regulates and controls the metabolism between himself and nature. He sets in motion the natural forces which belong to his own body, his arms, legs, head and hands, in order to appropriate the materials of nature in a form adapted to his own needs. Through this movement he acts upon external nature and changes it, and in this way simultaneously changes his own nature … [The labour process]

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> is the universal condition for the metabolic interaction between man and nature, the ever-lasting nature-imposed condition of human existence. (Marx cited in Dickens 2004, p. 62)

As Marx makes clear, conceiving of 'our environment' and 'ourselves' in dualistic terms is highly problematic. Marx refers to nature as our 'inorganic body' (see Dickens 2004, p. 72). That is to say that the human body is constituted only in relation to nature beyond its boundaries (1992, see also 2009); 'the central idea being that nature is continuous with and an integral part of persons, albeit not part of their organic being' (1996, p. 57). Marx and Engels both understood that work on this external nature necessarily constitutes our internal nature—our biological and psychological constitution, our health and well-being (Dickens 2004, p. 22; Dickens 1992). With the 'new biology', Dickens (1996) asserts the importance of recognising that humans do not merely *encounter* their environment, but actively make, or 'reconstruct' it (here emphasising the significance of human powers, whilst elsewhere noting the same principle is true of all organisms, Dickens 1992). In this respect they 'colonise' or 'humanise' nature (Dickens 2000, p. 69; see also Dickens 1992, where he recognises Parsons's work). The relationship between ourselves and our environment must be understood in dialectic terms (as the late Andrew Collier also emphasised, see Dickens 1992).

Dickens refers to both the Hegelian notion that reflection on nature changes the subject (2001) and the materialist version of dialectics found in Engels's (1959) *Dialectics of Nature*. The tradition of dialectics in Hegel and Marx was interested in 'how the subject (the person) interacts with the object (nature) and thereby makes the object part of the subject' (2001). There was, therefore, no subject without nature. Though finding Engels's dialectics overly mechanistic (1996), what Dickens takes from it is his acknowledgment of 'the interactions, especially between humans and nature, in which, because of their intimate relationship, a change in one caused a change in the other as the two become intertwined' (2001, p. 3). Dickens's central argument is, therefore, as follows:

> As societies interact with nature, human beings start changing themselves. Put in more sociological and material terms, as societies observe and modify external nature they start modifying their own, *internal*, nature. And

> this is a dialectical process. The kind of internal nature made in the process of environmental study and transformation has important effects on how external nature is in turn considered and therefore treated. (Dickens and Ormrod 2007, p. 3)

As becomes clear in this book, the processes of 'observing' and 'modifying' nature cannot be treated separately either. It is in the process of transforming nature that knowledge is both tested and generated. In particular interactions with nature, lay, tacit, and practical knowledges provide the grounds for the subject's reflexive relationship with nature—a type of relationship associated with eudaimonia and human flourishing.

True to Marx, Dickens frequently reminds us that the relationship between internal and external nature is never determined at the individual level, nor at a purely cultural level, but is always anchored in productive relations;

> Modes of production, and in particular the relationships made between people in the labour process therefore dominate the way in which social formations as a whole interact with nature—internal as well as external. (2000, p. 101)

Understood this way, 'both internal and external nature now seem fully infused with, and influenced by, social and political processes' (Dickens 2004, p. 17). Like other environmental sociologists, Dickens is adamant that economic, social, and environmental issues are inextricably linked (see, for example, his discussion of Chipko 'tree-huggers' and rights to the forest in Dickens 1996).

The fundamental premise of a socially organised dialectic between external and internal nature is to be found in the work of many thinkers with whom Dickens has engaged. But, he argues, its origins are to be found at the very heart of the Enlightenment movement so often associated with pitting humanity against nature. Francis Bacon is a figure to whom Dickens repeatedly returns as a philosopher who believed in the mastery of nature for human use. The enclosure and cultivation of land was to make improved, rational beings from the blank sheets of human nature. 'As humans modify the external world, went the thinking, they upgrade their own nature' (Dickens 2004, p. 3). The science of nature and

the science of 'Man' (of internal nature) were therefore conceived of as inherently connected from the beginning, and both were believed essential in the elevation of the human condition (see Dickens 2004, p. 35).

But this Enlightenment optimism has proved harder and harder to sustain in a world in which the development of scientific and technological capabilities has continued apace, but so often brought with it the degradation of our external and internal nature. Under capitalist relations of production, our alienation from nature seems greater than ever. Of particular concern to Peter Dickens has been the impact on human well-being of the marginalisation of lay knowledge by forms of abstract knowledge more conducive to capital accumulation. Such changes are also intimately connected with climate change, loss of biodiversity, and so on, and thus have had devastating effects on both internal and external nature (though the manifestations of this vary tremendously across different spaces and social groups).

One intellectual response to the 'Anthropocene' era has been to dissolve the boundaries between the human and external nature, and to reduce nature to an object produced by human culture. Dickens accepts that 'the distinction between internal and external nature is increasingly difficult to maintain' (1996, p. 112). But in order to retain a concept of nature as an analytically distinct category, Dickens's critical realist philosophy asserts that the causal mechanisms of nature operate at a more foundational level than psychological and social mechanisms. He has refused to abandon the sense that human beings, for their increasing permeation of external nature, remain dependent on its powers. With the contributors to this book, he remains hopeful that through recognising the dialectic between internal and external nature we can both recover and discover distinctly human capacities that will enable us to live more harmoniously with ourselves and with our environment.

Outline of This Book

Part I of the book is focused on the work of Peter Dickens and his contributions to the development of green social theory. It should serve as an introduction for those new to his writing and as an elaboration of its core arguments to those more familiar.

In Chap. 2, Ted Benton first situates Peter Dickens's work within its historical political and intellectual context. Benton introduces Dickens's writing as an attempt to transcend the then stale conflict between structuralist and humanist Marxism (and the latter's legacy in the critical theory of the Frankfurt School), with which Benton and so many other Western Marxists had been grappling. He suggests that Dickens's engagement with critical realism was what allowed him to move forwards from both this debate within Marxism and the stand-off between positivist—empiricist and interpretivist—hermeneutic sociology. He notes, however, that arguing for the necessity of biological knowledge in understanding human social relations has meant that Dickens has had to negotiate the troubled history of such a project. Second, Benton outlines some of the ways in which Dickens's work has picked up major contemporary social issues of theoretical and moral concern over its duration, whilst remaining committed to a coherent set of humanistic values and motivated by a concern with alienation and estrangement. Dickens's starting point, it is noted, is an appreciation of the historical variability of human subjectivity. Benton discusses recent sociology's fascination with consumerism, and Dickens's abiding concern with its psychological consequences, often turning to psychoanalysis as a loose theoretical base. Benton suggests this approach still has fruit to bear when discussing current sociological and environmentalist concerns with climate change. He then turns his attention to Dickens's interventions in arguments regarding the development of 'cognitive capitalism' and emotional labour. Here, he introduces the distinction between formal and substantive (or real) subsumption, explored in different contexts by Sharp, Addicott, and Dean later in this volume, as well as Dickens's foundational concern with the mental/manual division of labour. He finishes by pointing to the ongoing productive tension in Dickens's work, as he acknowledges at once both the difficulties and opportunities for resistance in the world of late capitalism.

In Chap. 3, I attempt to add detail to Benton's overview, providing a summary of what I see as the main themes across Peter Dickens's substantive work. The chapter begins by situating his work in relation to critical realism. It argues that his work hinges on the distinction between construing and constructing nature, the concept of latent biology, a belief in the underdetermination of human nature, and a critique of the metaphor

in science. I then proceed to outline five interrelated main arguments to Dickens's ecosocialism. The first concerns the effects of the mental/manual division of labour—buttressed, but not caused, by capitalism—on lay and tacit knowledge. Leading on from this is the argument, originating with Marx and developed by others such as John Bellamy Foster, that humans are alienated from nature. This alienation takes the form of a metabolic rift, manifested particularly in our understanding of nature. Third, to the extent that capitalism deepens this alienation and threatens to undermine human psychological well-being, Dickens refers to the 'third contradiction of capitalism'. Fourth, and turning to psychoanalytic theory, Dickens examines the ways in which this contradiction shapes unconscious defences and fantasies and how these are manifest in the erection and maintenance of social and spatial divisions. It is these divisions that prevent us from developing the kinds of communal relationships with external nature capable of improving our well-being. And finally, the chapter looks at how Dickens envisages the rift in human–nature relations being healed. This takes the form of prefigurative politics that are at once to be celebrated and continually critically interrogated. These projects must be progressive and outwards facing, else they run the risk of becoming insular, middle-class preoccupations.

The chapters in Part II of the book elaborate ongoing philosophico-theoretical debates at the heart of our attempts to understand human relationships with nature.

In Chap. 4, Kate Soper provides some important salutary warnings about how environmental alienation might be conceived. She begins by noting Dickens's reservations about embracing the notion of human 'species being' in Marx's early work. For her, such an absolute concept of what it is to be human lends itself to a critical-normative project that cannot be defended on philosophical grounds. She therefore embraces Dickens's arguments that human nature is better considered 'underdetermined', that is, shaped by social forces as much as biological ones. Her main focus in the chapter is on the concept of alienation, and in particular 'environmental alienation'. Soper notes that she shares with Dickens an ethical concern for many of the features of contemporary social life Dickens and others describe under the heading of environmental alienation. And yet, she remains sceptical about the possibility

of identifying what she calls an 'authentic' non-alienated relationship with nature that might act as a basis from which to attempt to rebuild this relationship. Like Dickens, Soper appreciates that external nature is as historically variable as human internal nature, given their dialectic relationship. The problem, then, lies finding a philosophical framework that acknowledges that nature is 'made' by humans, both materially and discursively, but that also holds onto a nature that stands outside of this and which can ground discussions of human–nature interactions. The route Soper takes runs through Adorno. In particular, she endorses his call to 'retain the alien as alien'. That is to say that the preconceptual in nature both transcends and compels language, and that in the aesthetic contemplation of nature our conceptualisation of it dissolves. By Soper's own admission, the second half of the paper presents a break from the first. Here, she temporarily fixes the term alienation so as to offer a more normative critique of the growth economy and its damaging effects on internal and external nature. In what she terms 'avant-garde nostalgia' (a notion influenced, as in Dickens, by Raymond Williams's arguments about the need to resist the antipathies of nostalgia and industrial progress) she sees the de-alienating potential in thinking about what is pre-empted by the growth economy. This concept of alienation is based on unrealised possibilities for what Dickens refers to as eudaimonia. And in her brief discussion of craftivism (as a blending of craftwork and activism involving a great deal of lay and tacit knowledge) she illustrates what an 'alternative hedonism' might look like in practice—one that rejects both the consumer lifestyle and austere counter-consumerism.

In Chap. 5, John Bellamy Foster and Brett Clark explore conceptualisations of the relationship between human society and nature, like Soper taking the work of the Frankfurt School, and, more specifically, Horkheimer and Adorno's *Dialectic of Enlightenment*, as their starting point. They are critical of the Frankfurt School-inspired work of Alfred Schmidt, and in particular his pessimistic reading of Marx. Marx's later work is here seen as resigned to a 'domination of nature' perspective (as also addressed by Soper). It was on these grounds that first wave ecosocialists, such as Benton and Gorz, rejected Marx's views of the relationship between humans and nature. Foster and Clark are keen to salvage Marx's ecology. But to do so they must also defend him from a very different

tradition of Marxian environmentalism. More in line with Marx's early work, Neil Smith and others argue that rather than humans confronting nature as an opposing or limiting force, we have thoroughly 'capitalised' nature, such that we can no longer speak of nature existing outside of capitalism. Foster and Clark wish to resist both alternatives on offer—a dualism that pits humans against nature, and a monism that insists there is no nature outside of society. They advocate a return to Marx's own writing on ecology, and from this develop three interrelated concepts—the universal metabolism of nature, the social metabolism, and the metabolic rift—central to what they see as a second wave of ecosocialism (to which they themselves, as well as Peter Dickens, belong). They argue that these concepts allow us to better understand the coevolution and corevolution of society and nature, pointing to the need for 'a new order of social metabolic reproduction rooted in substantive equality'.

In Part III, the contributors each take up themes explored in Parts I and II in exploring emerging issues in human–nature relations.

In Chap. 6, Graham Sharp explores 'metabolic rift theory' and its application to ultra-processed food and the crisis in contemporary foodways. He takes up the notion of a metabolic rift generated in the nineteenth century between humans and nature, as first suggested by Marx but popularised by Foster, Dickens, and others. However, he argues for the usefulness of combining this concept with Marx's distinction between the formal and real subsumption of labour (and therefore also, inevitably, of nature). Whilst in the former, capitalism worked *around* nature, in the latter, Sharp suggests, it works *through* nature—producing an industrialised and capitalised nature reflective of an alienation of humans from nature. Taking inspiration from Jason Moore's arguments, Sharp suggests that the contemporary era of ultra-processed foods represents the latest in a series of metabolic rifts, of which the nineteenth-century rift resulting from rapid urbanisation is just one. Sharp suggests, however, that this latest rift is different in that it has brought about a 'knowledge rift' in people's understanding of food provenance. This, he argues, must be understood not only in the context of changing food production processes, but also in the context of changing consumption patterns—influenced by the restructuring of capitalism and the family, but also

encouraged by supermarket oligopolies. He ends with a brief discussion of the ways in which this latest metabolic rift might be healed.

In Chap. 7, James E. Addicott returns to many of Sharp's concerns about food production and the metabolic rift through a study of satellite farming in the UK—encompassing both the provision of remote sensing data and the remote control of agricultural technology. He draws on critical realism in order to structure his analysis. In doing so, he provides an analysis that addresses the chemical, economic, social, and cultural mechanisms underpinning the development and uptake of satellite farming. This necessitates an appreciation of the nitrogen cycle and the chemical rift caused by overuse of nitrogen fertilisers. But it also means Addicott engages with Marx's account of capitalism and its requirements for technological innovation, territorial expansion, regulation, and, recently, more flexible modes of accumulation. At the social level, Addicott points to the shifting population balance between the countryside and urban areas, and what Sharp calls the 'knowledge rift' this has opened up regarding agriculture. At the cultural level, the chapter identifies the effects on agricultural workers themselves of increasing reliance on information technology such as that utilised in satellite farming. Addicott draws on work expressing concern for the loss of autonomy and alienation of lay knowledges associated with this process. He questions whether this might be depriving the worker of the 'eudaimonia' associated with the exercise of human species being. His own research, however, whilst accepting many of these concerns, instead points optimistically to another side of satellite farming. Through interviews and focus groups with farmers, Addicott identifies that whilst, on the one hand, satellite technology has the potential to alienate local and tacit knowledge (often with economically disastrous consequences), on the other hand, farmers are able to use the time, space, and capital saved to engage in diversification practices that reinvigorate traditional knowledge, closer working relationships with nature, and familial relations on the farm. In his analysis then, satellite farming operates as a double-edged sword, with the lesson being that academics must listen to farmers themselves in order to identify the ways in which satellite farming might be regulated and incentivised, rather than dismiss it out of hand.

In Chap. 8, Kathryn Dean takes up a theme from Peter Dickens's more recent work—alienation under cognitive capitalism—to examine the effects on the human subject of the increasing mediation of mental work by computers (and here, as in Dickens, capitalism appears as part, but not the whole, of the problem). She sets up her argument by noting two opposing predictions. On the one hand is Lyotard's pessimism about the externalisation and alienation of knowledge. On the other hand is Vercellone's optimism about cognitive capitalism effecting a transition from the real subsumption of labour to a neo-formal subsumption, and of redressing the balance between dead and living labour in favour of the latter. She then charts the emergence of the real subsumption of craft knowledge, with an emphasis on the role of the codification of tacit knowledge in this process. She extends this analysis to a discussion of Artificial Intelligence, arguing that the Turing Test reduces thinking to the explicit and disembodied. Central to this in the era of cognitive capitalism are the codification of knowledge in the form of algorithms, and the process of datafication producing 'big data' to feed such algorithms. These are illustrated through a case study of the Deep Blue versus Kasparov chess match. Dean argues that the contest resulted in the 'mechanic reduction' of Kasparov as a knowledgeable human chess player, such that only the abstract and algorithmic aspects of the game mattered. This analysis is then taken from this experimental context to examples in the world of labour where computers are making inroads into tacit knowledge—driverless cars, automated piloting, and the reading of biological scans. These case studies can be added to Addicott's analysis in the previous chapter. She believes that such technologies, favoured because of capitalism's emphasis on performance, are dehumanising the worker and leading to a new form of catastrophic accident. Despite a largely pessimistic conclusion, Dean believes in the possibility of a more human-centred automation in the future.

In Chap. 9, the collection finishes with a contribution from Peter Dickens himself. With typical humility, it refuses any great retrospective and instead joins the spirit of the other contributions, building on past themes from his work but in order to produce something altogether new. The focus of the chapter is Orford Ness, a shingle spit off the UK coast, which is now a wildlife reserve but which has historically been

used as a site of ammunitions testing and military surveillance. His interest is in how the place is experienced by visitors, and how it has become a site for alternative cultural practices in relation to nature. The chapter begins with a brief engagement with the literature on 'dark tourism'. However, Dickens prefers the theoretical framework of Henri Lefrebvre (from whom he has consistently drawn inspiration) to the Foucauldian underpinnings of much dark tourism literature. Using Lefebvre's triad of spatial production, he charts the material practices that created Orford Ness as a military site, attempts made to represent Orford Ness (especially in the work of G.W. Sebald), and then finally, and most significantly, the role of Orford Ness as a space of representation. In respect to the latter, he notes that the National Trust intended the deterioration of the military installations on the site to function as a symbol of the end of war. Yet, evidence from visitors suggests that it is the ambiguous nature of the site—the presence of natural beauty in the midst of reminders of the historical *and continuing* death and destruction on which society is founded—that is responsible for emotional reactions to it. It is here that Dickens makes extensive use of Lefebvre's notion of 'jouissance' to understand the ambivalent admixture of negative and positive emotions surrounding the place, whilst also flirting with the contribution psychoanalysis might make to understanding this experience, including Freudian and post-Freudian notions of the uncanny. What people find at Orford Ness, it seems, is an encounter with nature (from which they are alienated and sequestered under capitalist modernity), but a nature that continually both threatens and refuses to resolve itself into a simple good (wildlife preservation)/bad (violence and death) dualism. The paper concludes that the experience of jouissance arising from this ambivalence is responsible for positive, creative social renewal.

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Part I

The Work of Peter Dickens

2

Peter Dickens: Late Capitalism, Nature, and Mental Life

Ted Benton

Peter Dickens has a near-unique ability to take up and see what is valuable in each new intellectual fashion, while never being carried away as a 'dedicated follower'. While some of us might deride the latest continental import as old wine in new bottles, or as mere rhetoric dressed up as knowledge, Dickens patiently shows how something can be drawn from it without sacrificing what is also worth retaining in older traditions of thought. His ability to do this has, I think two sources. One is his deep and life-long commitment to humanitarian moral values, and his closely associated intellectual coherence. The other is his insistence on grounding his thinking in empirical work.

A great part of what makes Dickens's intellectual contribution so distinctive is his journey through an amazing range of empirical fields of study, whilst never abandoning his fundamental intellectual and moral/political orientation. His work draws on and integrates insights from a great range of traditions, disciplines, and empirical sources: Architectural

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theory, urban sociology, developmental biology, evolutionary theory, ecology, critical realism, historical materialism, depth psychology, structuration theory, cosmology, classical sociology, and contemporary political economy.

In this short contribution I will attempt, first, to situate Dickens's work in the context of the political radicalisation that affected many in his generation, and the ideas that were taken up selectively by himself as well as others in their efforts to comprehend what they saw as the oppressive and exploitative character of the economy and society of that time—and through that to envision alternative possibilities and how to realise them. Next, I will outline Dickens's substantive critical work on the consequences of late capitalist social and economic forms for our subjective life, and his distinctive ways of linking the ecological destructiveness of this phase of capitalist development with the impoverishment of mental as well as physical life. Much of his thinking and writing on these topics has taken the form of a convivial dialogue with other members of the Red-Green Study Group.

As newly radicalised scholars entered the academy in the mid to late 1960s, especially in the humanities and social sciences, the towering intellectual legacy of Marx, Engels, and later figures in the tradition of historical materialism was unavoidable. Of course, not everyone was absorbed into this pervasive intellectual atmosphere. Feminists, especially, were often wary of Marxism's seeming indifference to specifically gendered dimensions of exclusion and oppression. Even those who struggled to find their place within the legacy were deeply divided as to how much of it and which bits of it remained of value by the latter part of the twentieth century. Often radicalised by the horrors of the wars in south-east Asia and American imperialism more generally, the young leftists of that time were not attracted by the state centralist regimes of 'actually existing' communism as their vision of a just and peaceful alternative. A 'new left' was emerging, with allegiance neither to East nor West in the Cold War, but if the legacy of Marx and Engels was to provide intellectual rigour to the movement, that necessitated a critical investigation of that legacy itself. How, above all, had the revolutions inspired by the Marxian tradition turned into the opposite of their aspirations?

What emerged was a broad intellectual division. On one side was a 'humanist' current of socialist thought, often inspired by Marx's early work, notably the *Economic and Philosophical Manuscripts* of 1844. For those attracted by this current of thought, capitalism was denounced for its fragmentation and distortion of the subjective lives of those caught up in its sway, and the inhibition of all prospects for individual and collective self-realisation. The concepts of alienation and self-estrangement carried both analytical and moral power, as at once explanatory frames for understanding the sources of suffering and resistance and also the sources of motivation to transform it.

Some of the mass communist parties of western Europe adopted versions of these ideas as their way of distancing themselves from the largely discredited regimes of central and eastern Europe. Intellectual critics, often affiliated to a loosely defined tradition of 'critical theory' had, since the 1930s developed critical perspectives on capitalist society and culture by developing these humanist themes and adapting them to critique the newer forms of capitalist economic organisation and patterns of consumption that emerged in the 'rich' world from that time onwards. Key thinkers here were Theodor Adorno, Max Horkheimer, Walter Benjamin and, in terms of direct influence beyond the classroom, above all, Herbert Marcuse. I make the guess that this was the broad framework of thought that most influenced Dickens.

By contrast, and especially in Britain, another route to an anti-Stalinist but still Marxist intellectual orientation took hold with great rapidity. The key influences were a group of French Marxist scholars, notably Louis Althusser and Etienne Balibar, soon to be joined by the Greek scholar, Nicos Poulantzas and many others. Shockingly they rejected the humanism of Marx's early work (and, by implication, much of the tradition of critical theory), declaring themselves 'anti-humanist'. For these scholar-activists, only the 'mature' works of Marx were scientific (even then, a 'symptomatic reading' was needed if you were to discern the genuinely scientific in even Marx's later works). Ideas drawn from a distinctive French tradition in the history and philosophy of science were used to argue for a dismissal of the early, humanist Marx as pre-scientific, and promotion of the later Marx as the author of a cognitive transition to a scientific understanding of human history. We were enjoined to 'read

Capital', and offered an attempt at rigorous definition of key concepts in Marx's later work: Forces and relations of production, mode of production and social formation, repressive and ideological state apparatuses, and so on. This 'structural' Marxism in many respects paralleled a mainly American tradition of 'analytical' Marxism. The aim was to place the intellectual legacy of the left on a scientifically rigorous foundation, as an indispensable resource for the formation of political strategy and tactics. With some reservations, this was the approach that drew me in.

Initially these two very different intellectual currents were antagonistic to one another. For humanists, the structural Marxists failed to comprehend the subjective dimensions of life under capitalism, regarding human 'subjects' as mere dupes of the system, incapable of autonomous agency. For the structuralists, the humanists merely imposed their values on the world, without the means to grasp adequately the complex structures and processes of late capitalist society.

In retrospect, it is easy to see that both criticisms have their strengths, but perhaps what opened up the possibility for escape from the dilemma of 'humanism' or 'structuralism' was another specifically British intellectual development. This was the philosophy of critical realism. At its core, this was a theory about the nature of scientific explanation. So, what possible bearing could such an esoteric topic have on these intense debates among different factions of leftist intellectuals? The key to this is the reliance of the structuralists on the French tradition in history and philosophy of science, most notably the work of Gaston Bachelard. The claim to authority for their development of the materialist tradition rested on its proclaimed scientificity. But this turned out to be no more than a claim—by what independent criteria could a scientific set of concepts be distinguished from a non- or pre-scientific one?

This fed into a deeper and more long-established question in the human and social 'science' disciplines. Could they be practiced scientifically, or was there something about human beings and their social life that rendered scientific analysis inappropriate? Prior to the emergence of critical realism, there were two antagonistic and pervasive answers to this question. 'Yes' pointed to the empiricist tradition, gathering together observational evidence, making generalisations and, if you were lucky, discovering 'laws' of human behaviour. 'No' pointed to recognising

humans as distinctively bearers of consciousness, acting with meaning and intention, and communicating with language. On the one side, there was to be factual knowledge of regularities in behaviour, on the other, the interpretation of meaning, and the significance of the particular. Both 'yes' and 'no' shaped important research traditions, but the impasse between them frustrated those of us who wanted to understand both the objective realities of power and structure, and the forms of consciousness developed by the human agents differently located within their scope. The 'wave' of critical realism, from the mid 1970s into the 1980s, offered, first, a new and highly original account of the nature of scientific explanation. The key work for this was Roy Bhaskar's *Realist Theory of Science* (1975), but the importance of philosophical work by Rom Harré, Mary Hesse, and others should not be underestimated. This provided a defensible alternative account of natural science to both empiricism and the relativist/social determinist approaches heralded by the work of Thomas Kuhn, then highly influential (and also shared by Bachelard and the French tradition). The new approach was clear that science should be understood as a social process, but at the same time insisted that the objects of scientific knowledge existed and acted independently of the social (experimental, observational, discursive, etc.) social processes of its production. Scientific knowledge was to be seen as fallible, but open to correction in the light of evidence about the way the world is.

The newer realist approach to natural scientific knowledge now opened up the possibility of asking the question of a 'scientific' human or social science in new terms. It was now possible to think of scientific work in different domains adopting distinct methodological approaches and models of explanation, appropriate to their objects of study, while recognising that such research was premised on the independent existence of a single real world, albeit one characterised by dynamic change and structural complexity. The vision was of distinct disciplines, each exploring different aspects or regions of reality, each having its own specificity, but with the aspiration for cross-disciplinary cooperation and mutual enlightenment. Widely shared among the early contributors to the development of critical realist philosophy of social sciences was an account of reality as internally differentiated and stratified. So, for example, the patterns of action of individual humans could be understood as made possible by,

but also constrained by, both the specific social structures and processes (including linguistic ones) forming the action-context, and personal attributes of the individual concerned. These latter might include current emotional and cognitive states, but these, in turn, would be partly shaped by longer-term psychological formation and dispositions, as well as, perhaps, unconscious mental processes, neurophysiological states, and other bodily processes. All of these, as well as the wider social structural conditions and processes, are constrained/enabled by continuous interchanges between human social practices and deeper-level living and non-living beings, materials and processes in non-human nature.

There were two main outcomes, both of them crucial for the sort of synthesis achieved in Peter Dickens's work. First, the realist approach allowed for the integration of multiple levels of social and psychological reality. Analysis of the structure and dynamics of the social system could be linked with forms of meaningful social interaction and, in turn, with the inner dynamics of the individual psyche. The fields of exploration signified by the concepts of 'alienation' and 'estrangement' could be pursued in ways that could still be defended as 'scientific', so long as what this might mean was understood in relation to the sorts of beings and processes under investigation. Here was a possible route for a reconciliation between the structural and the humanist.

Second, there was, by this time, a growing challenge to both currents of Marxian thought—as to the whole spectrum of social, political, and economic thinking. This was posed by the advancing evidence of a multi-dimensional crisis in the relation between human civilisation and its planetary life-support systems. Radical green-ecological critiques were already gaining influence by the late 1960s, and by the late 1970s a powerful emergent green movement made it clear to many on the left that the inherited discourses of both traditions were not up to the challenge. The pervasive opposition between empiricist and hermeneutic approaches in the social sciences posed deep obstacles to spanning the gulf between the social sciences and the natural sciences that had so far been the main source of evidence fuelling the green movement. Where questions of the substantive connection with natural scientific knowledge were raised, the common tendency was reductive: often, some form of social Darwinism, as in the case of sociobiology and its successor, evolutionary psychology.

The prevailing alternative, 'humanist' or 'hermeneutic' approaches tended to work with a dualist opposition between the natural and the human, or social, domains. For the natural domain, an empiricist philosophical account was generally not questioned, while various forms of 'qualitative' or 'interpretive' methods were prescribed for the social sciences. Critical realism, with its more open view of the diverse unity of the sciences was a key resource for cracking this problem. A critical use of physical, chemical, biological, and psychological ideas could now be integrated non-reductively with critical social science.

The way was now available for researchers such as Dickens, Kate Soper, Andrew Sayer, Andrew Collier, myself, and many others to share an appreciation of the importance of the legacy of Marx, Engels, and later thinkers in the tradition as providing indispensable means for understanding social and economic processes—including those through which we as a species engage with the non-human world. But there was nothing to prevent us making frequent use of ideas drawn from other sources, as well as rethinking the tradition in the light of historical changes and new sources of evidence. Historical materialism can be used as an open-ended research programme, capable of being updated and revised in the light of social change and the emergence of new fields of knowledge and understanding—as well as new causes for moral and political concern. This is not 'revisionism' in the sense of a watering-down of the critical purchase of the Marxian heritage. For myself, and, I suspect, for Peter Dickens, contemporary globalising, ecologically destructive corporate capitalism is still more threatening than the capitalism of Marx and Engels's day.

This broad pattern of thought made possible defence of approaches to social scientific research that recognised both the self-understanding of social actors ('reflexivity', and the hermeneutic aspects of research), and also the many layers of causation underlying their practice, some of which may escape full consciousness. Thus far, critical realism provided philosophical resources to enable or justify critical social science, and, especially, to investigate processes of interaction between the human and non-human, as well as those between bodily and psychological dimensions of individual life. In terms frequently used at the time, critical realism was to be an 'underlabourer' to the work of the social sciences, not a 'masterbuilder' producing metaphysical grand theories to displace

substantive enquiry. Subsequently, Roy Bhaskar (who sadly died while this chapter was being written), by far the most influential of the early grouping of critical realists, added new layers of philosophical abstraction and terminology—from critical realism simpliciter came dialectical critical realism, to be followed by a quasi-religious conception of a 'self-grounding ground of all being' (Bhaskar 2000, p. 31). Some notable critical realists such as the late, much missed, Andrew Collier, and the sociologist Margaret Archer followed Bhaskar at least some distance along this route. Others, however, saw the new developments as abandoning the liberatory potential of the earlier achievements. As Greg McLennan put it:

> From its original conception as a way of being for science in the social sciences, through the 1990s Bhaskar introduced a number of additional categories and 'levels' into critical realism that upped the philosophical stakes considerably, relaunching it as an all-encompassing dialectical totalisation. The new point was not so much to sketch what the world must be like for science to be successful, but to show how the sciences themselves must be understood if they are to become adequate to a philosophically self-sustaining worldview … Realism was thus upwardly mobile, from underlabourer to overlord. (McLennan 2009, pp. 54–55)

To judge from my reading of Peter Dickens's work, it is the earlier, 'underlabouring' version of critical realism that is most at work in his thought. When, as he often does, he uses the term 'dialectic', it is not in the strong metaphysical sense of Bhaskar's later work. In his writing, the term is used to denote the interaction, or intertwining of two beings or processes, through which both are transformed.

Central to Dickens's work has been his attention to the importance of our individual and society species-wide relation to non-human nature. Dualistic traditions in the social sciences have been unable to adequately grasp the importance to individual well-being of bodily health and environmental quality. Accounts of social inequality and class disadvantage have been limited by this tendency to marginalise the bodily aspects of human being as 'biology'. So far as 'external' nature has been concerned, the re-emergence of powerful environmental social movements has made

it necessary for social scientists to bring discussion of nature and our relation to it into their discourse. Again, however, an understandable resistance to endorsing reactionary misuses of biological ideas has resulted in dualistic interpretations of environmental movements that affect methodological agnosticism about the objects of their concern—climate change, extinction of species, deforestation, or whatever.

Dickens, Kate Soper, and others, as sympathisers with those latter concerns, have sought ways of reworking social scientific theoretical traditions so as to fully grasp both the internal and external relations to nature that underpin any society, and well as to explore the ways in which those relationships have gone profoundly awry in our present phase of global 'civilisation'. Critical realist philosophy helped to sustain a version of historical materialism with the potential to grasp these issues. But the emphasis is on 'potential'. Whilst, as I mentioned above, the Marxian tradition offers indispensable conceptual resources, these need to be reworked and developed if they are to be helpful in understanding our predicament today. As Marx himself came to recognise, Darwinian evolutionary theory provides a counterpoint in the natural sciences for historical materialism in the social sciences. Dickens has drawn extensively from evolutionary theory in grasping the living dimensions of 'external' nature, and well as using it to understand 'internal nature'—that is, human nature itself. This has been Dickens's distinctive emphasis, and it is a particularly precarious and challenging association for social scientists to make. The history of 'scientific racism', eugenics and reductionist views of gender and sexual orientation, all appealing to validation by Darwinism, is a daunting and discouraging legacy. Dickens settled his accounts with these distortions and misappropriations of evolutionary thought, most especially in his important work, *Social Darwinism* (Dickens 2000).

Perhaps this emphasis in his work derives from the shaping of his thought by Marx's earlier, 'humanist' perspective and its subsequent developments—his development of Marx's famous dictum to the effect that in transforming external nature humans simultaneously transform their internal nature. Strong themes in his work are notions of distinctively human flexibility and adaptability, and the idea of self-creation. Human identities are highly socially, culturally, and historically variable. This view of human nature opens up the way to Dickens's concern with

the way in which different phases of capitalist development—as well as different locations within capitalist society—impact differently not just on the material conditions of groups of social agents, but on the possibility for them to enjoy a fully human quality of psychic life. Important predecessors in the Frankfurt School of critical theory, notably Adorno, Marcuse, and Habermas, incorporated Freudian insights in developing their own distinctive socio-cultural critiques of late capitalism. Dickens has drawn on these developments, but takes them forward to analyse the psychological consequences for those caught up in the latest forms of work relationship in contemporary capitalism.

In his *Society and Nature* (Dickens 2004) Dickens charts the development of 'consumerism' as an imposed vision of the 'good life' in late capitalism, a development associated with widely regretted processes of decline of community and solidarity in favour of forms of self-absorbed individualism. Sociological accounts of the increasing use of electronic means of storing and communicating information are reviewed in terms of such characterisations as 'information society' or 'network society'. These highly attenuated, at-a-distance forms of communication increasingly displace face-to-face interactions in concrete locations. Both at work and in the wider society, interactions are increasingly individualised and mediated by digital technologies. It can be argued, with some validity, that the new communications technologies can be used to forge new communities across physical barriers of space and evading more centralised mainstream media hegemonised by the powerful. But, as Dickens points out, these new avenues of communication also have a darker and more sinister dimension, and even in their constructive use as ways of mobilising opposition to powerful interests, they provide a limited, if welcome, challenge to prevailing structures of power.

Overall:

> A very large part of such information-processing now takes the form of one individual interacting with another. These forms of interaction are what Dean (2003) calls 'disorganizing': not greatly helping people to develop the resources, relationships and understandings they need to become fully autonomous subjects. Social relations and relations with nature of the kind necessary to be adequately 'self-programming' are ignored. People just need

> to perform, not asking too many difficult questions. (Dickens 2004, p. 163)

The tendency of modern capitalist societies to undermine traditional community ties and solidarities in favour of atomised, individualistic, and self-absorbed modes of personal and psychic life has long been a concern of sociological writers, as Dickens points out. However, new forms of 'post-Fordist' industrial organisation, requiring increased flexibility and adaptability on the part of even core workers, together with proliferation of a great variety of insecure, part-time, agency and sub-contracting working arrangements, are contributing to the formation of new kinds of subjectivity. This deepens the individualising tendencies of consumerism, and extends the scope of the attenuated forms of communication fostered by the spread of digital media. These shifts are also experienced in the context of neo-liberal rolling back of the state's role in providing social welfare, healthcare, and other sources of security.

The outcome of all these interrelated changes is the spread of a form of individual psychology—seemingly autonomous, flexible, adaptable, and 'self-programming'. It is at this point that Dickens calls in the aid of psychoanalytic theory, in the shape of Freud's notion of narcissism. Dickens follows Christopher Lasch (1979), as well as Ian Craib (1994) and Kathryn Dean (2000) in making use of the idea of a 'culture of narcissism' to characterise what they see as pathological consequences of current social and economic trends for individual well-being. Narcissism is a particular form of self-experienced autonomy, characteristic of early infancy. The external world is understood solely as a source of immediate satisfaction of desire. In normal development, this is displaced by a growing recognition of the independent reality of the physical environment and of other selves. Freud gives one of the clearest and most sobering statements of the implication of this emergent realism:

> We are threatened with suffering from three directions: from our own body, which is doomed to decay and dissolution and which cannot even do without pain and anxiety as warning signals; from the external world, which may rage against us with overwhelming and merciless forces of destruction; and finally from our relations with other men. The suffering

> which comes from this last source is perhaps more painful to us than any other. We tend to regard it as a gratuitous addition, though it cannot be any less fatefully inevitable than the suffering which comes from elsewhere. (Freud 1985, p. 264)

In this especially bleak version of Freud's realism, our relations with our own bodies, external nature, and other people are represented as sources of suffering. We can (and should) also see them as essential conditions for such happiness and fulfilment as human beings are capable of. Either way, what Freud expresses is a recognition of our dependence upon these sources of suffering, and their imperviousness to our will.

Freudian analysis represents normal growing up as the progressive displacement of infantile narcissism, with its expectation of the instant gratification of desire, towards an adult identity which acknowledges and adapts to the reality and autonomy of external reality and bodily processes. Adequate guidance from parents or other intimate carers is supposed to enable this development, but, under the influence of 'the culture of narcissism', a dominant personality-type is formed in which the infantile state is retained into adulthood. Advanced consumerism, technologically mediated communication and new forms of working relationships, as well as, more recently, the rolling back of state provision of healthcare and social welfare, all combine to deepen the individualism endemic to modern capitalism, favouring the formation of self-absorbed narcissistic personalities.

Peter Dickens combines this way of using psychoanalysis with an extension of the Marxian concept of alienation, and a sociological grasp of modern relations of work and consumption. Put together, these resources provide hypotheses about the actual social distribution of contemporary narcissism. Such personality traits are more likely to be found among high-earning and high-consuming business and professional elites, and associated with self-presentation, 'self-surveillance', health, and golf club membership and the like. Tracey Emin's self-exposure in some of her artworks, such as the tent naming everyone she had ever slept with, is cited by Dickens (2004, p. 168) as an extreme example of narcissism in the high culture of contemporary society.

For such groups in society, it is possible to retain the infantile fantasy that the world is organised around them, and that it should provide them with instant gratification. At the same time, 'things that are out of sight, such as food production, waste and environmental degradation, remain firmly out of mind' (Dickens 2004, p. 167).

> Individualism, including its advanced, narcissistic form, has been detached from material reality. People may be treated by employers, by the media and others as independent, proactive individuals. And they may behave as though they are such, with their behaviour having significant material effects. Yet all these people actually still live in systems of power and ecosystems on which they are deeply dependent. Apparent autonomy has been bought at the expense of alienation from their social and natural environments. (Dickens 2004, p. 170)

Such forms of personal identity are harder to sustain for people whose lives are subject to much greater insecurity and anxiety, such as the unemployed, and people in low-wage, casual, and insecure forms of employment. But the spread of these personality traits, especially among elites, has serious political consequences. This is not simply a matter of a tendency to withdraw from political engagement, as noticed by other writers, such as Lasch, who have used these ideas. In addition, there are cognitive implications that serve to undermine the development of adequate policy responses to the major challenges of our times:

> Elites and others transfixed by celebrity and instant gratification combined with a commodified 'virtual nature' are fatal combinations. They are perhaps the least likely forms of personality and environment for developing an adequate understanding of global environmental change and associated social justice. Rising levels of risk are an almost guaranteed outcome; until, that is, the risks become so transparent as to create alternative types of identity and self. (Dickens 2004, p. 172)

A recent collection of articles edited by Sally Weintrobe (2013) takes forward psychoanalytic thinking to address social and political responses to the specific challenge of climate change. Several contributions discuss the recognised phenomenon of 'climate change denial', but do so by

distinguishing three distinct sorts of 'denial'. First, 'denialism' is seen as a thoroughly socio-political process. Established vested interests run campaigns of misinformation and distortion to sow doubts about scientific findings. Second, 'negation', is a psychological response to the shock of an unbearable reality and the anxiety it produces. Third, 'disavowal' involves part-acknowledgement of the reality, but underplaying its significance. In the late Stan Cohen's account (Cohen 2000), it involves both knowing and not-knowing at the same time. All three sorts of denial are at work in the persistent failure of national and international decision-making elites to develop practical policies adequate to the challenge of global climate change. The sociologically informed concept of narcissism as developed by Craib, Dickens, and others seems well suited to diagnosing the psychological roots of this failure.

So far, the outlook seems rather bleak. Several apparently ineluctable social and economic trends appear to both generate social injustice and environmental destruction, and produce social–psychological identities ill-suited to respond effectively to the challenges they pose. True to his 'dialectical' approach, and the legacy of Marxian thought, Dickens is alert to counter-tendencies that provide at least some hope. One is the use made by a range of social movements of the internet as a resource for dispersing information and mobilising collective action. The technology may produce narrowly based and individualised forms of communication in many of its uses, cutting people off from one another and the external world, but it can also be a valuable means of bringing groups of people together and facilitating 'real world' collective action. There is also a hint at the tail end of the quotation above, that Dickens envisages situations in which the trend to narcissism may be offset by the direct experience of realities that cannot easily be denied. In Weintrobe's discussion, 'negation' may be the first step towards coming to terms with such realities, and thus has more hopeful prospects than 'disavowal' which relies on distortion and self-deception. The latter is more readily sustained despite the evidence.

Consistent with Dickens's openness to new ideas and modes of analysis is his engagement with recent theoretical characterisations of contemporary capitalism as 'cognitive capitalism'. This way of characterising the current phase of capitalist development was developed in the early 1990s

among parts of the left in Italy, and subsequently in France. Hardt and Negri (2000, 2006) are perhaps the best known of the theorists who have developed the idea, but both the idea and interpretations of its significance for emancipatory political struggles have been highly controversial (Toscano 2007; Vercellone 2007). In some ways the attempt is to extend broadly Marxian concepts, such as the distinctions between formal and substantive subsumption of labour, and mental and manual labour, to provide a critical grasp of processes characterised in elite, mainstream thinking as 'the knowledge-based', or, simply 'knowledge', economy. The rise of 'flexible' business organisations, responsive to shifts in consumer preferences and under competitive pressure to innovate technologically, is said to herald the emergence of a new phase of capitalist economy and society in which knowledge is the dominant source of economic value. This implies a transformation in the division of labour and, from a Marxian perspective, also in the pattern of class relations and the potential for human emancipation. Hardt and Negri (2006) controversially see the globalised system of political and economic power as potentially challenged by a digitally connected and extremely diverse 'multitude'. Others see the changes as giving rise to an increasingly significant social stratum of technically literate 'cognitariat' that is relatively autonomous vis-à-vis capital (Vercellone 2007).

A common feature of the analysis is that at least for employees who are highly qualified and technically skilled, the new conditions of work call forth aspects of their identity and human potential that were systematically excluded in earlier phases of capitalism, symbolised by Adam Smith's analysis of the extreme division of labour in the manufacture of pins. Whereas industrial labour reduced work to the monotonous repetition of simple manual tasks, under cognitive capitalism the human potential for creative engagement, development of skill, curiosity, and cooperation would be increasingly realised. At first sight, the work relationships highlighted by this idea might seem to offer promise of reversing the alienated conditions associated with earlier phases of capitalist development. As Dickens says, 'this may seem a wholly admirable thing. Their species-being is finally recognised and allowed to flourish. Emancipation via self-determination is at hand' (Dickens 2009, p. 123). However, Dickens is not convinced.

> But the problem for the great majority is that these features of the human species are being managed, co-opted and controlled by capital in the interests of continued accumulation. The power of humans to understand and improve their lives is therefore not being enhanced. Some of the distinctive qualities of humans' 'species being' are being used but in an alienated way, one not allowing genuine self-determination. (Dickens 2009, p. 123)

In fact, the appropriation in the service of capital of human capacities that otherwise might play a part in self-actualisation can be seen as the imposition of a more extreme form of self-alienation than those grasped through the early Marx's use of the concept. For him, alienation from self and others through subordination to capital had at least partial, if inverted, compensation in life outside work.

> As a result, therefore, man (the worker) only feels himself freely active in his animal functions—eating, drinking, procreating, or at most in his dwelling and dressing-up, etc. … certainly eating, drinking, procreating, etc., are also genuinely human functions. But taken abstractly, separated from the sphere of all other human activity and turned into sole and ultimate ends, they are animal functions. (Marx 1975 [1844], p. 275)

Where the distinctive human attributes of intellectual labour are co-opted by capital, even this limited form of compensation is denied by the incessant and intrusive demands of the flexible firm. In this reading of the new sorts of subsumption of labour as intensifying alienation, Dickens is close to the more negative view espoused by an early theorist of cognitive capitalism, L. Cillario, for whom the new work relations affect 'the very psycho-cognitive structure of the individual', so that work becomes 'reflexive self-exploitation' (cited in Toscano 2007).

The argument is rendered more powerful by extending the scope of human capacities that are brought into the analysis. The changes, such as the reduction in manual labour, increasing use of technically and scientifically trained workers, pervasive spread of IT into all work situations, and the importance of scientific research in business innovation, which led to talk of a 'knowledge economy', constitute only one aspect of the change. Dickens here cites Hochschild's iconic study (1983) of the 'emotional management' involved in the work of cabin crews in commercial airlines.

Their capacities for not only controlling their own emotional responses, but also empathising with and managing the feelings of the passengers in their charge, draws on a whole range of psychological and social skills, engaging core aspects of personal identity.

Dickens links this with ever-growing forms of pathology in the wider society:

> Working hours are rising and 'flexibility' increasingly invades emotional life in the home. Adults' relations with children, particularly in the poorest households, are placed under increasing stress … Many people are becoming less happy despite, perhaps because of, their commitment to ever-increasing material well-being (Devine et al. 2009). The past 50 years in Britain, for example, have witnessed growing levels of personal unhappiness. Affluence is resulting in increasing levels of depression, anxiety, and addiction in many of the supposedly most advanced societies. (Dickens 2009, pp. 123–124)

But these symptoms of a fundamentally flawed society and economy suggest a highly fragmented and individualised, even self-destructive response from those who suffer most from it. This contrasts markedly with the more optimistic perspective on offer from theorists of the forms of alienation that predominated in earlier phases of capitalist development. Subsequent to the observations of Adam Smith, and then of Marx, the material subsumption of labour associated with machinofacture reached its apogee in Taylorist forms of management. Here, the project was to appropriate from the labour process all practical knowledge and autonomy as a monopoly power of management. This extreme impoverishment of work content nevertheless eventually set the conditions under which powerful forms of collective organisation could be developed by the workforce. Once described as 'instrumental collectivism' (Goldthorpe et al. 1968), this enabled key sections of the industrial workforce of the richest countries to achieve relatively high levels of consumption as compensation for monotonous and intrinsically meaningless work.

As we have seen, according to the advocates of the concept of cognitive capitalism there is a marked reversal of this long-run trend to eliminate intelligence, creativity, and engagement from the labour process. Instead, the current tendency is for job content to be enriched, with demands on

workers to develop skills, discretion, and even creativity, many aspects of higher human potential being actively required, learned, and exercised 'on the job'. But the question arises, 'how general has this trend become? How well does the approach characterise the situation of many workers in contemporary capitalist economies?'

These questions demand substantive empirical research, so the following remarks should be taken as informal and provisional observations. First, the range of occupations in which at least some of the features of 'cognitive capitalism' are present is very heterogeneous: workers on low pay and with very insecure employment in care homes; 'front line' workers in job centres, benefit offices, hospitals, surgeries; receptionists; private sector retail sales, marketing, and customer service; policing and emergency services; many middle and lower range jobs in financial services; tourism; teaching and training, and many jobs in research and development, including academics and university technicians. This range of occupations is clearly very diverse indeed in terms of income levels, social status, degrees of autonomy, job security, and other working conditions. They are also very diverse in the skills and aptitudes that are demanded. Some, such as nurses and emergency workers, may come close to the sophisticated emotional management shown by Hochschild's cabin crews, but even here the conditions for exercise of these virtues may be eroded or outright eliminated by overwork and budgetary constraints. For care workers dealing with elderly or disabled people in their own homes or in specialist 'care' homes, close to the full range of higher human capacities is required, not just emotional management, but technical/medical knowledge, flexible initiative and discretion and practical skills, but low pay, insecure conditions of employment, and overwork make the development and exercise of these competences virtually impossible. In other occupational categories, the attributes required may be less social or emotional, but narrowly cognitive and technical.

Despite all this diversity, these jobs have three broad features in common:

1. In order to be successful, or even to sustain the occupation, it is necessary to mix one's personal identity with either the firm (or other employing institution), or with the job itself.

2. There is usually a highly individualised system for allocating pay, other rewards, and promotions. This is calculated to foster competitive, rivalrous, and mutually suspicious work-place relationships.
3. Working time and associated pressures make a clear distinction between work and non-work difficult to sustain. This might include the necessity to take work home in order to meet deadlines, or be continuously available online, but in other cases will involve more invasive, disruptive, and unpredictable demands that are difficult to combine with satisfactory non-working lives and familial relationships.

Compared with the situation of 'Fordist' industrial workers these features of the 'cognitive' work situations seem highly unlikely to generate either solidaristic collective action or oppositional identities or both. They are notoriously difficult to unionise, but even when unionised, cross-cutting loyalties (e.g. in health or education) make really effective industrial action hard to sustain.

The third characteristic—the lack of clear boundaries between work and non-work, and the unpredictability of the demands of work—imposes severe constraints on life-strategies. Some people in these situations deal with the demands of work by even closer identification with the firm and their working life, often at the expense of the quality of their lives outside work, only to suffer disillusionment when it becomes clear there is no reciprocity. Most people attempt to seek a degree of fulfilment in their personal lives as well as at work, while dealing with the inevitable frustrations and disappointments by some form of compensatory consumerism.

Here Dickens's fusion of humanism and naturalism with psychoanalysis shows its analytical value. The enormous flexible adaptability that many people show in dealing with the contradictory and often impossible demands imposed on them has its limits. No matter how much one may recognise the extent to which subjective identities are 'socially produced', there are also outer boundaries around the range of adaptive strategies available to people consistent with their feeling they have satisfactory lives. To breach those boundaries is to risk epidemics of the pathological symptoms described above—hyperconsumerism and runaway

debt, various sorts of addiction, family breakdown, and depressive illness. Many of these ways of dealing, or failing to deal, with contradictory and unsustainable pressures are inward-looking and self-destructive, especially where people come to see themselves as failures, or as in some way inadequate. Turned outwards, these feelings can issue in forms of destructive and anti-social behaviour, rather than forms of collective action to transform the conditions and relations that are the root cause.

Nevertheless, there remains at least the possibility that new communications technologies, combined with wider recognition of both the social and ecological unsustainability of current modes of coordinating the diverse competences and aptitudes of the population to meet our needs and wants might lead to the emergence of broadly based social movements of resistance. As Dickens puts it:

> Making coalitions between subaltern groups and intellectuals of this kind within the multitude remains the most promising way of resisting capitalism of all kinds and recovering the autonomy and self-determination to human species-being. (Dickens 2009, p. 127)

If this happens, then the workforce of 'cognitive capitalism' will have all the skills needed to play their part in fighting for an alternative social world.

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3

Defragmenting Nature: Themes in Peter Dickens's Work

James S. Ormrod

In this chapter, I outline what I see as the key themes infusing Peter Dickens's work. This work has spanned a huge range of topics, including housing, nation, the city, social class, evolutionary thought, the environment, and outer space. But across this work, I believe there are five recurring themes: (1) the effects of the mental/manual division of labour on internal and external nature, (2) the alienation of humans from nature, (3) the third contradiction of capitalism (between capital and internal nature), (4) the relationship between unconscious mechanisms and social and spatial divisions, and (5) the significance of production, consumption, and identity in 'escape attempts' and pre-figurative utopias. These themes emerge during the course of his oeuvre, and are still being reformulated as Dickens continues to write, but I believe that tracing their emergence and translation from one context to another tells us a great deal about their value. Before discussing these five themes, however, it is necessary to say something about their philosophical grounding in Dickens's engagement with critical realism.

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Critical Realism and Environmental Sociology

Peter Dickens's critical realism was based initially on his reading of Roy Bhaskar and Andrew Sayer, and later heavily influenced by Collier's (1994) interpretation of Bhaskar. He adheres to the view that sees critical realism as performing an 'under-labourer' role for the social sciences. In *Society and Nature*, Dickens (2004) embraces critical realism as a philosophy that allows for a reality beyond language and politics, and which 'not only recognises the "churning up" of society and nature but which also reassembles these different types of knowledge in a coherent way' (p. 19). He provides a succinct summary of the pillars of critical realism (Dickens 2004, p. 20; Dickens 2003). But in what follows, I focus on how Dickens draws on these to inform four particular critical realist arguments about 'nature' that underpin his ecosocialism.

Construing Nature

First, for critical realists, knowledge is seen as a product of society, 'but not *only* a product of society' (Dickens 2004, p. 20). Here, Dickens follows Bhaskar's argument that our knowledge of objects and mechanisms is always a social product, and yet this knowledge does not in itself *generate* these objects (e.g. Bhaskar 1978). These objects have an intransitive dimension, and exist independently of our thinking about them. Beginning in his early work, Dickens employs an under-utilised distinction in this respect between 'constructing' and 'construing' external nature (see especially Dickens 2000a, p. 52).

Dickens acknowledges that 'the environment' as we know it, whether this is an urban environment, non-human 'nature', or outer space, is a social construction and a crucial one in organising social life, but argues that it is also characterised by its own causal mechanisms operating independently of our knowledge. Although Dickens's work does still occasionally use the term 'social constructions' to refer to socially produced knowledges and understandings, he believes that the term often implies that ways of thinking about nature actually create it ex nihilo. The benefit of the alternative term 'construal' is that whilst acknowledging the importance of the

means by which understandings are produced, it suggests that there is at least something there in the first place *to be construed*. His work is therefore a correction of much contemporary social science which he sees as sidelining our interaction with nature in favour of our interpretation of nature (Dickens 2004, Appendix; contextualised in Buttel et al 2002), and especially the reduction of nature to discourse (Murphy 2005). Take, for example, his criticism of Tester (1991, p. 46) when he argues that animals are 'a blank paper which can be inscribed with any message, and symbolic meaning that the social wishes'. With Benton, Dickens (1996, p. 72) is adamant that animals are not blank sheets of paper, however much their construal may be intrinsic to our attempts to make sense of human society.

As our construals of nature are a dialectic part of the societies producing them, they have profound effects on the material organisation of social life (including our relationship with nature), regardless of whether they correspond to current reality or not (W.I. Thomas is an early touchstone here, see Dickens 1990, p. 35). His discussion of Merchant's work on the displacement of the image of a living female Earth by a mechanical model is a good example (Dickens 2004, p. 73). But because all societies are formed through a material relationship with nature, 'socially constructed' knowledge of nature is not wholly independent of nature itself (hence, following Soper 1995, the realism/constructionism dichotomy is refused). This is the way in which critical realism relates the 'material' and the 'ideal' (see Dickens 2001b, which anticipates Offer's 2002 criticism).

The best example of Dickens's repeated assertion that knowledge of the natural world can be socially constructed but also 'refer to real mechanisms' is his discussion of Darwin's theory of evolution. Following a line of argument originating with Marx, Dickens accepts that Darwin's theory was a product of its times. He quotes Marx's letter to Engels as follows:

> It is remarkable how Darwin recognises in beasts and plants his English society with its division of labour, competition, opening up of new markets, 'inventions' and the Malthusian 'struggle for existence'. (Marx cited in Dickens 2000a, p. 29)

And yet, despite its ideological nature and subsequent abuses, 'to the extent to which Darwin's theory has stood the test of time, it can indeed

claim to have discovered some of the key underlying mechanisms in the natural and human spheres' (Dickens 2000a, p. 29). He expresses similar thoughts in relation to Isaac Newton (Dickens and Ormrod 2007b, p. 36).

Latent Biology

Second, according to Bhaskar, 'real, relatively enduring structures and causal mechanisms in the physical, biological and social worlds underlie what we see and observe' (Dickens 2004, p. 20). In concrete conjunctures, these combine with each other and with contingent circumstances produced through other mechanisms. These mechanisms are stratified into 'lower' and 'higher' levels of mechanisms, from the physical to the social, each of which is 'rooted in—but not reducible to—those operating at lower levels' (Dickens 2004, p. 20; see also the example in Dickens 1990, p. 169).[1] Thus, biological properties are 'latent', but socially activated. Crucially for Dickens, new powers and mechanisms are 'emergent' at higher levels and so both biological and social reductionism must therefore be avoided.

From his early urban sociology, he set about theorising the relationship between what he called the instinctive or biotic level and the social or cultural level, the structures of the human mind, and social structures (drawing on a swathe of sociology from the Chicago School to the Frankfurt School) (Dickens 1990, pp. ix–xii; see also Dickens 1989). In early work, Dickens refers to biological and psychological imperatives as latent: 'wait-

[1] A distinction is thus made between 'necessary' relations—those underlying causes of observable outcomes—and the 'contingent' relations that merely shape them. The issue, Dickens recognises, is that different theories or disciplines will each see one type of causal mechanism as necessary, and others as contingent. Indeed here he seems to have some sympathy with Pete Saunders's claim that Marxism has hijacked realism by insisting that class struggle is *the* single underlying necessary relation. The epistemology encapsulated in the diagrams Dickens uses to illustrate the realist approach to explanation of concrete conjunctures (Dickens 1990, p. 170/175, following Dickens et al. 1985, based on Sayer 1984) is to an extent a mirror image of his hierarchical ontology, proceeding from abstract concepts of people and nature (genetics, natural selection, etc.), through historically specific abstractions resulting from contingent relations (gender, class, etc.), down to concrete conjectures (e.g. 'vandalism of British public sector housing, 1990') (see Dickens 1998, for a diagram that appears to combine ontological and epistemological elements). Tellingly, social structures do not appear at the abstract level of this diagram. For Dickens then, it appears there may be no abstract form of sociological knowledge.

ing, as it were, to be activated by the social and political relations and contexts in which people are living' (Dickens 1990, p. 98) or as producing 'tendencies … not necessarily expressed concretely "on the ground"' (Dickens 1998). In this he was influenced by Harré's Jung-inspired discussion of social triggers for deep-lying mechanisms (Dickens 1990, pp. 97 and 11; Dickens 1992). This has been a way of recognising that human behaviour always has a biological basis but is never biologically determined. 'Instinctive (biotic) processes are mediated by social (cultural) processes and relationships' (Dickens 1990, p. 56, see also p. 64).

Dickens sets himself up in opposition to the likes of Donna Haraway, whom he sees as confusing the distinctiveness of the biological and the social. He understands that her line of critique raises extremely challenging questions (Dickens 2004, p. 18) especially as the boundaries of Marx's 'nature-imposed condition of human existence' seem to be called into question with every development in biotechnology. He sees postmodern theory as a response to this, but not an appropriate one (see Dickens 1996). With Marx, he continues to argue that whilst humans can, and necessarily do, alter 'manifest' nature, they have the capacity to do so only as far as the 'latent' laws of nature allow (see Dickens 2004, p. 254; also Dickens 1992). Nature is not 'indefinitely malleable' (Dickens 1998, p. 110). There are such things as the 'limits of nature' (Dickens 1996; 1992, following Caldwell and others). The laws of nature are not conquered, but depended upon and exploited. In genetically modified pigs, for example, their powers of development have been disastrously interfered with, though the underlying processes of growth and development are left intact (Dickens 2004, p. 114). In in vitro fertilisation (IVF), to give another example, the biological body 'reacts dialectically' against choices made (Dickens 1998, p. 107; see also Dickens & Ormrod 2016b and ongoing work on the body in outer space). And whilst humans might be having disastrous effects on our climate, 'this does not affect the real underlying mechanisms themselves' (Dickens 2004, p. 19; Dickens 1996 citing Benton 1993). Utilising distinctions in Kate Soper's work, Dickens (1998) therefore criticises Giddens's pronouncements on 'the end of nature', in particular in relation to genetic engineering. Giddens's confusion here leads him to overenthusiastically consign emancipatory politics to history in favour of reflexive 'life politics'.

Dickens has continued to make use of the term 'instinct' in Freud's sense, in an era in which the word has fallen into decline. However, Dickens is not implying that patterns of human behaviour are predetermined by biological programming. The term instinct is generally used to refer to the ways in which drives for sex and preservation (and death) are unconsciously shaped by social forces into more historically and socially specific defences and fantasies. Dickens suggests more attention needs to be paid to this social construction of instinct, especially through people's location in class, gender, and ethnic structures (see Dickens 1990, p. 67). The precise forms through which these instincts are manifest in social behaviour are then determined by a range of other contingent factors.

Dickens has controversially identified the basis of nationalism, subculture, and property in these biotic psychodynamics. He argues that instinctive drives underlie nationalism and racism (Dickens 1990, pp. 142 and 147), and these mechanisms are just as 'real' as Marxist class relations (see also Dickens 1992, p. 173). But, of course, the emphasis is placed on the latency of these mechanisms. 'They will take many different forms and indeed they may not be self-evident in the "real" world at all.' The point is nonetheless that even the 'higher' forms of human social and cultural life are rooted in biology (as acknowledged by theorists from Malinowski to Habermas, see Dickens 1992).

Dickens's organism-centred account of the 'biotic "struggle" for existence' (Dickens 1990, p. 49) does not ignore the genetic underpinnings of biology or psychology but instead points to the plasticity of genes and their *potential* based on their interaction with each other and the organism's interaction with the environment, rather than seeing their effects as hardwired (Dickens 2000a, pp. 100–101; Dickens 2004, p. 150). The effect of any one particular gene might therefore be different in different organisms and contexts. Here, he is influenced especially by Waddington's chreod theory and its conclusion that over the evolutionary long course of a population it is adaptability that is selected for and reproduced, rather than any particular genetic pathway. He also draws attention to organisms' capacities for self-organisation (Dickens 1996). Thoroughly aware of its contentious nature, Dickens also draws our attention to recent developments in Lamarckian evolutionary theory (e.g. Dickens 2000a, pp. 114–115; Dickens 2004, p. 37; Dickens 2001a), for example, around acquired immunity to disease.

Dickens makes similar claims about the extent to which action in the built environment is determined by the physical–biological limitations of space versus the opportunities to develop different, potentially conflicting or innovative, meanings around social spaces (utilising Giddens's notion of 'locale'). Distances and walls between people clearly have effects, he argues, but these are hard to generalise or predict (Dickens 1990, p. 5). Dickens's concerns about the optimism of modern architects and urban planners become particularly clear in a heated exchange with Alice Coleman, whom he accuses of 'spatial fetishism' (Coleman 1987; Dickens 1987). But nor does Dickens see space as determined purely at the symbolic level. His critical realist understanding of space pays attention to the historical and economic context in which space is used, and the ways in which the materiality of the physical environment has its effects through its relationship with instinctual biological mechanisms (such as the ontological security established through a sense of territory). This understanding has been clarified further through his engagement with Lefebvre's triad of spatial production—spatial practices, representations of space, representational spaces—in recent work on outer space (Dickens and Ormrod 2016a).

An Underdetermined Human Nature

Third, and following on from the arguments above, Dickens has consistently argued that human nature is not in essence either individualistic or mutualistic, but that the biological bases of both can be activated under different social conditions. The focus thus shifts to developing an understanding of the constraints and potentials that biology presents for human social action: potentials that may or may not be realised by different social structures. As he says, humans 'have inherited a number of alternative potentials and it is difficult to predict in advance which one of these will be predominant' (Dickens 2000a, p. 82). And new capacities are continually discovered (see Dickens 1996, pp. 57 and 152).

There are, of course, good evolutionary reasons for altruism (and, indeed, symbiotic relationships with other species) in humans as in other animals (Dickens 2004, p. 36). This may even extend to an unconscious

awareness of the needs of the group (Dickens 2000a, p. 90). But there are also reasons why humans might act under instinct of self-preservation, an acknowledgment made more or less explicit in Dickens's discussions of urban 'moral careers' (a term adapted from Goffman, but also drawing on Simmel; see Dickens 1990, p. xii), where such instincts are bound up with self-esteem and social value. Agency appears here as something that is biologically rooted, but dependent on social context for its realisation.[2]

Dickens draws attention to the relationship between these competing claims about human nature and the respective political ideologies they support. He criticises the individualist assumptions associated with the abuses of Darwinism and more recent comparative work on ape sociability. But he likewise rejects Kropotkin's arguments about the mutually cooperative nature of all animals, including humans. He also attacks Reich's assumptions about the purity of human nature in his critique of Nazism (Dickens 1990, p. 145).

As Dickens notes, there is in Marx's early work a clear concept of human nature or 'species being'. Key to this is the human ability to make 'their own natures, futures and societies' (Dickens 2000a, p. 95), albeit through a close relationship with external nature (see Dickens 1996). 'Human beings are the self-conscious part of nature, clearly a result of

[2] Dickens's view of the dialectic between individual and society is influenced by Harré (Dickens 1990, p. 11/12) but clearly also owes a debt to Giddens's structuration theory (Dickens 1990, p. 2). Pointing to the shortcomings of some theories of labour such as David Harvey's early work, he says:

> Labour is typically characterised as simply waiting to be either exploited or abandoned by capital. People are pawns or units to whom things happen. The result is that little attention is given to people's own experience and understandings of these processes and the fact that such understandings in turn lead to ways in which they attempt to improve their circumstances within the constraints and opportunities with which they are faced. No attention is given to the history of people themselves, to what we would call 'moral careers'. (Dickens 1990, p. 80, see also pp. 77 and 79)

Dickens points to the relevance of moral careers in relation to slums, gangs, football hooliganism, schooling, careers, and housing (Dickens 1990, pp. 113, 85, 119). Yet this version of structuration theory cannot be accused of over-emphasising reflexive individual agency. He lays out his position very clearly when he takes from Harré the notion that 'people's mental processes are simultaneously shaped by their social environment while they are at the same time, *albeit in a weaker way*, contributing to that same environment themselves' (Dickens 1990, p. 11, emphasis added). In his own empirical work, Dickens examines the strategies of individuals and how these strategies, whilst active, are both structured and in turn structure the world around them. In this, he draws on Wright and Bourdieu (see Savage et al. 1988, 1992; Dickens 2012).

evolution but a species that plans ahead and actively shapes its own development' (Dickens 2000a, p. 85). But more problematically, Marx's work also contains a notion that human nature is communistic. But Marx then shifts to a more 'flexible' view of human nature according to which 'people remake themselves in the process of forming and living in particular types of society' (Dickens 2000a, p. 96). Here, he concedes too much ground to social construction, and fails to acknowledge the constraints and potentials of biology. It is therefore in the compromise of *Capital*, in which Marx (1970) distinguishes 'human nature in general' from 'human nature as modified in each historical epoch', that Dickens finds the way forward. For him, there are important innate human capacities for self-reflection, but these are realised in differing ways and to differing extents by different social classes in different societies. Human nature is, in this respect, 'underdetermined' (Dickens 2000a, p. 96). It could be argued that through such an interpretation, Dickens dissolves some of the differences that are often noted between Marx and Durkheim's theories of human nature (e.g. Dickens 2004, p. 41).

Dickens argues that Marx's later work shows him to be both a naturalist and a humanist—human nature is the product of evolution but also continually remade through interaction. Dickens casts Ted Benton as erring on the naturalist side, though accepting some of his criticisms of Marx's dualistic view of the human and the animal. Benton argues that Dickens's concept of alienation (discussed further below) 'is a sign of his reliance on a normative perspective' (p. 237; see also Soper, this volume). It implies an authentic human nature from which we are alienated. The issue is largely resolved if, rather than consider alienation from an essence species being, we read Dickens's version as alienation from human *potential*. Our potentials for self-knowledge, knowledge creation, communication, and reflexivity are blocked under certain social conditions (Dickens 1996, p. 173).

Although Murray Bookchin also naturalises mutualism to some degree, his concept of 'second nature' clearly appeals to Dickens. Humans may be a 'natural sort', but they are 'a culture-making natural sort' (with these 'specifically human qualities … founded on the biological needs which they share with other species', Dickens 1996, p. 203). This includes making 'their own self-identities in the contexts

of their environments' (Dickens 2000a, p. 60). Whilst social structures condition human nature, reflexivity at the social and individual levels is central to Dickens's understanding of how it is that social structures are reproduced and challenged. This includes the individual having a sense of their relationship to society (Dickens 2000a, p. 62). Referencing Leakey and Lewin (1978), Dickens (1990, p. 61) makes the point that the ability to reflect on our own innate processes is a distinctive human characteristic. As Darwin said, it was humans' enhanced capacity for abstract reasoning and communicating complex ideas that enabled them to triumph over other species (Dickens 2004, p. 36). Conceptualisation and language were essential in this (Dickens 1990, p. 168). Language is a way of making sense of the world through transposing the familiar onto the non-familiar (Dickens 1996), transferring or projecting experience (Dickens 1992, p. 138), and

> a means by which humans make both their society and themselves. It is part of the emergence of the distinctly human capacity for abstract thought, though a capacity which is genetically enabled. (Dickens 2000a, p. 62)

Dickens's critique of Bookchin is based on an acknowledgement of the variation that these human potentials allow in the development of patterns of social behaviour.

The Danger of Metaphor

Fourth, as is typical of critical realism, Dickens acknowledges the relevance of different forms of knowledge to different levels at which causal mechanisms operate. He argues that 'no one discipline has a monopoly of wisdom' (Dickens 1990, p. 167). Because of this, he has been highly sceptical about the possibility and desirability of a 'theory of everything' (see Dickens and Ormrod 2007b; also Dickens 1998, p. 105; Dickens 1996, p. 11). There are places in his work where he seems more positive about a totalising theory—when talking about Marx's 'one science' (Dickens 1990, p. 180) or Engels's single theory (Dickens 2004, p. 64), for example—but here it is crucial that one science is not *subsumed* by

the other, but each subsumed within the other, overcoming the division of the sciences (Dickens 1992).

One of the cautionary tales that characterises Dickens's work relates to the danger of using knowledge of mechanisms operating at one level of reality to understand mechanisms operating at another. In *Social Darwinism* (Dickens 2000a) in particular, he criticises analogies drawn between biological and social evolution.

The first issue is that the knowledge drawn upon from other disciplines is often (deliberately) partial. Whilst Marx and Engels saw their science of human history as building on Darwin's theory of biological evolution (Dickens 2000a, p. 26), Dickens urges caution when it comes to translating knowledge of such biological processes straightforwardly into sociology. Of course, social structures do change over time. Dickens's main issues stem from the importation of the concepts of progress, direction and teleology to understand the mechanisms driving this change. But these concepts were improperly attributed to Darwin in the first place. Even at the biological level, Darwin did not believe that evolution necessarily resulted in 'better' organisms (only ones adapted to their environment), or that evolution had a linear direction and was headed towards some ideal final state. Such a view can be attributed more fairly to the sociologist Herbert Spencer's understanding of evolution, to whom I return, but not to Darwin himself.

The second issue is with analogies that do not acknowledge the different mechanisms that operate at different levels. Evolutionary economics, for example, portrays competing firms as trying out 'blind' innovations, with the most economically fit of these surviving. The analogy does not hold. Genes cannot learn from and imitate others' successes, but companies can. This points to an underestimation of the 'active, reflexive and flexible' nature of human beings (a criticism also levelled at Spencer, in Dickens 2000a, p. 44). Spencer's theory of evolution relied on the concept of 'differentiation'. Evolution, at whatever level it occurred, physical, biological, or social, involved the increased differentiation of component parts. Parts become more heterogeneous and their relations became more complex. Dickens's issue with this is that the process of differentiation is understood in the same way across all these levels. Whilst differentiation may occur at all these levels, a sociological understanding of why the divi-

sion of labour in society occurs in the ways it does cannot come from an understanding of differentiation in nature (Dickens 2000a, p. 40).

A further example is his critique of Dawkins's use of the notion of 'memes' to explain the evolution of ideas in an analogous way to the functioning of genes (see Dickens 2000a, p. 55). As Dickens says, Dawkins is able to describe the patterns through which memes are spread, but not 'why people take up some ideas and not others' or 'the mechanisms by which ideas become entrenched' (Dickens 2000a, p. 57). The mechanisms are clearly not those of genetic reproduction, but their exact nature is not specified. Dawkins ignores the way in which social power operates to determine which ideas get reproduced (tearing apart the idea that the Coca Cola theme might be a meme).

A third issue is the way in which theories of social evolution that have used biological analogies have tended to ignore, apparently rather paradoxically, the dialectic between social evolution and (internal and external) nature (Dickens 2000a, p. 44; Dickens 1992; Dickens 2004; Dickens 1996, following Collier 1994). Dickens alludes to this, of course, being far from coincidental. In addition to the desire to establish sociology as a distinctive discipline, one political purpose of importing knowledge from biology has been to 'naturalise' particular social relations, and so nature must appear static and itself divorced from social processes. In *Social Darwinism*, Dickens pays less attention to the better-documented political abuses of evolutionary analogies, but elsewhere in his work he has engaged in extensive analysis and critique. Much of his argument is encapsulated in a quote from Sahlins about sociobiological theory, heir of Spencer's work and precursor to Dawkins:

> What is inscribed in the theory of sociobiology is the entrenched ideology of Western society: The assurance of its naturalness, and the claim of its inevitability. Since the seventeenth century we seem to have been caught up in this vicious cycle, alternatively applying the model of capitalist society to the animal kingdom, then reapplying this bourgeoisified animal kingdom to the interpretation of society. (Quoted in Dickens 1990, p. 62)

Dickens's recent work on cosmology has made very similar points (Dickens 2011; Dickens and Ormrod 2007b). Drawing on the work of

a number of historians of cosmology, he notes the 'resonances' between Aristotle's hierarchical universe and feudal society (Dickens and Ormrod 2007b, p. 20) as well as the explicit analogy made at the time between Isaac Newton's atomistic view of the universe and the so-called Newtonian System of Government represented in early British industrial capitalism and parliamentary democracy (Dickens and Ormrod 2007b, p. 36). In the latter case, he again draws attention to the failure of the analogy to cope with human agency, as people 'unlike planets or atoms, tend to be proactive, take stock of their situations and often behave unpredictably' (Dickens 2004, p. 14).

Having said all of this, Dickens is not completely against the use of analogy (see Dickens 2001b, p. 97), which is, after all, essential to conceptualisation and language (Dickens 1992). Used as a heuristic device, analogies can lead to theoretical breakthroughs. He even acknowledges that the use functionalist theory made of the 'organic metaphor' for society was useful in throwing up new questions (Dickens 2004, p. 38). 'The problems begin', he argues, 'if the analogy does not lead to an independent understanding, one which no longer needs the scaffolding of the analogy from whence it started'. The corresponding mechanisms operating at another level must be uncovered using approaches appropriate to that level. Robert E. Park is used as an exemplar of a theorist whose work recognised two distinctive levels at which evolutionary processes were taking place—the 'biotic' and the 'cultural'—but also the dialectic relationship between them (though his ecological analogy employed to explain the processes of invasion and succession in respect to the changing 'natural areas' of the city is often misrepresented) (Dickens 1990, p. 33). The important thing is how different types of knowledge are combined. Insights can travel across disciplines, but not in the form of analogies (Dickens 2000a, p. 55).[3] It is crucial for critical realism that mechanisms operating on all these levels are interrogated through both scientific and practical experience.[4]

[3] Note that Dickens translation of the biological concept of organism 'metabolism' to the social level is an *extension* of the biological theory of metabolism, building on its insights, and *not* an analogy (Dickens 2004, p. 59 and 67).

[4] Dickens's approach to sociological research, both praised and criticised, is supported by a 'realist epistemology'. He provides a critique of empiricism insofar as it claims to understand the ordering

It will hopefully be clear in what follows that these philosophical tenets feed directly into Dickens's environmental sociology.

The Effects of the Mental/Manual Division of Labour on Internal and External Nature

Dickens takes his lead from historical materialism. This he defines as an approach insisting that 'at the core of a society is the mode of production, the way in which human societies organize to work on nature and produce the things they need' (Dickens 2000a, p. 101, following Cohen). Much of his work concerns knowledge, but it is through our labouring on external nature that our understanding of the latter is altered (see, for example, Dickens 1996, p. 103). However, Dickens's version of historical materialism has never been interested in the unfolding of the laws of human history based on a static concept of human nature, but rather in the dialectic between modes of production and human nature, and the human potentials which are and are not realised within each epoch. One concern of historical materialism that is particularly important for Dickens is 'the marginalization of knowledge which accompanies the exercise of class power' (Dickens 2000a, p. 104). This has a detrimental effect on our understandings of both external and internal nature and of the relationship between them (Dickens 1996). Marx had mentioned the effects of the fragmentation (or 'Balkanisation') of knowledge in his early work, but Dickens's arguments are informed by a range of writers.

Dickens has placed a great deal of emphasis on the division between mental labour and manual labour, which he sees as forming a basis for other social divisions (Dickens and Ormrod 2007b). The associated power relations underlie unequal control over how the urban environment, human beings, nature, and the universe are understood, and therefore our relationship with them. In *Reconstructing Nature* (Dickens 1996), Dickens suggests that 'to concentrate the attack on capitalism alone may

of the world merely through the collection of 'facts' (Dickens 2004, p. 20), and of a positivist method that ignores the reflexive capacities of human actors (op cit. p. 14). And yet he holds empirical work in high regard. The point is simply that this data must be understood as indicators as to underlying mechanisms.

be to miss a central problem, that of the advanced division of labour under modernity' (Dickens 1996, p. 4). The separation between abstract and lay knowledge can be traced to Ancient Greece (Dickens 1996, p. 141; see also Dickens and Ormrod 2007a). And he notes the destruction of nature that has taken place in socialist countries (Dickens 1996, p. 31), accompanied by a managerial and technical division of labour (p. 50, following Sayer). The division of labour, he argues, came about in order to make work more productive, as well as for reasons related to control and penetration of capital (Dickens 1996). However, Dickens does argue that such a division of labour may be enhanced and entrenched under capitalism (drawing on Raymond Williams 1973). He points to both a Weberian process of social closure wherein groups protect and promote their own forms of knowledge,[5] and the incorporation of science into industry as what Braverman calls an 'adjunct of capital' (though Dickens separates the technical and social divisions of labour, see Dickens 2002). Both work to inhibit the development of a truly reflexive modernity. Dickens (1996) is therefore exposed to criticisms from two directions at once. There are those who see his work as overly Marxist and those, such as White (1997), who fear he emphasises the division of labour/knowledge at the expense of recognising the importance of capital accumulation or patriarchy.

For Dickens (1996, p. 48), the division of labour is predicated on the 'marginalisation of tacit and lay knowledge acquired during work', including 'the knowledge that indigenous farmers have of their land, the knowledge which women have of their own bodies, knowledge of preparing and cooking food, and the knowledge that children have of their environments'. In recent work (Dickens and Ormrod 2007b), he has extended this to marginalised knowledges of the universe. Practical (immediate and unquantifiable, Dickens 2004, p. 79), lay (non-abstract, Dickens 1996), and/or tacit ('non-codifiable', Dickens 1996) localised knowledge is marginalised at the expense of abstract, expert knowledge. The deskilling of labour consists in 'taking knowledges out of a given labour process and placing them in the possession of a materially distinct set of workers' (Dickens 2000a, p. 105). As he goes on to emphasise,

[5] Here, he draws on Parkin (1979). See also the discussion of professional groups and knowledge in Dickens (1997).

the development of such knowledge by a set of mental labourers then becomes the basis for further transformation of the labour process. The result of this, in addition to unemployment brought about by mechanisation, is alienation from nature.

Dickens brings Marxist theory into dialogue with feminist insights, which have stressed the way in which 'female' forms of knowledge have been denigrated as 'passive and uncreative' (Dickens 2000a, p. 105). Referring to Mies and Shiva's (1993) study of women's agricultural work in India, a critique of Enlightenment 'progress' in the form of scientific crop management (aimed at ensuring productivity and uniformity) is combined with an acknowledgement of the interests of capitalist agribusiness that are driving such developments. Dickens is interested in the impact of this form of knowledge not only on the environment, but also on women labourers themselves, as they are alienated from an environment they understand through 'non-codified' forms of knowledge, which may nonetheless involve complex cultural and scientific practices (Dickens 2004, pp. 79–80). Dickens (1996) is very clear that manual work involves mental work as well, but a form that goes unrecognised, whilst abstract forms of knowledge are withheld from the worker. Workers remain aware of how their own knowledges have been marginalised (Dickens 1996, p. 139), and are thus able to recognise their own alienation.

What Sohn-Rethel calls 'alienated knowledge' thrives under capitalism as abstract knowledge can be bought and sold (Dickens 1996). This is particularly true of agricultural knowledge. 'An extra premium', Dickens says, is placed on

> scientific understandings of a kind which can be quite easily transformed into marketed products. This particularly applies to genetic knowledge. Here are individual parts of an organism which can be readily identified, patented, invested in and used for commercial purposes. (Dickens 2004, p. 115)

Dickens's point is that such forms of knowledge, whilst amenable to commercialisation, pay little or no attention to the wider organism and environment to which these parts are dialectically related. A different kind of science has a role to play in understanding these relations, but

Dickens believes such a form of knowledge—less likely to produce profitable 'information'—is inherently less marketable (Dickens 2004, p. 116).

The fragmentation of scientific knowledge clearly relates to a process of 'disassembling and reassembling' nature as far as Dickens is concerned. He argues that 'conceptualisation as systems of parts is a preliminary to domination' (Dickens 1996, p. 110). Fragmentation puts control in the hands of wealthy corporations in the developed world. Dickens (1996) utilises the concepts of appropriationism (wherein elements of production are industrialised) and substitutionism (wherein industry supplies inputs into food production) to understand some of these processes (taken from Goodman and Redclift 1991; see also Lawrence 1989). This includes, for example, the Beltsville pigs, whose biology was disassembled so that their meat-producing capacity could become the focus of intervention, whilst the whole animals were reassembled in monstrous ways from the perspective of the animal's overall well-being (Dickens 1996, p. 63). Dickens makes similar arguments about reproductive technologies, which he argues reduce women's bodies to parts that can be exchanged and sold (Dickens 1996). The result is an alienation from their bodies, which they feel they fail to understand, though he acknowledges the active part women play in this process. Dickens is aware that selective breeding of plants and animals has a very long history, but it is the fragmenting of the organism, and its alienating effects on 'producers' that is new.

It is also in relation to these processes that Dickens (1996) believes the unintended consequences of modern interventions in nature are realised (referring more positively to Engels's understanding of this than that of Beck and Giddens). What he is pointing to here are the multiple failures in the rationalisation of nature (referencing Murphy's 1994, Weberian account). His position is supported by the critical realist notion of latent mechanisms. The issue is that genes are treated in isolation, whilst these only actually code potentials and capacities. The relationship of genetic intervention to other genes and the environment is ignored. This gives rise to what Dickens (1996) refers to, following Engels, as 'nature's revenges' (extending to acid rain, the effects of additives in the food chain, and the evolution of resistant strains of bacteria).

This is not to say that Dickens sees no place for abstract knowledge. This is not a call to abandon 'science' as such, and for a romantic return

to lay knowledge (contra White 1997), or even for abolishing the division of labour entirely. Whilst supportive of Irwin's (1995) 'citizen science', he recognises that the division of labour has brought benefits and 'must be a central element of any future modern society' (Dickens 1996, p. 1). Scientific advances and new technologies do bring advantages, and are often welcomed and incorporated by lay people. Instead, a dialectic between scientific and lay knowledge must be constructed (Dickens 1998, p. 120, following Collier), resulting in a 'theoretically informed concrete knowledge' (Dickens 1996). Ultimately, he says, 'the idea of scientific knowledge must be accepted, but science must continually justify itself, with reference to what people are experiencing' (Dickens 2004, pp. 249–250). Dickens (1996) takes Collier's argument that the problem with abstract knowledge comes when knowledge derived from the laboratory is applied to open systems. Abstract knowledge of general causal mechanisms must be combined with concrete understandings of the way in which general mechanisms are influenced by contingent causal factors (often related to the influence of local space and time, Dickens 1992). This is where lay knowledge comes into its own. Dickens also suggests that it is through the conduit of lay knowledge that the dialectic between reality and knowledge takes place (whilst, it can be inferred, the sphere of expert knowledge production and testing remains relatively hermetically sealed and self-supporting). Workers' lay knowledge 'necessitates some understanding of abstract knowledge as well as brute experience of what is taking place' (Dickens 1996, p. 56). It must 'in some respect reflect the material circumstances in which they are working'.

Dickens argues that 'Green politics is therefore above all part of what Wainwright (1994) calls "the politics of knowledge"', (Dickens 1996, p. 174). And yet, for Dickens, the politics of knowledge, conceived of in this way, is not confined to new social movements alone; 'The stakes to politics whether "old" or "new" are no less than a recovery of self, of meaning and identity in a society where lay, tacit and local knowledge are systematically denied' (Dickens 1996, p. 170). Whilst he has been criticised for not specifying clearly enough how abstract and lay knowledges may be combined in practice (White 1997), Dickens is clearly inspired by the anarchist elements of new social movements. Indeed, it is the anarchist commitment to abolishing the mental/manual division of

labour that appears to draw him away from some socialist traditions and towards others (see his example of Lucas Aerospace, Dickens 1996).

The Alienation of Humans from Nature

With other contributors to this book, Peter Dickens has been at the forefront of a green or eco-socialism, mining Marx's writings for insights capable of helping us understand the origins of contemporary environmental issues. A central concept for Dickens in this has been humans' alienation from nature. Under capitalism, Marx argued, humans are alienated from internal and external nature in four ways—from the product of their labour, from their labour itself, from their species being, and from each other. As Swain (2012, pp. 71–72) notes, Marx identified that in being alienated from the product of labour, the worker relates to 'the sensuous external world, to the objects of nature, as an alien world inimically opposed to him'. But Dickens makes a distinction between this concept of private property as alienating in Marx's early work, and the concept of alienation from external nature when it is treated as a mere input into the production process, which appears in his later work (Dickens 1996). Taken together, we are alienated from our 'naturally' sociable and creative internal nature, when we treat ourselves and our fellow humans as 'just another input in the production process' and when we do not produce for ourselves (Dickens 2004, pp. 72 and 79; Dickens 1997, p. 86).

Dickens (1996, p. 58) recognises two contrasting definitions of alienation. One, represented in Marx, is as 'loss or absence of something which is essential to humans' "well-being"'. The other, taken from Bhaskar, is as being 'separated, split, torn or estranged from oneself' (cited in Dickens 1996, p. 58). Dickens's own definition of alienation is somewhat idiosyncratic: 'the process by which people's understanding of themselves and their relationships to the world are removed' (Dickens 1996, p. 58). This lies somewhere between Marx and Bhaskar. It acknowledges that inherent in human beings is an ability to reflect upon themselves and their relationship with nature. And it is in not being able to realise this potential that humans are alienated. The notion of latent capacities lies beneath such an idea, and allows Dickens to navigate between overly

prescriptive ideas about human nature or essence and purely negatively conceived conceptualisations of what alienation might mean.

In theorising our alienation from external nature, Dickens has helped popularise the concept of the metabolic rift. Dickens makes clearer than some writers that there are two dimensions to the metabolic rift, both identified by Marx (Dickens 2004, p. 80). Though one appears more focused on the effects on external nature, and the other on internal nature, these cannot be so easily separated.

Dickens (1997, p. 82) draws heavily on John Bellamy Foster's work when outlining the first dimension of the metabolic rift, which is a chemical one. When using the term in this sense, the metabolic rift, sometimes also called the ecological rift, is defined as 'the overloading and exhausting of ecological systems' (Dickens 1997, p. 84). Pre-capitalist societies, Marx had argued, returned waste to the soil in what might now be called sustainable ways. In capitalist societies, no such efforts were made. Cities did not recycle their waste. A trade in guano developed before the introduction of the nitrogen fertiliser industry. These efforts resulted in new sources of profit, whilst promising to safeguard or enhance yields for farmers. But they generated new forms of risk, and further undermined the sustainability of humans' relationship with nature. Some might argue that this dimension of the rift can be addressed through the recycling of waste (though as Dickens makes clear, such a move needs to target industry and not simply aim to raise consumer consciousness, see Dickens 2004, p. 144). But for Dickens, the rift is founded on humans lacking direct experience of how waste affects the environment (Dickens 2004, p. 43).

The chemical dimension of the ecological rift relates to another concept developed in contemporary green Marxism, with which Dickens also repeatedly engages, and that is O'Connor's notion of a second contradiction of capitalism. This is the contradiction 'between capitalist production relations and the "external physical conditions" of such relations' (Dickens 2000a, p. 106, drawing here on Benton 1996). As capitalism expands its productive capabilities, it undermines its own material base in the resources of nature. It is important to note that Dickens is opposed to any form of catastrophism in respect to Earth running out of resources. He believes, like O'Connor, that social solutions will be found before

that point. But unlike O'Connor, who believes the answer will likely come in the socialisation of nature, in recent work, Dickens has speculated about whether the development of space resources will forestall the crisis before this point is reached (if not permanently resolve crises of over-accumulation) (Dickens and Ormrod 2007b; Dickens and Ormrod 2009; Dickens 2009b; Dickens 2016). This is one example of the ability of capitalism to restructure, whilst ensuring the costs are paid by the poor (Dickens 2002). Dickens has gone as far as to very tentatively say that he can 'just about imagine a sustainable capitalism' (Dickens 1996, p. 9). The issue is that this would not alleviate alienation.

It might be misleading when Dickens says that the issue historically has been that the costs of waste disposal 'have not appeared as part of the costs of production, the prices at which they are sold or the level of profits enjoyed by shareholders' (Dickens 2004, p. 84). This should not be understood as an endorsement of contemporary schemes which aim to deal with the problem precisely by attaching economic value to pollution avoidance, such as carbon trading. Dickens (2004) is clear that the privatisation of nature takes place in a world already marked by alienation and uneven development, hence commodifying nature only enhances these things. This is true of the commodification of internal nature (what Yoxen 1983, calls the 'life industry') as well as external nature. A similar position informs his critique of environmental rights defined on the level of individual organisms and the principle of compensation (Dickens 2004, p. 215). Dickens argues that individual rights generate alienated communities rather than 'real' communities. Following Marx (1975, p. 146), Dickens sees the state's protection of rights as providing equality in the 'Heaven' of the political world whilst people, and indeed animals, remain unequal in their earthly existence.

There is work to be done in making waste more visible, and here he uses Elias's work to understand how the 'civilizing process' has meant the systematic denial of waste. This has a geographic dimension (Dickens 1997, p. 168), and can be understood psychoanalytically—linked to Dickens's later work. Dickens (1996, p. 29) makes it very clear that 'environmental crisis' is not just about environmental degradation, 'it is as much a crisis of understanding and resulting human alienation'. Dickens is less interested in efforts like Podolinsky's to measure agricultural energy

inputs, and, like Engels, more interested in the human dimension of the rift.

The second dimension of the rift therefore exists at the level of human understanding of nature. Capitalism has been responsible for alienating people from understandings developed in the course of interaction with nature in the production process. This is not to say that nature is no longer appreciated on an aesthetic or spiritual level (Dickens 2004, p. 73), although this may take the form of fetishisation, especially of a 'pure' nature (Dickens 1992). The issue is that we do not understand the role of nature in production processes. There is a geographic separation between 'the environments in which people live and the industrial and agricultural systems on which they depend' (Dickens 1996, pp. 26–27; Dickens 1997). The problem is not a lack of 'knowledge' per se, but that our understanding of nature does not emerge from *direct engagement* with nature, from *working on* the land (Dickens 1997, p. 95). Indeed, the proliferation of knowledge has merely contributed to a 'profound psychological disorientation' in relation to food (Dickens 2004, p. 43). The impact of the internet on this, as a medium of excessive information but increasing disembedding of social relations, remains to be seen.[6] Whilst he does talk about estrangement in food preparation (Dickens 2004, p. 141), Dickens's argument goes beyond lamenting how little inner city children know about the source of foodstuffs. The important point is that through the social relations of production and consumption, the rift in our relationship with external nature fundamentally damages our own, internal nature. Dickens does not prize *knowledge* about nature for its own sake, but valorises an *understanding* of nature developed through working with it to produce the things that we need, and hence reaffirming our genuinely creative human powers (see Dickens 1997, p. 83).

Both dimensions of the metabolic rift are intimately connected to the alienation of humans *from each other*, both heightened by and contributing to it. 'Environmental injustices are clearly linked to social and

[6] Dickens (1996) is sceptical about new information technologies ushering in a new era of citizenship, but optimistic about their subversion (see also Dickens and Ormrod 2007b). The internet might also aid self-development through enabling people to recognise their relationships to one another and their environments (Dickens 2004, p. 138; Dickens 2002; see also Dickens and Parry's school project, Dickens and Parry 1998).

economic injustices' (Dickens 2004, p. 86). Dickens makes it clear that healing the metabolic rift cannot take place without addressing the collective nature of the production process. Here, he draws on eclectic sources. From Tönnies, he takes the argument that community was once based on locality, territory, and collective work on the land, and that problems emerge when this relationship is dissolved (Dickens 2004, p. 40; see also Dickens 1992). Whilst attempting to avoid romanticism, Dickens questions whether sustainability is possible without intergenerational links to the land.

For Dickens, all new social movements tackle issues on the society/nature divide (Dickens 1996, p. 180). He believes that many new social movements are aimed at addressing alienation (Dickens 1996; including a critique of the state as alienated community), and, more specifically, the metabolic rift (Dickens 2004, p. 240). He sees hope in new social movements' attempts at re-embedding (following Giddens)—developing 'understanding of, and possibly control over, their lives' (Dickens 2004, p. 243), often after some kind of personal shock. Insofar as Dickens (1996) associates Habermas's notion of 'the colonization of the lifeworld' with a type of alienation, the latter's work on new social movements (Habermas 1981) might also be seen as a description of the process of contesting alienation.

However, Dickens also sees many new social movements as emotional, romantic reactions to Enlightenment views of nature, attaching a mystical value to 'untouched nature' (Dickens 1997, p. 110). He is clear that he distances himself from many currents in ecological thinking, and especially deep ecology, through his rejection of benign views of nature (see Dickens 1996, p. 39, following Martell) and of the possibility of an environmental ethics that truly abandons anthropocentrism. As he says in his critique of Naess, 'attribution of value to non-human beings must be a human-centred business' (Dickens 2004, p. 229).

Such a view arguably means Dickens fails to problematise the 'humanization of nature' and creates one of the major fault lines between him and Ted Benton. For the latter, the term evokes a kind of 'species narcissism', with humans making nature 'an object confirming their specifically human powers and capacities' (in Dickens 2009a). There is a tension

between human realisation through mastery of nature, on the one hand, and appreciating the aesthetics of nature, on the other hand. It is to this that Dickens attributes the contradiction between Marx's Promethean and ecological interpreters (Dickens 2004, p. 5). Benton (2009, p. 230) accepts that Dickens's interpretation of the term 'humanization' is a much 'greener' one than his, and is not one that treats external nature as an object for the satisfaction of human need. Dickens's path, as ever, lies between a romantic 'return to community' and the domination of nature by technology (see Dickens 1996). Dickens argues that what matters is what kind of human is doing the imprinting, and he defends a dialectic between the 'humanization of nature' and the 'naturalization of man' (Dickens 1997, p. 86), in which understandings of nature are key (Dickens 1992).

> Humans convert nature into the things they need but in doing so they develop their own nature. They develop their inborn capacities and potentials in new and wholly unanticipated ways. In this sense, as indeed Marx argues, humans 'naturalise' themselves in the process of humanising nature. They enhance their own natural being. (Dickens 1996, p. 204)

The Third Contradiction of Capitalism

One of Dickens's contributions to Marxist theory has been the identification of a third contradiction to capitalism, in addition to the central contradiction identified by Marx and the contradiction between capitalist production relations and external nature mentioned above. For Dickens, the third contradiction exists 'between capitalist production relations and *internal* nature—the capacity of people to remain healthy and work productively' (Dickens 2000a, p. 106). He goes on to cite Marx: 'Capital is reckless of the health or length of life of the labourer, unless under compulsion from society.'

Whilst, as he acknowledges (Dickens 2004, p. 48), O'Connor's second contradiction includes the reproduction of labour power, Dickens's third contradiction goes beyond mere biological reproduction through suffi-

cient wages and labour conditions (though it also includes this, Dickens 2000a, p. 107). Much more important is the reproduction of the subject in the sense of a psychologically well-adjusted human. How this reproduction is promoted and hindered by social and economic conditions is understood through Dickens's brand of biotic psychoanalysis. This is what ultimately underlies the willingness of capitalist subjects to reproduce or challenge capitalist relations of production.

This introduces an important distinction in O'Connor's second contradiction, which would otherwise replicate the capitalist mistake of treating human subjects as mere inputs into the capitalist machine that need to be maintained through other material inputs—food, water, sleep, and so on. It is of course right that humans have certain biological needs that must be met in order to sustain any mode of production, and also true that capitalism threatens to undermine these things. But if these relate to a contradiction with humans' 'natural being', then I want to suggest that Dickens's third contradiction relates more to humans' 'species being', and therefore more closely to the notion of alienation discussed above. And as Marx noted, whilst individual capitalists will out of necessity pay to reproduce the labour power of their workers, it is the endemic effects of lengthening the working day, stress, loss of autonomy, alienation, and so on that are left unchecked because they affect the ability to work to a lesser extent.

Drawing on Wilkinson's empirical research, Dickens notes that physical and mental health do not only deteriorate in conditions of material scarcity, but also, in capitalist societies, through a variety of mechanisms, deteriorate even amongst the materially comfortable. This includes a variety of conditions he says might be labelled as stress—'dissatisfaction, boredom, uncertainty, anxiety, alienation' (Dickens 2004, p. 108). Some of these conditions are nonetheless still associated with the working class, even if they cannot be reduced to inadequate wages and the physical exhaustion resulting from meeting subsistence needs. But Dickens also hints at so-called diseases of affluence, which range from diabetes and heart disease to eating disorders. And, more importantly, he acknowledges the excessive individualism, status anxiety, and unstable social attachments (Dickens 2004, p. 107) that emanate

from the wealthier strata but increasingly characterise late-modern capitalist subjectivity across classes.

In later work, Dickens refers to the dominant form of subjectivity in capitalist societies as 'adult infantile narcissism'. Whilst he uses the term in a way that is largely compatible with what other authors (such as Christopher Lasch 1991) have had to say about the social causes of late-modern cultures of secondary narcissism,[7] I think Dickens's preference for the deliberately oxymoronic term points to his emphasis on an adult form of narcissism in which identification of others as separate subjects has not taken place ('individuation'). In this respect, he differs from those who see secondary narcissism as a condition associated with narcissistic object choice. This is reflected in his reference to Craib's (1989, p. 10) suggestion that the narcissist relates to the external world as a 'magical extension of itself' (cited in Dickens 2004, p. 167). As in Lasch's work, Dickens makes reference to those cultural relations that sustain a sense of narcissistic omnipotence—this including the consumption of a 'tamed', 'constructed, simulated, commodified nature' as found in SeaWorld and other tourist sites (Dickens 2004, p. 138).

Dickens sees the roots of contemporary narcissism in modernity itself, rather than in the late-modern fragmentation of modern social forms. In this respect, he is closer to Drew Westen's (1985) theory of narcissism than Lasch's. Thus, whilst Lasch vehemently opposes modern individualism to narcissism, Dickens refers to narcissism as a 'particularly extreme form of individualism, the ideal of an autonomous subject' (Dickens 2004, p. 167;

[7] It is important to note that Dickens's version of psychosocial theory takes heed of a warning found in Freud, stated even more categorically by Lasch, and discussed specifically in relation to the sequestration of nature by Giddens (1991, p. 167). This is that the contribution psychoanalysis can make to social theory is not by offering diagnoses of whole societies, but of analysing the effects of a social structure on the psyches of its population. In the former, psychoanalytic concepts are really being applied to the social level metaphorically. An important case in point would be attempts to explain inactivity in response to climate change using the psychoanalytic concept of 'denial'. Denial has a specific psychoanalytic meaning, which does not adequately capture the reasons why climate change is not addressed. There may be those who repress knowledge of climate change and their contribution to it. But there are others who genuinely believe those who tell them that climate change is a myth, or who are unsure who to believe, or who are aware of climate change but feel it cannot be addressed. The social response is the product of power relations between various groups. The tendency in some psychosocial theory to diagnose social conditions not only fails to address this, but also tends to divorce social relations from their basis in psychological mechanisms, even as metaphors from that level are imported in the name of furthering our understanding.

see also Dickens and Ormrod 2007a). This is not to say he makes no distinction between the two, however, and he follows Lasch in expressing the value in a certain kind of self-esteem necessary for self-empowerment and altruism (Dickens 2004, p. 168, Dickens 2003, drawing on Rousseau's *amour de soi*). Contemporary capitalist societies go beyond this in projecting an illusion of autonomy 'bought at the expense of alienation from their social and natural environments' (Dickens 2004, p. 170). Dickens (2003) identifies individualism in the labour market, telecommunications, and high levels of consumption as to blame, later making reference to Dean's (2003) work on the illusion of 'self-programmable workers' (Dickens 2004). He makes clear how this analysis relates to his critical realist framework; 'Pre-existing narcissistic tendencies in the human psyche are being activated by the kinds of social change (changing work structures, the retreat of collective state provision, etc.) which characterise contemporary society' (Dickens 2004, p. 173; see also Lasch, 1991, Afterword). Humans, Dickens asserts, have the capacity for what Freud called anaclitic relationships, which can be realised under particular social conditions, and which in turn encourage non-hierarchical social forms (Dickens 2004, p. 247).

A key term Dickens takes from Marx is the 'subsumption' of internal nature to capital, and this is tied up in his analysis of alienation. Workers are 'formally subsumed' to capital when they become wage labourers. 'Real' subsumption consists in workers' loss of autonomy and work being 'reduced to following the movements of the capitalist's machine' (Dickens 2000a, p. 105, also pp. 115–116). For Marx, 'workers' skills were becoming so diminished and their movements so subjected to the capitalist's machine that they had become "by nature unfitted to make anything independently"' (Dickens 2000a, p. 116). However, Dickens goes on to suggest a 'radical extension of Marx's theory of subsumption' when tentatively supporting the notion that the mental/manual division of labour is embedded in the biological structure of the population (Dickens 2000a, p. 115; and see Dickens 2001a on the uneven development of abstract reasoning). As he argues, 'Marx hints at a third stage when the worker's internal nature is itself transformed. The worker is made into not much more than an extension of the capitalist's machine' (Dickens 2004, p. 156).

This argument adds another dimension to Dickens's third contradiction, and is based in part on the acknowledgement that the development

of adult biological capacities is influenced in utero by the mother's immediate environment and later by the childhood environment. In respect to the latter, it is pointed out that genetic variations are manifest much later in the development of the organism than often assumed and are therefore not predetermined (Dickens 2000a, p. 111). Hence, 'we can envisage a biological mechanism contributing to the continued reproduction of an "unfit" underclass; generations of people being not only born into poor circumstances but constructed for such contexts and, furthermore, even passing on inherited biological misfortunes to their children' (Dickens 2000a, pp. 109–110; Dickens 2001a). It is important to recognise that in saying this, Dickens is, in his own words, 'turning *The Bell Curve* on its head' (see also Dickens 2001c). In this case, biology becomes a dependent as well as an independent variable (Murphy 2005). Society is not seen as the outcome of individual biological traits, but biological capacities are seen as the outcome of social processes (see Offer 2002). This is also supported by Bourdieu; 'socialization of the biological and biologicization of the social combine to reverse the relationship between causes and effects and to make a naturalized social construction' (Bourdieu 2001, p. 3). Furthermore, because of the emphasis placed on biologically based potentials or capacities, Dickens encourages us to concentrate on realised and unrealised potentials, rather than seeing the biological embedding of the mental/manual division of labour as insurmountable. He thus avoids the right-wing politics so often associated with the 'survival of the fittest'. Indeed, 'survival of the fittest' is replaced by 'survival of the richest'.

There is another, perhaps even darker, side to Dickens's discussion of how capital is 'modifying nature in its own image' (see, for example, Dickens 2001a). One of his foci in this respect has been the 'industrialization of human procreation' through IVF, egg donation, and ultimately the possibility of the direct genetic modification of foetuses. This is seen as the radical extension of the subsumption of internal nature by capital. Just as capital has both commodified and interfered with the DNA of plants and animals in order to make them more profitable, so, Dickens fears, it will modify human biology. 'Even now', he notes, 'wealthy American parents are engaging in a form of DIY eugenics, advertising for donors whose eggs are likely to produce children of high intelligence'

(Dickens 2000a, p. 116). Dickens sees sensationalist concerns over the 'Nazification of medicine' as unfounded, and seeks a middle ground when it comes to discourses of risk around biotechnology (e.g. Dickens 2004, p. 111). What is important is understanding that these risks are the product of political deregulation and the commodification of the commons, which is not necessarily there in Beck's work (Dickens 2004, p. 115). Drawing, not unusually, on science fiction, he hints at ways in which the genetics of workers might also be affected so as to make them better capitalist subjects, and also at the possibility of social divergence into two classes—one able to afford genetic modification and the other not (Dickens 2004, p. 182). One aspect of this modification of nature of analytical significance is the creation of a 'nature industry' in which 'the powers of nature are themselves being used as production processes' (Dickens 1996, p. 44). He gives the examples of genetically engineering animals to make human blood and milk, but his concerns are even greater for the future of nanotechnology, through which nature might be produced 'to order'. Following Noske (1989), Dickens (1996) argues that this is contributing to our alienation of animals from external nature and their own natures, though accepting that this is a product of human speciesism as well as the dynamics of capitalism (acknowledging the mistreatment of animals in communist societies).

Dickens's work on the third contradiction provides an answer to a much deeper question regarding the ontological status of the causal mechanisms underpinning capitalism as a mode of production. We can observe the effects of various 'causal mechanisms' apparent in capitalism (so well-identified by Marx in *Capital*). But what exists of these beyond the human agency that continually reproduces them has been called into question (in particular by structuration theory). What the likes of David Harvey and Neil Smith, both of whom Dickens draws upon in his own work, demonstrate is that capitalism is manifest in the uneven development of external nature (including the accumulation of its resources and its reconstruction in technology). What Dickens's work draws attention to is that capitalism is also manifest in the configuration of human bodies, our internal nature (including our genetics, health, embodied knowledges, and psychologies).

The Relationship Between Unconscious Mechanisms and Social and Spatial Divisions

Throughout his work, Peter Dickens has been concerned with spatial divisions. Citing Sayer and Walker (1992, p. 17), he says he is wary of the 'vacuous' notion of 'community', which ignores the divisive effects of modernity and should not be seen as a political panacea. This includes the identification of 'the spatial division of labour' (Dickens 1996, p. 136) as part of his central theoretical argument. For Dickens, following Kropotkin, the issue here is when specialisation in regions is imposed from the outside (the same is true of the state's role in imposing abstract knowledge), without consideration of the relationship between local people and the land, and local need for diversity in production (see also Dickens 2000b). In regions importing products from elsewhere, there is no connection to the place of origin, and consequently these products become fetishized. But the fetishized world of the commodity at the same time 'compensates for the increasing fragmentation and alienation of daily life and belies the existence of all discontinuity and contradiction' (Plant 1992, p. 12, cited in Dickens 1996, p. 139).

It is only in recent work, however, that Dickens has explicitly engaged with Kleinian psychoanalysis, and in particular the centrality of the theory of paranoid–schizoid splitting to that perspective. In this recent work, he has argued that the mental/manual division of labour promotes paranoid–schizoid ways of relating to the world, and that this is heightened in late capitalism. If commodities promise completeness, this is only a magical solution to the ambivalences and conflicts of social life. Dickens develops this psychosocial project through historical research into the paranoid–schizoid split between outer space and the Earth, onto which 'good' (pure, harmonious) and 'bad' (threatening, untamed) properties have variously been projected since the instigation of the mental/manual division of labour (Dickens 2009c; Dickens 2011; Dickens and Ormrod 2007b). This division, made common sense, then serves as a hegemonic tool in the maintenance of social and economic power.

However, an argument can be made that Dickens's work has been concerned with the paranoid–schizoid splitting of the environment since his early work in urban sociology. Here, he notes that Giddens used Freud as

a way in to understanding how human beings order the social and natural worlds (Dickens 1990, p. 69). Taking this argument further, Dickens suggests an 'instinctive' basis for spatial divisions. At the forefront of his mind is the division between the urban and the rural. Dickens (1990, pp. 19–20) reflects on the construction of an alternative way of life in the countryside or city as a way of introducing order into people's lives, especially when ontologically insecure. But this fantastic element has profound social effects. Such fantasies have a direct impact on people's actions and become the basis for the establishment of communities (as well as 'escape attempts', as discussed later). Because of this dialectic relationship, such fantasies are not wholly divorced from material social and environmental exchanges. Dickens references Collier's (1994, p. 224) critical realist position on psychoanalysis, which 'recognises the interaction of a real environment with a really existing world of fantasy, including a new perception of the environment' (see Dickens 1992, p. 126, on the integral nature of fantasy to the human constitution; see also Ormrod 2014, p. 75, on Klein's dialectics).

In addition to a more conventional critical realist critique of 'strong social constructionism' as a philosophical project, Dickens also criticises 'strong social constructions'. It is tempting to dismiss this as a term used to refer simply to constructions that are 'wrong'. But for Dickens, 'strong constructions' are often those that seek to disambiguate and polarise nature, often into 'good' and 'bad' camps. They are imposed on the environment (both 'natural' and 'urban' spaces) with little respect for its complexity. Often these also involve a metaphoric process in which feelings towards other objects are projected onto the environment, ignoring the existence of different levels of reality and different types of object. They 'assist in various forms of social domination' (Dickens 1996).

In respect to the city itself, Dickens affirms Wirth's suggestion that the urban personality is schizoid—the result of the need to insulate the self from others (Dickens 1990, p. 48). This has effects on the spatial organisation of the city itself. Dickens also utilises Goffman's understanding of front and back regions to make sense of these divisions. Front regions are spaces in which public display takes place—the projection of a socially accepted self. Back regions are spaces where performance can be dropped and non-valued aspects of self can be acted out. In Kleinian terms, these often map onto 'good' and 'bad' regions, though Dickens is

clear that these are socially contested. Dickens (1990, p. 109) argues that subordinate cultures defined along class, age, and ethnic lines are often acted out in relation to spatially differentiated 'back regions' in respect to the dominant culture. In this respect, each culture is able to express itself through the spatial annexation of its 'other'. Dickens is clear that neither region is constituted purely on its own terms, but exists in dialectic relation. Front regions incorporate resistance into the dominant order, whilst back regions 'are often a distorted version of dominant forms [….] Paradoxically, both dominant and subordinate seem to sustain each other in a reciprocal fashion' (Dickens 1990, p. 114).

Such splitting of urban space is also understood through Giddens's notion of sequestration. This is where significant natural experiences—such as birth, sexuality, madness, illness, and death— as well as external nature itself are hidden from everyday life, often through their spatial confinement. Thus 'bad' biological processes are split off so as not to contaminate the approved sphere of everyday life. For Giddens, this contributes to an ontological insecurity to which the modern state responds through a symbolism that engenders a sense of order and community. But Dickens draws on evidence to show that the result is a sense of helplessness in the face of nature (1992; Dickens & Ormrod 2007b).

Dickens's urban sociology is marked by an ambivalence towards modern urban planning and architecture. Educated as an architect, his hopes had very much been that the design of urban spaces could lead to social improvement. His sociological work, however, appreciates that economic conditions and the 'expressive order' have as big a part to play in the generation of social order as the built environment. Thus, whilst he criticises Newman and Coleman's arguments for dividing up the city into 'front' spaces for which residents felt responsible and which controlled behaviour, his criticism is not just of the specific arguments, but of the whole modern project of engineering social spaces (Dickens 1987). If he does prefer an approach to urban planning, it is clearly Hillier's argument about opening up the city, so that residents have a better sense of the whole of which their locale is a part (Dickens 1990, p. 155).

Dickens has frequently gained inspiration from the work of Raymond Williams. This includes the way Williams's novels point to the tensions within which inner city lives are lived, rather than trying to dissolve such

tensions through narratives of escape that reconstruct schizoid divisions (Dickens 1990, p. 24). Dickens, like Engels (see Swain 2012, p. 75), does not look backwards to a rural idyllic past, but to the dissolution of the town–country split.

The Significance of Production, Consumption, and Identity in 'Escape Attempts' and Pre-Figurative Utopias

Dickens's view of social action as driven by socially constructed instincts leads him to an interest in the various ways in which people respond to social conditions that provoke feelings of alienation and insecurity. A number of concepts come to his aid here, some of which have already been encountered. One is the notion of the moral career. This is the attempt by the individual to make the best of their lives within status hierarchies and the material they provide for the construction of the self.

Often these careers are linked to another important concept: the 'escape attempt'. These are 'means of creating individual identity in a society which is seen as threatening' (Dickens 1990, p. 16). On the one hand, Dickens points to the ways in which they can lead to a split or schizophrenic form of identity (following Laing)—the escape attempt being associated with the construction of a false self. In later work, this is often seen as part of a fantasy formation sustaining a narcissistic form of subjectivity. On the other hand, these escapes can be attempts to establish social or spatial zones of autonomy and self-management or self-determination. Given that the threatening conditions emerge primarily in the sphere of production, Dickens looks for these escape attempts in what he loosely calls 'civil society'—the realm outside of employment in which the vicissitudes of capital play a less important role and in which forms of identity are therefore more stable (Dickens 1990, pp. 4 and 24). Here, despite our manipulation by advertising and so on, consumers are able to exercise an autonomy rarely experienced at work, as Marx recognised (Dickens 1990, p. 99). Civil society is also important in Dickens's work because he sees it as the sphere in which the biological reproduction of the social

order takes place—where future generations are raised—as well as where 'deep-rooted emotional drives can be realised' (Dickens 1990, p. 99; see also his reference to Urry's work, Dickens 1996). His general argument is that under capitalism, humans may use consumption and leisure time as means of satisfying their needs and generating self-identity, and yet unless relationships in the sphere of production are socially reorganised, human potentials will remain under-realised.

As mentioned above, escape attempts often hinge around the fantasy of a better life elsewhere (the escape to the country that is still so popular, and yet problematic, see Dickens 2000b). But this does not have to be the case. Dickens's examples of escape attempts are extremely broad, and include the home (Dickens 1990, p. 118), nationalism (Dickens 1990, p. 150), urban communities (Dickens, 2000b, p.161), consumption (Dickens 2004, p. 44), allotments (Dickens 2004, p. 44), and even space tourism (Dickens and Ormrod 2007b). As we saw above, Dickens does not attempt to distinguish authentic and illusory realms in which escape attempts are made, even accepting that the thesis about consumption 'realising the Enlightenment ideal of individual fulfilment … has something to recommend it' (Dickens 2004, p. 44). This is perhaps because he sees escape attempts as manifestations of a desire for self-determination, which appears universal. His interest in Simmel is often apparent here, but so is his biotic psychoanalysis. He accepts that 'property and other social relations are both enabling and constraining people's instincts to be self-determining and to protect self and kin' (Dickens 1990, p. 123). He is nonetheless clearly concerned with some forms of escape attempt. This is true not only of nationalism, but also the retreat to private property ownership (which his colleague Pete Saunders saw as crucial to ontological security) which is damaging to external and internal nature, and reinforces social hierarchies.

Dickens also recognises that escape attempts are more available to some than others (Dickens 1990, p. 123), and takes issue with escapes that reproduce enclaves of class and gender privilege (see also Dickens 1996). Making a stand against some contemporary writers, he asserts that the metabolic rift cannot be healed 'by the middle classes retreating to cultivate their gardens in the suburbs' (Dickens 2004, p. 85; see Savage et al. 1992, on the fragmentation of the middle classes and their different

relationships to environmental politics). Again, Dickens's concern with the paranoid–schizoid splitting of urban space is apparent. Initiatives such as Slow Food or LETS may be well meaning, but they are always in danger of becoming inward-looking. In doing so, they at best fail to challenge the established order, and at worse threaten to undermine collective welfare provision (Dickens 1996).

Dickens is equally cautious, and at times scathing, about the purely symbolic or 'magical' forms of resistance that take place in urban subcultures (Dickens 1990, p. 110). Such illusory resistance often adapts, rather than challenges, existing racial or gendered divisions, and as such is easily incorporated into dominant culture, 'albeit in sanitised, respectable, forms' (Dickens 1990, p. 110). Recent years have indeed seen this incorporation of urban resistance become the major renewal strategy for mainstream culture. In this respect, as Benton (2009) notes, Dickens would distance himself from Soper who looks at the 'alternative structure of satisfactions that are arguably latent within [existing patterns of consumption] rather than look outside of it', where he and Pat Devine look to alternative visions.

Nonetheless, for Dickens, value lies in escape attempts that involve movements towards collective ownership, production, and consumption (Dickens 2004, pp. 87–90; Dickens 2000b). These he identifies as 'pre-figurative', 'local' (Dickens 1990, p. 72), 'mini' (Dickens 1996), or 'practical' utopias.

> [Mini-utopias] are flexible new starts, there being no grand, permanent or long-term plans being handed down by small elites. They take life as they find it, but the galvanising ideal is a profound shift of power and the division of labour. (Dickens 1996, p. 202)

He draws support for the notion of pre-figurative politics from Collier's critical realism, as follows:

> Freedom must be 'in gear' rather than 'out of gear' freedom; it is not a matter of disengaging ourselves from the world so that it gets no grip on us—for by the same token we would get no grip in it. We do not escape from necessity in that what we do we do in ways governed by causal laws. (Collier 1994, pp. 192–193, cited in Dickens 1996, p. 145)

And so whilst Dickens is in principle positive about the potentials of a plethora of holistic teaching and practices (as represented in acupuncture, Alexander Technique, Dao, Buddhism, Taosim, Gandhi's teachings, indigenous knowledges, shamanism, Gaia, and ecofeminism, but also in the Frankfurt School's arguments) in overcoming modern dualisms and embracing lay and tacit knowledge, he also provides a salutary warning. These practices are, he says, 'a million miles away' from modernity and its labour processes. The result might not be social change, but a coupling with Western neoliberalism in self-help movements (see also Heelas 1996).

Although wary of Andre Gorz's 'stratospheric' view of social change (and his pessimism about the possibility of change originating in the sphere of labour), Dickens agrees with his arguments at least as they apply to the realm of consumption. He argues that the projects of local self-build producer–consumers, cooperatives, and so on are 'the first signs of a new, less alienated relation with external nature, one that is emerging from the seeds of an older type of society'. But he continues:

> Their multiplication, however, cannot be relied on to produce a more socially just and environmentally sustainable society. More profound and general social transformations are still needed, such as the placing of industry in collective hands. (Dickens 2004, p. 90)

Furthermore, in laying out his understanding of Red–Green politics, he defines it as a position 'which argues that for all the focus of [new social movements] on new values, cultural diversity and the re-embedding of social life within "modernity", the focus should remain on capitalist social relations and processes' (Dickens 2004, p. 245). This is not to say, however, that industrial relations are the key to Dickens's politics. He is well aware that in the era of informational capitalism, much more intimate issues concerning subjectivity, familial and community relations are part of the capitalist social relations of production. In recent work (Dickens 2009a), he takes up the concept of cognitive capitalism (having previously argued that people in service industries are also transforming nature, albeit in even more remote and alienated ways, Dickens 1996). Citing the *Grundrisse*, he suggests that 'the general intellect' has

increasingly been made 'a direct force of production'; 'the production of surplus value increasingly depends on the human species' "universal" capacities, their biologically inbuilt imaginative and affective capabilities, their potential for adjustment, planning ahead and reading other people's minds' (p. 123). And whilst this might seem emancipatory, under capitalism they are being alienated from these same qualities (including what happens in Hochschild's 'emotional labour'). Universal qualities are being realised in partial and distorted ways. Capitalism cannot allow autonomy and self-creation or it would lose control of the labour process.

Dickens therefore makes it very clear that what he takes from Marx is much more than 'a narrowly conceived and industrialist' communism (a caricature that Dickens rejects in the image of Red–Green politics as 'watermelon politics'—green on the outside, red on the inside):

> Popular and self-activated struggles in such areas of culture and domestic life join industrially based politics, with the common and unifying theme of reorganizing not just industrial relations but the whole range of social and environmental conditions surrounding production. It would be a form of association which avoids the market and overcomes the sense of alienation from the product and from people. Collective and communal ownership would be a way of overcoming the disruption between humanity and ownership, overcoming the 'metabolic rift' and recovering the connections between humanity and nature. (Dickens 2004, p. 87)

Dickens thus asserts an affinity with guild socialism, associative democracy, and active citizenship, built from a dialogue and coalition between old and new movements. On the one hand, he sees diversity and pluralisation of social forms as an important way in which social power is challenged and he recognises that it is within decentralised politics and especially new social movements that re-engagement with nature has made the most strides (Dickens 2004, p. 229). On the other hand, he is concerned that this can present those in power with the possibility of a divide-and-rule strategy and leave movements insular (following Rustin 1986). He agrees with Luke Martell (1994) about the importance of some central agency (Dickens 2004, p. 230), and yet he is forthright in asserting that 'the idea of a state-imposed single, universal solution was clearly

an enormous mistake' (p. 245/246). National and international agencies must support and network local initiatives in what Dickens refers to, following the Red–Green Study Group (1995) as 'enabling from above'. Murphy (2005) is therefore somewhat unfair in accusing Dickens of ignoring what happened socially and environmentally in Eastern Europe and China. Given his concerns about both strategies, it is understandable that White (1997) questions how clear Dickens is on how the eco-socialist project can be open to pluralist politics. The two do not, however, need to be understood as diametrically opposed. Dickens clearly supports a plurality of pre-figurative practices, but believes it is crucial that such pre-figurative practices do not become sectarian enclaves, but aspire to joining up in a state-centred project. Again there is a dialectic at work here (Dickens is a fan of Harvey's dialectical utopianism). State-centred politics must start somewhere if it is not to be imposed from above, but it must also envisage itself as part of a *process* of much greater transformation.

In this sense, even whilst the allotment movement, for example, might not represent the solution to social and environmental problems in itself, Dickens nonetheless recognises such initiatives as 'attempts at self-determination and the *re*-establishment of personal relations and direct relations with external nature' (Dickens 2004, p. 44, original emphasis). In optimistic spirit, in a variety of attempts to establish more fulfilling socialised relations with nature, Peter Dickens sees 'seeds or kernels developing in the heart of society and perhaps representing new, more autonomous and environmentally sustainable ways of living in the future' (Dickens 2004, p. 88, see also p. 111).

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Part II

Philosophical and Theoretical Debates

4

Environmental Alienation

Kate Soper

Preamble

Peter Dickens's contribution to social and environmental studies has been very wide ranging and its influence felt in quite diverse disciplines and sites of political engagement. I am very aware, in offering this tribute to his work, of the richness of this legacy, and how little justice I can do to its full scope here. What lies at the core of it, however, has been a set of arguments that I myself have found particularly interesting and admirable, and this has been his lucid and nuanced account of the dialectics of 'internal' and 'external' nature. This, of course, has its fundamental roots in Marxism, but it has been developed by Dickens in ways that bring out the range of tensions and unresolved dimensions in the Marxist offering, particularly as this unfolds from early to later work. In this connection, Dickens is critical of the idea of human nature or 'species being' in the early work as lending itself to an overly idealised and essentialist position, and endorses the more equivocal or relativist position of the

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later argument, with its implication that human nature is 'under determined'. This is a position with which I am in broad agreement (although, as will emerge from what I have to say here, I am perhaps less certain than Dickens is that the critical-normative and the more relativist understandings can be reconciled). I also, like others, very much value Dickens's important and eloquently formulated distinction between 'constructing' and 'construing' nature and the Critical Realist insights this lends on the limits and fallibility of human interaction with, and conceptualisation of, external nature. Which brings me to the focus of my discussion here, which will be on a concept that has been central to Dickens's sociology and environmental ethics, that, namely, of alienation, and specifically alienation as applied to our relations with 'external' nature and the non-human (what I shall refer to in short as 'environmental alienation').

The general concept of 'alienation', and its relevance today, can be approached, so it seems to me, from one of two interrelated points of view. In the first approach, one presupposes the basic coherence of the concept, and considers to which aspects of contemporary society it is most applicable. In the second, one questions the coherence of the very idea of 'alienation', especially where this is conceived—as it has been by Critical Theory—as a social (as opposed to individual) pathology, and considers its future as a concept in political philosophy. I shall have something to say from, and about, both approaches, but will be mainly concerned with the issue of coherence. For although I find a great deal to agree with in what Dickens (and others) have had to say by way of explanation or description of our alienation from nature (e.g. about the commodification of nature; the cognitive estrangement resulting from the lack of 'direct engagement' with it; and the metabolic rift that has accompanied industrialisation, and the ever more intensive erosion of resources), I also find it quite difficult to justify the idea of environmental alienation in a more philosophical sense. And I remain uncertain what it is that can legitimately count as an 'authentic' or 'non-alienated' relation to nature—and why. But I would also emphasise that my own views on these issues are unresolved, and that what follows here is therefore exploratory rather than a confident statement of my own position.

Introduction: 'Lay' Discourse and Its Philosophical Criticism

Let me begin by suggesting that if we are to speak coherently of 'environmental alienation' then some meaning must be given to the idea of our 'de-alienation', and it is difficult to see how this can be thought without reference to an independent and normative 'nature' whose proposals or instruction we have failed to observe, or pathologically distorted. In other words, there must be some way of differentiating between our behaviours and constructions, and those that would have been less alienated because truer to 'nature'. This differentiation is implicitly assumed in all our discourses about our estrangement from nature. For example, in one of the more commonly encountered ways of thinking about this—that one might call a 'lay' sentiment about it—humans are said to be 'out of touch' with or 'cut off' from nature. Its core idea is that of human disconnection or separation from the 'natural world' understood as a directly perceptible environment, with its wilderness, landscape, resources, wild life, and so forth. It is an idea voiced in laments about 'our' loss of everyday knowledge of the natural world and how to deal with it; and it comes up repeatedly today in claims that children have too little contact with nature, spend their lives insulated from it in cars or looking at computer screens, know more about commercial logos than about the names of trees, and so forth. It is reflected, too, it has been said, in the way in which such access as we do have to the natural world has become increasingly 'managed' and supervised, either for health and safety reasons, or because the so-called alienation is such that we (supposedly) can only feel comfortable about getting 'back in touch' in highly mediated ways (nature parks, wild-life centres, eco-tourism, 'extreme' sports centres, etc.). And it is reflected more generally in the 'compensatory' dynamic of an economy which now profits so extensively from selling us back as commodities the gratifications that were once more directly or 'naturally' provided, in the sense of commercially unmediated, that we have lost through overwork: the leisure and tourist companies that sell back 'quality time', the catering services that provide 'home cooking', the dating and care agencies that see to personal relating, the gyms where people pay to go treadmill

walking because the car-culture has made it unsafe or unpleasant to walk elsewhere, and so on. What is more, it would appear very likely that if we are incapable of springing this trap, and reverting to a more rational economic order, we are destined for ecological collapse and all the social horrors that will entail.

But while sympathetic to these views on environmental alienation, I also find them troubling for a variety of reasons. There are questions, in the first place, about their applicability to any but the most industrialised societies. The globalised spread of the capitalist market has certainly meant that human relations to the non-human environment are mediated today in ever more complex ways. But there are still vast numbers on the planet who are living 'very close' to 'nature', sometimes too much so for their own safety or comfort (Soper 1995b, pp. 67–68). And to this one might add, that even within the Western or Euro-zones, where this lay idea of 'human' alienation might be claimed to have more applicability, it remains partial in the sense that individuals vary enormously in their attitudes and relations to the natural world. Walkers, cyclists, climbers, bird-watchers, so-called nature lovers generally, and those living in sustainable dwellings: these types might all in virtue of their close engagement with the natural environment be said to be less alienated than others.

There is the further consideration that much talk of alienation 'from nature' abstracts from the human role both in the actual, material creation of what we view as the 'natural environment'; and from the human role in conceptualising the natural environment as 'natural', and ourselves as in some sense distinct from it. And in doing so, it overlooks the constantly changing impact of environmental conditions on humanity and its forms of interaction with the natural world. This was the basis of Marx's critique of Feuerbach's philosophy of nature and his view of human species-being as realised in an immediate emotional-intuitive unity with nature. Feuerbach, Marx argued, conceives of the external environment in abstraction from its subjugation by human industry, and thus reduces specific and determinate conditions of human existence—which differ not only in time but also between different individuals and classes—to the sameness of an undifferentiated 'essence'. It is then, as Marx put it, a philosophically abstract category—'Man'—not real historical beings who

exist in what Feuerbach calls 'a unity with nature', and whose essence is not so obligingly elastic as to be realised in the crowd of 'scrofulous, overworked and consumptive starvelings whom Feuerbach can everywhere observe around him' (Marx and Engels 1970, pp. 60–64).

And it is, of course, these insights on the role of praxis in creating the objective conditions of human existence that Marx draws upon in the argument he develops in the *Paris Manuscripts* on the alienated conditions that result when the interaction with nature, or human objectification of labour, is carried out under specific relations of private ownership—in other words when the private property is created through the system of wage labour (i.e. in the bourgeois epoch when wealth does not exist essentially in land ownership nor gets transmitted through political rights of primogeniture, but is created through capitalist relations, the purchase of labour and rights over the disposal of its products). This is an important point to understand since it alone explains why Marx argues that private property is 'the product, result and necessary consequence of alienated labour' (Marx 1967, pp. 297–298). The worker is indeed alienated in virtue of the existence of relations of private property, but private property is not naturally pre-given, but only comes into existence in virtue of the sale and purchase of labour power. Fully developed private ownership—capitalist property—is nothing but stored up value, the appropriated product of the worker's labour, thus based on alienated labour. This contrasts with feudal property, which was essentially inherited land, a possession acquired not through sale of commodities on the market, but secured through political privilege.

In speaking of nature–humanity interaction under capitalism as 'alienating', Marx intends us to understand that there is something pathological about the world it has created—that this is a distortion of what is truly needed, that it is, if you like, 'against our nature', a perversion of human species-being. The argument, in other words, would seem to make sense only with reference to the idea of a pre-given nature and its authentically human needs.

And yet this is precisely the idea that Marx has himself seemed to subvert in his criticism of Feuerbach's essentialism, and which he further subverts in later work where the emphasis always falls on the historic nature of human needs and the extent to which the 'rich development

of individuality' is reliant on the emancipation from natural limits, rather than their observation. In the *Grundrisse*, for example, even as he recognises the nomadic quality of capitalism in uprooting individuals and destroying communities and old ways of living as in some sense 'alienating', Marx also applauds the rupture with all natural presuppositions, 'parochial needs' and 'encrusted ways of living' as the essential precondition of the all-round individual who is to find 'unlimited' fulfilment under communist existence (Marx 1970, pp. 487–488). Freedom of self-realisation is here, paradoxically, conceived in terms of release from the erstwhile constraints of a more *naturally* confined existence. As he put it in one of his more striking passages:

> In bourgeois economics—and in the epoch of production to which it corresponds—this complete working-out of the human content appears as a complete emptying out, this universal objectification as total alienation, and the tearing down of all limited, one-sided aims as a sacrifice of the human end-in-itself to an entirely external end. This is why the childish world of antiquity *appears on the one side as loftier*. On the other side, *it really is loftier* in all matters where closed shapes, forms and given limits are sought for. It is satisfaction from a limited standpoint; while the modern gives no satisfaction; or where it appears satisfied with itself, it is vulgar. (Marx 1970, p. 488)

The 'loftier' view *is* loftier insofar as it values the human being as existing plenitude, as a fixity to be reproduced, and insists that failure to satisfy that specific plenitude will involve an alienation, a loss of self; but it is lowliness itself to a view that sees emancipation from all erstwhile reproductions of the self as the very condition of self-realisation.

Alienation, then, is here associated with transcendence of a more animal-like immanence, and with escape from conformity and the 'encrusted' needs of a parochial existence. It is, if you like, that which is achieved rather than lost when 'everything that is solid melts into air'. And were we to update this sense of alienation as emancipation from earlier traditions and complacencies, and to include within it freedom from presuppositions *deemed* at an earlier stage to be natural, but exposed at a later one as culturally induced, we can appreciate its relevance to

the understanding of many contemporary developments: such as, to take an obvious example, the role of feminism in generating dissatisfaction with earlier forms of co-existence and communion between the sexes, in exposing the limits of previous 'contentment', and thus in generating the desire to break with the estranging conventions of earlier forms of the division of labour and older modes of intimacy. (Even though this may have proceeded only at the cost of introducing new forms of estrangement and instability between the sexes, cf. Soper 1995a.)

To take stock at this point, then: Marx could be said in his early work to theorise 'environmental alienation' in terms of the distorted form of the objective conditions of existence created under capitalism, whether so-called built or natural; and as the corrective to this, he gestures to the idea of some more authentic way of living, a way that is legitimated by reference to that which is 'more naturally' in tune with human species-being. But in later work Marx offers an altogether more Hegelian picture in which it is freedom from the 'otherness' and 'limits' of nature rather than observance of its restraints, or living in harmony or conformity with it, that is emphasised.

An Adornian Corrective?

Is there, then, we might ask, a way in which we could *both* recognise the essential truth about the ongoing human mediation of the environment, whether built or 'natural', *and* at the same time keep faith with the idea of a 'nature' as a normative, shaping force that is 'other' to the 'human' and could thus in principle provide the ground for discriminating between more or less distorted forms of humanity–nature interaction? One thinker I have turned to here is Adorno, since (and in ways, I think, that are comparable to Dickens's argument) he seeks to respect the human role *both* in the construction of the environment *and* in the conceptualisation of 'nature', while at the same time acknowledging a 'nature' that can ground a discourse about the more or less 'alienated' form of human environmental activity.

In opposition to Hegelian appropriation of nature's 'otherness', and to the positivism associated with viewing alienation as no more than an

always transcended moment affecting any and every human objectification of thought or praxis, Adorno wants us to recognise and retain the alien as alien—or, to add to the paradoxes, if you will, he wants us to avoid the alienation of an anthropocentrising appropriation of the alien as if it were wholly knowable or transcendable. Yet even as he recognises the summons of the spontaneously given and pre-conceptual in nature as a counter to commodification and the dominance of our own construction she also acknowledges the extent to which what is discoverable as other to us in virtue of its naturality owes its reception as such to human apperception. Adorno presents himself as salvaging an aesthetic of nature from the influence exercised by Kant's emphasis on human freedom and autonomy on subsequent idealist aesthetics, whose upshot was that nothing came to be treated as worthy of respect that did not owe its existence to the human subject (Cf. Adorno 1997, pp. 61–77 and see especially p. 92). Writing of the beauty of nature in his *Aesthetic Theory*, for example, he presents speech or writing as mediating, either deliberately or as an effect, that which is immediate and pre-conceptual, and thus as rendering conceptual—and therefore in some sense 'betraying'—that which is as it is, and is experienced as it is, only because it cannot be spoken. Yet even as nature transcends expression, anyone who responds to its beauty feels compels to give utterance as a way of signalling the moment of release it affords from the confines of the perceiving and representing (thus always conceptually mediating) self (Adorno 1997, p. 69). This would conform with his argument elsewhere in the same chapter that natural beauty cannot be copied, a point he links with his claim that the taboo on images in the old Testament has an aesthetic as well as a theological dimension: the prohibition on imagery is itself an expression of the impossibility of creating it. And more generally in his writings, Adorno shows himself to be as cautious about the appeal to a supposedly quite separate 'nature' as he is about the appeal to what is cultural or historical as if it were wholly free of the nature that is 'other' to it, and he constantly uses the one to correct the confident pronouncements of the other and vice-versa. Hence his resistance both to false and fetishising forms of naturalisation of history and to what he calls the 'enchantment of history', that is, to any view of history as if it were a form of mastery of or escape from nature (cf. Adorno 2006). The paradox in all this, is that nature is conceptualised in

order to register its transcendence to conceptualisation; it is represented in order to capture its independence of representation. Nature demands to be conceptually determined as something that is not conceptual. And by way of our aesthetic responses to it, it can act as a kind of reminder of, or utopian gesture towards, a world in which humanity could enjoy a kind of immanence or immersion in it, in short, live without alienation. Adorno argues, for example, that aesthetic appreciation of natural beauty recollects a world without domination even as he recognises the element of fantasy in such an idea since such a world has almost certainly never existed. Adorno also recalls us to the fact that it is 'through this recollection that experience dissolves back into that amorphousness out of which genius arose and for the first time became conscious of the idea of freedom that could be realised in the world free of domination'. Human immersion in, or unification with nature, is thus, he suggests, incompatible with the consciousness that comes to an understanding of freedom and desires the release from domination.

This type of Romantic invocation of a pre-conceptual nature is not, of course, without its critics. For Steven Vogel, the mistake that Adorno makes is, as he puts it, to 'dream of an unmediated cognition', and this is a dream, he suggests, that is rightly criticised by the Lukacsian theory of reification.

> It is the dream of such a realm—of a cognition that could throw off the burden of being cognition, of humans who could somehow be other than human—that the theory of reification criticizes: not the hubris of natural subjects who fail to notice the otherness of the world, but the alienation of active subjects whose practices help to produce that world and yet who persist in seeing it as radically other. (Vogel 1996, p. 83)

The problem for Vogel of any Adornian positing of an object as beyond the concept's grasp is that any attempt to make sense of that positing 'would itself have to be an operation of thought and hence yet another activity of the subject' (Vogel 1996, p. 79). Yet (and this point is surely in line with Dickens's Critical Realism) there seems no obvious difficulty in 'making sense' of the idea of an object as existing whether it happens to be conceptualised or no—and this is surely the only 'sense' Adorno

is claiming. Anything further in the way of understanding he precisely rules out. In other words, if we take seriously the Adornian claim that the 'alien' must be left as 'alien', as beyond knowing, then it is precisely not 'to be made sense of'. To ask that it has to be known is to be guilty of the form of Hegelian–Lukacsian appropriation that Adorno is contesting. Adorno is not striving to attain immediacy, but rather registering its unattainability without finally relinquishing it. He is, if you like, more of a phenomenologist than Vogel would have him be. He is about 'letting nature be' in its otherness rather than striving for unity with it or knowledge of it. And if we want to invoke the notion of alienation to register this unattainability, as Adorno himself does in his references to letting the 'alien' be 'alien', then so be it.

Of course, it could still be objected that the 'alien' is here really not doing any normative work, but is simply standing in for 'difference', and that as a critical summons it remains no more than a gesture. We are dealing, then, it might be said, not so much with the mark of a pathology, but with the mark of a separation that we are called on philosophically to observe. But this recognition of the otherness of nature, and its Romantic invocation as a corrective to the dominance of our own constructions and a reminder of how things could be other than they are, is for me the only theoretical offering on environmental alienation that I find persuasive. And I think it is very comparable, if not fully consistent, with Dickens's own account of alienation, although I readily accept that he may want to contest that.

Contemporary Relevance

But if—to turn back at this point to my opening remarks—we do simply accept the philosophical coherence of the idea of 'alienation' as social pathology, then there would seem to be many ways, as Dickens has discussed in his work, in which it has special relevance to the contemporary ecological situation. And nowhere more so, I suggest than in the case of 'alienation' conceived on the model of 'religious alienation'—the 'alienation', that is, of our enthrallment to the 'god' of the growth economy—a creation of our own that we nonetheless view as an independent power to

which we are all subservient. Although it is the commitment to capitalist economic growth that is responsible for both the financial and the environmental crises of our times, the source of these problems is mistaken for their solution: it is, according to this 'alienated' standpoint, only by stimulating the economy, by producing more, by persuading people to buy more, by fixing credit at rates that might allow them to borrow more and hence consume more, that we can hope to spend our way out of a crisis largely precipitated by the dynamic of borrowing and spending. The common presumption of all these ways of thinking is that the consumerist model of the 'good life' is the one we want to hold on to as far as we can and that any curb on that will necessarily prove unwelcome and distressing. We hear little or nothing of what might be gained by pursuing a less work-driven and acquisitive way of life. We are held captive, it seems, to a consumerist vision of the 'good life' to the exclusion of all other ideas of how to live and prosper.

What needs challenging, therefore, as Dickens has pointed out, is the presumption that our work-dominated, time-scarce, materially encumbered and junk-ridden 'affluence' of today is advancing human well-being rather than detrimental to it (Soper and Thomas 2007;[1] Soper 2006, 2007, 2008; Soper et al. 2009). And the wisdom of doing so has been supported by much recent research on occupational ill-health and depression, and by empirical studies that contest the presumed correlation between increased wealth and increased happiness. I would only add that it is also now implicit in the diverse range of contemporary laments over lost spaces and communities, the commercialisation of children, the vocational shifts in education, the ravages of 'development', the 'cloning' of our cities, and so forth—all of which speak to a hankering for a society less subordinate to the imperatives of the growth economy and consumerist expansion. They speak, if you like, to a complex of despair and hope—and thus to a nostalgic sense of what has gone missing from our lives in consumer culture, but might be restored in a less politically divisive and more sustainable form in the future.

[1] For more on the Research Project on 'Alternative Hedonism and the Theory and Politics of Consumption', funded by the ESRC/AHRC 'Cultures of Consumption' Programme, see http://www.consume.bbk.ac.uk/research/soper.html

This retrospection—or 'avant-garde nostalgia' as it might be termed—is found in Adorno (1997, pp. 64–65). But is also defended in the argument of Raymond Williams, who has issued comparable warnings against both the 'simple backward look' with its patrician (and patriarchal) forms of nostalgia and the 'simple progressive thrust' with its unthinking adulation of industrial progress (1973, p. 184; cf. pp. 35–37). And both theorists would have us see what is truly progressive as lying beyond these antitheses. For Williams, the importance of transcending the modernising thrust was seen as increasingly urgent in his later writings, notably *Towards 2000* (Williams 1985), where he comes implicitly to acknowledge that socialism, engendered from within the dynamic of modernity, seemed incapable of framing an adequate critique of 'progress'. Thus, he writes, 'In every kind of radicalism the moment comes when any critique of the present must choose its bearings, between past and future' (Williams 1985, p. 36; cf. Ryle 2009, pp. 43–58).

A critical approach of this kind can contribute to our 'de-alienation' by reflecting on past experience in ways that highlight what is pre-empted by contemporary forms of consumption, and thereby stimulate desire for a future that will be at once less environmentally destructive and more sensually gratifying. And its implied concern to counter or qualify the concepts of 'progress' and 'development' associated with the growth model of prosperity has been at the heart of my research around the concept of 'alternative hedonism' with its call for a new 'political imaginary'.

'Alternative hedonism' responds to the current situation not only as a crisis, and by no means only as presaging future gloom and doom, but as an opportunity to advance beyond a mode of life that is not just unsustainable but also in many respects unpleasurable and self-denying. Alternative hedonists can speak more compellingly, and persuasively, than the prophets of environmental catastrophe. Whereas predictions of environmental disaster encourage a *carpe diem* fatalism, alternative hedonism is premised on the idea that even if consumerism were indefinitely sustainable it would not enhance human happiness and well-being (not, at any rate, beyond a point that we in the rich world have already passed). And it points to new forms of desire, rather than fears of ecological disaster, as the most likely motivating force in any shift towards a more sustainable economic order.

The general argument of alternative hedonism can be summarised in two main claims. The first, and more speculative, is that the affluent Euro-American mode of consumption, which has become the model of the 'good life' for so many other societies today, is unlikely to be checked in the absence of a seductive alternative conception of what it is to flourish and to enjoy a high standard of living. In this sense, the chances of developing or reverting to a more ecologically sustainable use of resources, as well as of doing away with some of the worst forms of social exploitation, are dependent on the emergence and embrace of new modes of thinking about human pleasure and self-realisation, especially, in the first instance, within the world's richer societies. This is not to suppose that ambivalence towards consumer culture will be experienced only by those who already have access to it; nor is it to presume that citizens of less affluent societies will necessarily be influenced by any alternative hedonist rethinking that might emerge within the more affluent. All that is claimed is that an important stimulus of any eventual change of direction will be the attractions for well-to-do consumers themselves of an alternative vision of the 'good life'. A counter-consumerist ethic and politics should therefore appeal not only to altruistic compassion and environmental concern, but also to the more self-regarding gratifications of consuming differently. It should develop and communicate a new erotics of consumption or hedonist 'imaginary'.

The second and more substantive claim is that we are now, as already noted, seeing the beginnings of such a trend, both in the sense that new conceptions of the good life appear to be gaining a hold among some affluent consumers and in the sense that there is a more questioning attitude towards the supposed blessings of consumerism (Bunting 2004; Hodgkinson 2004; Levett 2003; Purdy 2005; Schor 1991; Shah 2005; Thomas 2008). People are beginning to see the pleasures of affluence both as compromised by their negative effects and as pre-empting other enjoyments. The enjoyment of previously unquestioned activities—such as driving, or flying, or eating out-of-season strawberries that have been transported halfway round the world, or buying a new refrigerator—is now tainted by a sense of their side effects. The pleasures of the consumerist lifestyle as a whole are troubled by an intuition of the other pleasures

that it constrains or destroys, especially those that would follow from a slower, less work-dominated pace of life.

Alternative hedonism represents a critical approach to contemporary consumer culture that is distinctive in its concern with self-interested rather than altruistic motives for shifting to greener lifestyles. The citizen and subject invoked here is rather more complex, and lifelike, than the narrowly appetitive individual imagined by neo-classical economics and rational choice theory. The individual motivated by alternative hedonism acts with an eye to the potentially negative impact of aggregated personal acts of affluent consumption for consumers themselves, and takes measures to avoid contributing to it. For example, he or she decides to cycle or walk whenever possible, in order not to add to the pollution, noise, and congestion of car use. However, the hedonist aspect of this shift in consumption practice does not lie only in the desire to avoid or limit the unpleasurable by-products of collective affluence, but also in the sensual pleasures of consuming differently (Levett 2003, 60f). There are intrinsic pleasures in walking or cycling which the car driver will not be experiencing. But cycling or walking themselves are much pleasanter, and may only be possible, where car use is limited—that is, where others too are making alternative hedonist commitments to self-policing in car use and are supporting policies that restrain it. In this sense, the more selfishly motivated preference for cycling will be inseparable from a more collectively oriented concern to avoid contributing to noise, danger, pollution, and congestion. Similarly, those who avoid fast food are likely to do so for a complex of more or less self-interested motives, since to be bothered about its impact on one's own health is usually also to be bothered about the processes of manufacture. But the pleasure of eating healthy food may well be enhanced by the altruistic or moral pleasure of knowing that one has also avoided contributing to certain forms of environmental destruction and social exploitation. There is clearly, then, a considerable overlap between alternative hedonist types of motivation and the altruism of the green or ethical consumer. Both might be said to engage in a distinctively moral form of self-pleasuring and in a self-interested form of altruism which takes pleasure in committing to a more socially accountable mode of consuming.

The concept of alternative hedonism highlights this complexity of desire and motivation in newly emergent consumer responses. In dwelling on the pleasures of escaping the consumerist lifestyle rather than on the need for frugal consumption, its emphasis differs from that of much of the literature on ethical consumption and sustainable development. Yet it clearly chimes with those calling for a redefinition of prosperity (Evans and Jackson 2007; Jackson 2004, 2006; Kasser 2007; Sustainable Development Commission Report 2003) and with the growing demands for the GNP measure of productivity to yield to others—such as the UNDP Human Development Index (HDI) and the Index of Sustainable Economic Welfare (ISEW)—that are more reflective of real levels of well-being rather than purely quantitative economic growth. (The UK government's 'Quality of Life' index is a welcome response to such demands and a step in the right direction although its profile to date remains very low.)

Alternative hedonism also offers a theoretical framework for reflecting on the reasons behind the formation of the growing number of campaigning networks linking those who have opted for 'downshifting', reduced working hours and more sustainable lifestyles. The 'Voluntary Simplicity' movement in the USA aims, for example, to promote a way of living that is 'outwardly simple, inwardly rich' (www.simpleliving.net; cf. Elgin 1993; Holst 2007; Pierce 2000), while the mission of the more recently formed Center for the 'New American Dream' is 'to help people live the dream, but in a way that ensures a livable planet for current and future generations'. Insisting that its message is not about deprivation but about getting more of what really matters—'more time, more nature, more fairness, and more fun'—the Center can fairly claim to be attempting 'nothing less than a shift of American culture away from an emphasis on unconscious consumption towards a more fulfilling, just, and sustainable way of life' (http://www.newdream.org). To this we may add the growing expressions of dissent from the work-driven society, and the new interest in 'time affluence', that are being registered in the USA and across Europe (Bunting 2004; de Graaf 2003; Kasser 2007; Schor 1991), and the continued expansion of the 'Slow Food' (http://www.slowfood.com; http://www.slowfood.org.uk) and 'Slow City' (http://www.cittaslow.net; http://www.cittaslow.org.uk) networks (cf. Honore 2005).

By focusing on these new developments and shifts of feeling in constituting an immanent critique of consumer culture, the 'alternative hedonism' perspective aims to avoid the moralising about 'real' needs that has often characterised earlier critiques of consumer culture (Miller 2001). It engages with ambivalence or disaffection towards consumerism as this comes to the surface and finds expression in the sensibility or behaviour of consumers themselves. Although these shifts in response, and the new representations of pleasure that go with them, are presented in a positive light, the primary aim is not to defend or justify certain forms of consumption as objectively more needed or authentic. The concern is not to prove that consumers 'really' need something quite other than what they profess to need (or want)—a procedure which is paternalistic and undemocratic—but to reflect on the hedonist aspirations prompting changes in experienced or imagined need and their implications for the development of more sustainable modes of consumption. This approach marks a break in the politics of 'counter-consumerism' from more orthodox left responses to the consumer society.

I shall conclude by noting an aspect of the emerging resistance to the time-scarce economy that is much in line with Dickens's arguments on the division of labour, namely, the repositioning of craft by many of its practitioners and theorists as a way of doing and making and spending time that is opposed to the commercial priorities and production methods of the capitalist growth economy. In a postmodernist update of the kind of claims made by the Arts and Crafts movement at the turn of the nineteenth century, craft is now being projected as a significant challenge to the work-ethic obsessions of consumer culture and its often ugly and wasteful forms of mass production. And in the form of 'Craftivism' (a term coined by the writer Betsy Greer in 2003 to indicate the union of craft and activism) it has acquired a quite explicit socio-political outlook and message.

Craft ways of working, then, might be reclaimed as a component of an avant-garde, post-consumerist political imaginary rather than dismissed for their association with premodern social relations and hedonist limits. We are talking, in other words, of a formation that would cut the link between progress and economic expansion without the accompanying cultural regression and social conservatism. We cannot dismiss the

advances in democracy and social and sexual emancipation that have accompanied the development of market society and mass production. Nor can we deny the limitations that were formerly imposed by a more parochial existence on individual self-realisation. But we can be critical of the environmental disasters threatened by the continuing pursuit of economic growth, and of the constraints that the market has now in turn placed on personal pleasure and fulfilment both in and out of the work place. The reference in Marx's dialectical account to 'loftier' pleasures should, in this sense, not be overlooked, nor should we today be too quick to endorse the escape from all 'closed shapes' and limits as automatically a form of hedonist advance.

Obviously we cannot dispense altogether with heteronomous labour in a post-capitalist society. But the resurgent craft movement may have more to tell us about the realisation of a less alienated order of industry than Left (and particularly orthodox Marxist) critics of globalisation have allowed hitherto. Given our need for a politics of prosperity that dissociates progress from economic expansion, and pleasure from resource-intensive consumption, a Marxist politics that seeks to purify the utopian vision of the quaintness and greenery associated with craft thinking seems itself to be clinging to an outdated set of assumptions about what would constitute post-capitalist forms of industry, labour-process, and worker emancipation. The Left today surely cannot advocate equal, universal access to Western affluent standards of living, not even if their production were to be revolutionised in ways that freed it from the exploitations of heteronomous labour. Demands for full employment, the end of austerity and economic security for all have to be coupled with demands for the expansion of free time, the slowing down of the economy, and the establishment of an order based on an essentially reproductive form of material consumption. By prompting 'avant-garde nostalgia' and intimating the pleasures and fulfilments pre-empted by the consumerist lifestyle, the 'alternative hedonist' viewpoint can help to foster a culture in which such aspirational revisions can more readily be made.

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5

Marx's Universal Metabolism of Nature and the Frankfurt School: Dialectical Contradictions and Critical Syntheses

John Bellamy Foster and Brett Clark

The Frankfurt School, as represented especially by Max Horkheimer and Theodor Adorno's 1944 *Dialectic of Enlightenment*, was noted for developing a philosophical critique of the domination of nature. Critical theorists associated with the Institute for Social Research at Frankfurt were heavily influenced by the writings of the early Karl Marx. Yet, their critique of the Enlightenment domination of nature was eventually extended to a critique of Marx himself as an Enlightenment figure, especially in relation to his mature work in *Capital*. This position was expressed most notably in the work of Horkheimer and Adorno's student, Alfred Schmidt, author of *The Concept of Nature in Marx* (1970). Due largely to Schmidt's book, the notion of Marx's anti-ecological perspective came to be deeply rooted in Western Marxism. Moreover, such criticisms of Marx were closely related to questions raised regarding Frederick Engels's *Dialectics of Nature*, which was frequently said to

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have extended dialectical analysis improperly beyond the human-social realm. First generation ecosocialists, such as Ted Benton and Andre Gorz, furthered these criticisms, arguing that Marx and Engels had gone overboard in their alleged rejection of Malthusian natural limits.

So all-encompassing was the critique of the dialectic of the Enlightenment within the main line of the Frankfurt School, and within what came to be known as 'Western Marxism' (defined largely by its rejection of the dialectics of nature associated with Engels and Soviet Marxism), that it led to the estrangement of Marxists in this tradition not only from the later Marx, but from natural science (and hence nature) itself (Jacoby 1983; Foster 2008). Hence, when the ecological movement emerged in the 1960s and 1970s, Western Marxism, with its abstract, philosophical notion of the domination of nature, was ill-equipped to analyze the developing material interactions of humanity and nature and their increasingly perilous forms. Making matters worse, some Marxian theorists (Castree 2000; Smith 2008) responded by inverting the Frankfurt School critique of the domination of nature with the more affirmative notion of 'the production of nature'. Production of nature thinkers were less concerned with the issue of domination of nature, and saw nature (and natural processes) as entirely subsumed within production.

All of this changed, however, with the rise in the 1990s of a second-stage ecosocialism that returned to Marx's materialist-ecological approach, and particularly his concept of social metabolism, while also reincorporating elements of Engels's ecological thought. This development represented a sharp break with the earlier Frankfurt School-influenced approach to Marx and nature. Peter Dickens, in two successive books (both entitled *Society and Nature*, 1992, 2004), was among the pioneering thinkers forging this new synthesis. In this chapter, we compare the ecological views of the early Marx with those of the later Marx, highlighting the dispute that emerged within the left in this realm, while pointing to the possibility of a wider synthesis, rooted in classical Marxism and the concepts of the universal metabolism of nature, social metabolism, and metabolic rift.

Criticisms of Marx's Concept of Nature

Alfred Schmidt's *The Concept of Nature in Marx* was described two decades ago by Paul Burkett (1997, p. 164) as 'perhaps the most influential study ever written on Marx's view of nature'. It was published in Germany in 1962, the same year as the appearance of Rachel Carson's *Silent Spring* in the USA, which is seen as the starting point of the modern environmental movement. Schmidt's book was originally a dissertation in philosophy, written between 1957 and 1960 under the supervision of Horkheimer and Adorno, and was 'impregnated with the influence of "critical theory"' (Schmidt 1970, p. 9). It thus antedated the modern environmental movement. Yet, Schmidt's work, carrying with it the imprimatur of the Frankfurt School, had an enormous influence on how Marx came to be viewed by many New Left theorists in the context of the developing environmental movement of the 1960s–1980s. As Marxian geographer Neil Smith put it in 1984, Schmidt's book constituted the 'definitive study' of nature in Marx (Smith 2008, pp. 31–32).

The Concept of Nature in Marx was deeply affected by the general, Weberian-style pessimism of the Frankfurt School, which viewed the 'domination of nature' as an intrinsic characteristic of modernity or 'the dialectic of the Enlightenment' (Horkheimer and Adorno 1972). Under Enlightenment civilization, Horkheimer and Adorno declared, 'either men will tear each other to pieces or they will take all the flora and fauna of the earth with them; and if the earth is then still young enough, the whole thing will have to be started again at a much lower stage' (p. 224). Although Schmidt brought a number of important, positive contributions to the understanding of nature in Marx, it was his negative, pessimistic conclusions, in the spirit of Horkheimer and Adorno, with regard to the mature Marx's views that proved most influential. Rejecting the outlooks of 'utopian' Marxist theorists, such as Bertolt Brecht and Ernst Bloch, who, based on the early Marx, sought a 'reconciliation' between humanity and nature via socialism, Schmidt concluded:

> The mature Marx withdrew from the [utopian] theses expounded in his early writings. In later life he no longer wrote of a 'resurrection' of the whole of nature. The new society is to benefit man alone, and there is no

> doubt that this is to be at the expense of external nature. Nature is to be mastered with gigantic technological aids, and the smallest possible expenditure of time and labour. It is to serve all men as the material substratum for all conceivable consumption goods.
>
> When Marx and Engels complain about the unholy plundering of nature, they are not concerned with nature itself but with considerations of economic utility…. The exploitation of nature will not cease in the future, but man's encroachments into nature will be rationalized, so that their remoter consequences will remain capable of control. In this way, nature will be robbed step by step of the possibility of revenging itself on men for their victories over it. (1970, pp. 154–155)[1]

The last phrase was a reference to Engels (1975, pp. 460–464), whose views on the need for human beings to control their social relation to nature under socialism in order to prevent ecological crises (which he referred to metaphorically as the 'revenge' of nature) were here interpreted by Schmidt as a case for the extreme 'rationalization' and external control of nature (Schmidt 1970, pp. 155–156, 160). There was no real room in Engels any more than Marx, Schmidt insisted, for anything but a one-sided conqueror's approach to nature—despite Engels's criticisms of precisely this. Here Engels was reinterpreted in line with a crude 'domination of nature' conception in order to undermine Bloch and Brecht and to foist such views on Marx himself. In the end, Marx was reduced to being a proponent of a rationalized, reified, and mechanistic world in which a narrow instrumentalism, geared to an unrestrained productivism, was the only possible course. The mature Marx, in the Frankfurt School interpretation, thus led inexorably to the same Weberian iron cage with respect to the instrumentalist rationalization of nature as did capitalism and Soviet Marxism.[2]

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[1] The idea of a 'reconciliation' of nature and humanity was a constant theme of the Frankfurt School. In practice, however, it took the form of negative criticisms of various ways of reconciling nature and humanity/society, while, according to Martin Jay (1973, pp. 267–273), the form that such a 'reconciliation with nature' was meant to take in Horkheimer and Adorno's analysis 'was never fully spelled out'.

[2] References here to the Frankfurt School's critique of the 'dialectic of the Enlightenment' (and of Marx and nature) are meant to refer specifically to Schmidt, and to Horkheimer and Adorno. It excludes, most notably, Herbert Marcuse, who, though reflecting some of the same tendencies, was to respond affirmatively and dialectically to the growth of environmentalism in the 1970s.

Close readers of Schmidt's work were no doubt puzzled by the contradictions in his reading of Marx. For Schmidt could not have arrived at these conclusions, in what was in many ways a sophisticated philosophical reading of Marx's nature theorizing, without turning the early Marx against the later Marx, Marx against Engels, Marx against Brecht and Bloch, and even, as we shall see, the mature Marx against the mature Marx.[3] Brilliant as Schmidt's analysis was, it was colored by a double polemic: (1) against those who sought to apply the broad anthropological, humanistic, and ecologically utopian perspectives of the early Marx to the later Marx, and (2) against all those, associated with a more traditional Marxism, who suggested that there was the possibility of a more sustainable path of development under socialism.[4]

Schmidt's study was further compromised by a threefold failure to comprehend the depths of Marx's critique. First, Schmidt's deterministic notion of technology and industrialization under capitalism, and the automatic carrying over of this into socialism, meant that he failed to comprehend the full significance of Marx's historically specific critique of the capitalist value form, in which value, emanating from labor alone, was in contradiction to wealth, emanating from both nature and labor.[5] For Marx, the goal was not a society aimed at endless quantitative expansion (exchange value) but at the fulfillment of qualitative needs (use value). Second, Schmidt saw Marx's emphasis on the metabolism of nature and society as a broad philosophical 'metaphor' and as a form of speculative metaphysics. It was not treated primarily, in the end, as a scientific category, related to actual material exchanges and systemic (thermodynamic) processes—though he recognized that element in Marx (Schmidt 1970, pp. 76, 80, 88–90). Third, Schmidt attributed to Marx a notion of external nature as consisting of unchanging, invariant laws—that is, a pas-

[3] On Schmidt's criticisms of Bloch and Brecht, see Schmidt (1970, pp. 124–128, 154–163). See also Brecht (1966) and Bloch (1986).

[4] The first of the two polemical attacks is directly referred to by Schmidt (1970, p. 9). The second was just as pervasive, but was presupposed by Western Marxism's criticism of dialectical materialism.

[5] Schmidt (1970, pp. 77–78) recognizes the philosophical significance of the fact that Marx saw nature as the ultimate source of all wealth without realizing that this is key to Marx's political-economic/ecological critique. On Marx's value theory and ecological critique see Foster et al. (2010, pp. 53–64).

sive, dualistic, and rigidly positivist conception of nature, in which even evolutionary development within nature (outside humanity) conformed to narrowly delineated, fixed processes in conformity with a reductionist scientific view. Nature (outside of human nature and human society) was in this vision both passive and mechanical.

Although Schmidt briefly discussed a more dialectical concept of nature in Marx, ultimately Marx was interpreted as adhering in his mature phase to a mechanistic-positivistic scientific view (Schmidt 1970, pp. 15, 59, 63–64, 90, 98, 139, 157, 162). 'The attitude of the mature Marx', Schmidt wrote,

> has in it nothing of the exuberance and unlimited optimism to be found in the idea of the future society prescribed in the Paris Manuscripts. It should rather be called skeptical. Men cannot in the last resort be emancipated from the necessities imposed by nature. (Schmidt 1970, p. 139)

Hence, Marx was transformed into a forerunner to the skepticism, world-weariness, and dualistic division between natural science and social science and between nature (other than human nature) and society that characterized Schmidt's own mentors, Horkheimer and Adorno.

Adhering to a neo-Kantian epistemological outlook with respect to nature and society, Horkheimer and Adorno (and with them Schmidt) rejected both the Hegelian idealist philosophy of nature and the Marxian materialist dialectics of nature (associated especially with Engels), while simultaneously rejecting the 'unlimited optimism' with respect to the reconciliation of naturalism and humanism of the early Marx. The dialectic, in the Frankfurt School view, was applicable only to the reflexive realm of society and human history. Natural science, insofar as it was directed at the external, objective world apart from human beings, was depicted as inherently positivistic and separate from the human sciences. Hence, the early Frankfurt School thinkers were themselves caught in what they called the 'dialectic of Enlightenment', falling prey to a larger epistemological dualism between nature and society from which there was no exit. This did not prevent them from simultaneously developing a negative philosophical critique of the Enlightenment domination of nature; but it was one that had no meaningful relation to praxis. Here

their views were closest to Max Weber's well-known critical pessimism with respect to the Enlightenment 'disenchantment' of nature (see Foster and Holleman 2013, pp. 1660–1662). As in Weber's tragic vision, the 'iron cage' of formal rationality offered no visible escape, pointing inexorably to the disenchantment and domination of nature: Against which one could only offer empty protests.

For Horkheimer, the 'decay of civilization' in modern times is to be attributed to the fact that 'men cannot utilize their power over nature for the rational organization of the earth' (Horkheimer quoted in Leiss 1974, p. 154)—a problem that he saw as arising from the contradictions of Weberian formal rationalization common to both capitalism and socialism, and endemic to the modern human relation to the environment. The decay of civilization was associated with the rise, in reaction, of altogether new repressive tendencies, such as fascism, in which 'raw nature', in 'revolt against reason', represented animality, primitiveness, and crude Darwinism. 'Whenever man deliberately makes nature his principle', Horkheimer wrote, 'he regresses to primitive usages…. Animals…do not reason…. In summary, we are the heirs, for better or worse, of the Enlightenment and technological progress' (1974, pp. 123–127). A vain attempt to escape such a fate led to a world of primitiveness. Once such pessimistic assumptions were adopted it followed that Marx's notion of liberation was inevitably forced to accede to the Enlightenment vision of implacable technological progress—the Weberian iron cage—as the determining force in history. In this sense, Horkheimer was quite distant from his Frankfurt School colleague, Herbert Marcuse, who saw more room for struggling against technology and for the development of a non-alienated human-ecological metabolism (see Marcuse 1972, pp. 59–78, 1978, p. 16).

Schmidt (1970, p. 154) recognized the abstract possibility of a more revolutionary-critical interpretation of Marx's nature theorizing. Yet, he dismissed this, not so much in the terms of the logic of Marx's own analysis, but rather that of mid-twentieth-century critical theory, represented by Horkheimer and Adorno. 'We should ask', he wrote, concluding his analysis of Marx on nature,

> whether the future society [of socialism] will not be a mammoth machine, whether the prophesy of [Horkheimer and Adorno's] *Dialektik der Aufklärung* [*Dialectic of Enlightenment*] that 'human society will be a massive racket in nature' will not be fulfilled rather than the young Marx's dream of a humanization of nature, which would at the same time include the naturalization of man. (Schmidt 1970, p. 156, see also Jay 1973, pp. 259 and 347)

The utopian young Marx, in his view, was refuted by the realist mature Marx, who succumbed to the dialectic of the Enlightenment. As a result, Marxism offered no way out of the 'massive racket in nature'.

Schmidt's account of Marx's concept of nature, with all of its inconsistencies and convolutions, positing one contradiction after another in Marx's own analysis, only reduced him in the end to a repressive Enlightenment view—one that reinforced and served to justify Frankfurt School skepticism, pessimism, worldly alienation. Such views were in many ways a product of the divisions within Marxism beginning in the 1930s, and heightened after 1956.[6] Western Marxism, as a distinct, largely philosophical tradition, tended to see classical Marxism—particularly Engels but also extending to Marx himself—as falling prey to positivism. Critically commenting on this whole tendency, William Leiss, who was a student of Marcuse, observed in *The Domination of Nature* (1974, p. 217) that 'Alfred Schmidt's excellent book…attempts (unsuccessfully) to present Marxism as an extreme form of Saint-Simonianism', that is, reflecting an inherently techno-industrial relation to the domination of nature. Likewise for Smith (2008, p. 44), Schmidt depicted the socialist relation to nature as conceived by Marx as 'pretty much like capitalism except worse: The domination of nature.' In Burkett's (1997, p. 173) more critical judgment, Schmidt's analysis of *The Concept of Nature in Marx* ended up 'in a quagmire of environmental despair'.

Despite these limitations of his analysis, Schmidt, in what can be considered the most original and profound part of his work, centered his argument on Marx's now famous concept of social and ecological 'metabolism'. Here, he wrote, 'Marx introduced a completely new under-

[6] 'Western Marxism' arose as a specific tradition in the West, defined primarily by its rejection of the dialectics of nature (see Jacoby 1983, pp. 523–526).

standing of man's relation to nature' (Schmidt 1970, pp. 78–79). The metabolism category as employed by Marx in relation to the labor process, he noted, made it possible to 'speak meaningfully of a "dialectic of nature"'. The notion of social metabolism thus pointed to what Marx (1976, p. 637) himself had called the possibility of a 'higher synthesis' in the human–nature relation.

Nevertheless, Marx's metabolism argument was ultimately marginalized in the later parts of Schmidt's analysis, which characterized it as a 'pre-bourgeois' view of nature (1970, p. 11). For Schmidt, in developing the notion of metabolism as a dialectical mediation between nature and society through labor and production, Marx had sought recourse to a form of metaphysical speculation, constituting a negative, nonhistorical ontology (1970, p. 88). Erroneously attributing Marx's use of the metabolism concept primarily to the influence exercised on this thought by the crude, mechanistic scientific materialist Jakob Moleschott—rather than Roland Daniels and Justus von Liebig, the two thinkers who Marx drew on most directly in this respect—Schmidt saw it as both pre-bourgeois, in the backward looking sense (referring to a utopian, almost mystical attempt to resurrect a past unity), and mechanistic.[7] What Schmidt described, at one point, as a meaningful dialectic of nature in Marx (of the kind that was to draw the admiration of Georg Lukács as well) was introduced as a more sophisticated dialectic of nature and society—only to be dismissed in the end as both mechanistic and archaic, reflecting a lost precapitalist unity.

[7] Marx took his wider ecological notion of metabolism initially from the work of his friend the physician Roland Daniels (1988, p. 49), who appears to may have been the first to use it to develop a larger ecosystemic perspective. (It was Kohei Saito who first brought this to our attention in personal correspondence; we are also grateful to Joseph Fracchia for his translations from the German in this regard.) Later Justus von Liebig's analysis of the soil problem, in which he incorporated the metabolism concept, proved decisive for Marx. See the discussion of this in Foster (2000, pp. 147–154) and Saito (2014). Despite Schmidt's claim that Marx took his analysis of metabolism from Jacob Moleschott, there is no evidence of this, while there is considerable evidence on Marx's reliance on other thinkers here. Marx and Engels were consistent throughout their writings in their rejection of Moleschott's crude mechanistic materialism. Nevertheless, while Schmidt's claims on Moleschott's influence on Marx in this respect appear unfounded, Moleschott's mechanistic and speculative views of metabolism appear to have colored Schmidt's own rendition of Marx in ways that proved to be an obstacle to his interpretation (see Schmidt, 1970, pp. 86–88).

Failing in this way to comprehend the full complexity and range of possibility opened up by Marx's concept of social metabolism—an approach that was at one and the same time, philosophical, political–economic, and physiological—Schmidt dismissed it as a metaphysical, naturalistic category, reflecting a 'peculiarly unhistorical dialectic of the process of metabolism'—a 'rigid cyclical form of nature' that was 'anterior to man' (Schmidt 1970, pp. 11, 76, 90, 176).[8] Recognizing that Marx had introduced a materialist dialectic that connected nature and society, human production/reproduction and the natural-material conditions of existence, Schmidt nonetheless ultimately pulled back, wishing to avoid the question of a dialectic of nature, and thus limited the dialectic to an abstracted social realm.

This general outlook on Marx's concept of nature, articulated most influentially by Schmidt, was carried forward and reinforced in various ways in the first-stage ecosocialism that arose in 1970s and 1980s. Early ecosocialist thinkers, influenced by Schmidt, generally criticized Marx (and Marxism) for downplaying natural limits, and thus ecological constraints. They therefore eclectically promoted 'the greening of Marxism' by grafting onto Marx's analysis neo-Malthusian notions of environmental constraints together with ethical views regarding the nature–humanity interrelationship that were characteristic of deep ecology and 'ecologism' (see Benton 1996a, b; Smith 1998, pp. 71–73). Although representing an important self-critique on the part of left theorists, this argument generally avoided any close scrutiny of the foundations of historical materialism, particularly where issues of natural science were involved. 'The revival of Marxism in the 1960s and 1970s' took for granted, in the critical assessment of historian Eric Hobsbawm (1999, p. xix), 'the nonapplicability of Marx's thought (as distinct from that of Engels, which was regarded as separable and different) to the field of the natural sciences'. The new Marxism of this period, as distinct from earlier periods

[8] Reiner Grundmann (1991, pp. 90–98 and 121–122) considered Marx's metabolism argument as the strongest of the three approaches to ecological questions (the first being 'capitalist production as a cause of ecological problems' and the second the alienation of nature). Yet, Grundmann followed Schmidt in interpreting Marx's metabolism argument in simple instrumentalist-mechanistic terms, thereby losing sight of its complexity, and failing to recognize the importance of Marx's theory of ecological crisis arising in that respect.

of historical materialism, 'left the natural sciences totally to one side'. Marx's ever-present analysis of the natural conditions underlying production and the capitalist economy were generally skipped over in the study of his work and treated as uninteresting and nonessential—even in early ecosocialist accounts.

Having first failed in this way to appropriate the ecological aspects of Marx's thought as part of the legacy of historical materialism, the Western left went on to conclude that an ecological outlook occupied at best only a marginal place in Marx's historical materialism, and was largely discarded in his later economic works.[9] Expressing what was then the general view within Western Marxism, Perry Anderson stated as late as 1983 that 'problems of the interaction of the human species with its terrestrial environment [were] essentially absent from classical Marxism' (1983, p. 83). This claim, however, nullified not only Engels's voluminous discussions of the relation of human beings to their natural physical environment, but also the extensive discussions of natural-material relations and natural science—and within these, ecological concerns—by Marx himself.[10]

For an important first-stage ecosocialist, like Benton, Marx had gone overboard in his critique of Malthus, to the point of exhibiting a 'reluctance to recognize "nature-imposed limits" to human development' altogether. Malthus, meanwhile, was to be critically reappropriated in the process of the 'greening of Marxism' (Benton 1989, pp. 55, 60, 64). Gorz declared that socialism as a movement was 'on its last legs', due to its narrow productivism inherited from classical Marxism, and its lack of a 'reflexive modernist' view of nature–society relations (Gorz 1994, p. vii-9, 29, 100; 1983). In the view of such thinkers, Marx was said to have systematically excluded essential naturalistic components from his analysis. Likewise, Marxian economist James O'Connor (1998, p. 160), editor of *Capitalism Nature Socialism*, declared that 'Marx hinted at, but did not develop, the idea that there may exist a contradiction of capitalism that leads to an "ecological" theory of crisis and social transformation'. Alain Lipietz (2000, pp. 74–75), writing in *Capitalism Nature Socialism*,

[9] On the appropriation problem, see Foster (1999, pp. 391–396).

[10] Russell Jacoby sees the split that occurred in Marxism in terms of two different appropriations of Hegel. 'Soviet Marxism', he wrote, 'was regularly sustained by a scientific Hegel, and European Marxism was regularly sustained by a historical Hegel' (1981, pp. 57–58).

went even further, declaring that Marx underestimated 'the irreducible character…of ecological constraints' and adopted 'the Biblico-Christian ideology of the conquest of nature'.

Such early ecosocialist thinkers commonly attributed the alleged ecological blind spots in Marx's political economy to intrinsic flaws in the labor theory of value. Since 'all value was derived from labor power', environmental sociologist Michael Redclift wrote, 'it was impossible [for Marx] to conceive of a "natural" limit to the material productive forces of society' (1984, p. 7). Yet, what Redclift failed to notice was that it was this very one-sidedness of the value form in capitalism that lay at the center of Marx's critique, associated with the contradiction between wealth (derived from natural-material use values even more than labor) and value/exchange value (which left nature altogether out of account). From Marx's standpoint, once it was recognized that nature—constituting along with labor one of the two sources of all wealth—was not included in the capitalist value calculus, but was treated as a 'free gift… to capital' (1974, p. 745), it was impossible *not* to recognize both the existence of natural limits, and capital's destructive tendency to override them, in its unending drive to accumulation (Burkett 1999, pp. 89–110, 1997, pp. 173–174).

First-stage ecosocialists thus erroneously perceived Marx's critique of capitalism as, at best, neutral with respect to ecological issues, and, at worst, anti-ecological—even if the early Marx had alluded to the possibility of the unification of naturalism and humanism. Yet, socialism itself, in the outlook of these thinkers, remained essential, largely due to its critique of labor exploitation. Early ecosocialist thinkers thus proceeded to graft Green concepts onto historical-materialist analysis (or in some cases historical-materialist notions on Green theory), creating an eclectic, hybrid, Centaur-like construct. In the case of Benton, perhaps the most articulate spokesperson for first-stage ecosocialism, elements of Marx's critique of political economy, such as: (1) his political hostility to 'Malthusian "natural limits" arguments', (2) the priority given to value theory, (3) his neglect of ecological processes, and (4) his alleged 'Prometheanism'—or extreme productivism—all 'obstructed the development of historical materialism as an explanatory theory of ecological crisis'. These presumed shortcomings of Marxism required an 'interdisci-

plinary collaboration between a revised historical materialism and ecology' (Benton 1996b, pp. 103–110).

Yet, as commendable as such a program appeared on the surface, without a thoroughgoing exploration and reconstruction of Marx's own analysis of the nature–society dialectic, the hoped for higher synthesis conceived in this way could only end up being an eclectic mishmash in which the critical power of the historical-materialist tradition would be lost. More important, the criticisms of Marx from the standpoint of prevailing Green theory were often distorted, not only in their understanding of Marx's own ecological conceptions, but in the adoption of views (e.g., Malthusianism) that were antagonistic to a fully developed Marxian ecology.

The Production of Nature: A New Marxian Human Exemptionalism

Other left theorists took an entirely different tack, distant from both the Frankfurt School and first-stage ecosocialism. Thus Neil Smith embraced the basic structure of Schmidt's interpretation of Marx, but sought to stand it on its head, contending that Schmidt had generated a 'quintessentially bourgeois conception of nature out of his reading of Marx'. If Schmidt's (1970) *Concept of Nature in Marx* had argued that the mature Marx was caught in the technological determinism and extreme productivism that characterized the dialectic of the Enlightenment, Smith offered a far more positive reading of this, depicting Marx's view as one of the 'production of nature' or the constant reinvention and transformation of nature via production. As Noel Castree indicated, in an analysis supportive of this latter position, Smith sought to solve the problem by creating a causal arrow that went only one way—from production to nature, leading to what could be characterized as a 'hyper-constructionist' outlook. Nature was reduced to a passive concept. Smith's production of nature analysis, Castree (2000, pp. 27–28) noted, 'looked more at how capitalism produces nature and less at how produced nature affects capitalism'. According to Castree (2000, p. 28, 2001, pp. 204–205),

for Smith, 'nature becomes internal to capitalism'. Here subsuming nature as a whole almost completely under society solved the problem of 'dualism', which was used to criticize all other views of the environmental problem.[11]

Hence, in Smith's inverted Frankfurt School perspective on the domination of nature, nature as a whole was envisioned as increasingly produced by human beings for their own ends in almost Baconian terms. It was possible, he argued, to speak of 'the real subsumption of nature' in its entirety within human production. What we were witnessing in the late twentieth century, he proclaimed, was the infiltration of society into the last 'remnant[s] of a recognizably external nature'. Indeed, there was no longer any meaningful nature anywhere apart from human beings: 'Nature is nothing if it is not social.' 'The production of nature', in Smith's words, was 'capitalized "all the way down"'. From this perspective, the historical production of nature represented 'the unity of nature toward which capitalism drives'. In this ever increasing, capitalist-generated unity, 'first nature' (i.e., nature at its most elemental) was 'produced from within and as a part of second nature' (i.e., nature as transformed by society). Any recognition of 'external nature' as a dynamic, evolutionary force outside and beyond, and often interacting with, humanity itself was therefore castigated as 'dualism', 'fetishism of nature', and 'nature washing'. Natural science was to be faulted for focusing on 'so-called laws of nature' outside society (Smith 2008, pp. 44–47, 78–91, 244–247; 2006, pp. 23–28).

'Given Marx's own treatment of nature'—Smith (2008, p. 31) went so far as to contend—'it may not be unreasonable to see in his vision also a certain version of the conceptual dualism of nature'. Marx himself was therefore partly to blame for the rise of 'left apocalypticism', which Smith (2008, p. 247) identified with contemporary environmentalism with its dualistic outlook.

Castree followed along the same line as Smith, emerging as a major proponent of the production of nature approach, though in a slightly more nuanced form. Castree (1995, p. 16) stated that 'Marx did not him-

[11] Castree points to these contradictions in Smith's analysis, while nonetheless arguing that Smith's approach to the production of nature is basically the one on which Marxian theorists need to build—if in a more nuanced way, recognizing that nature too is involved, in what could then be described as its 'co-production'.

self provide a systematic account of nature. This task was left to Alfred Schmidt.' The brilliance of Schmidt's analysis, for Castree (2000, p. 17), was reflected in the fact that he detected a 'fundamental flaw' in Marx. Although 'Marx apparently envisioned a harmonious balance of nature and society' in his 'anticipatory-utopian vision', this pointed to 'a subtext of a will to power: That is, an affection for technology in the service of human well-being which could unintentionally turn into the domination of nature, and ironically (after Adorno and Hokheimer) into the domination of humans themselves.' Following Smith, Castree (2000, pp. 9–10, 21) proceeded to level the accusation of 'dualism' at almost all Marxist analysts of nature–society relations from classical Marxism to the present—hardly sparing Marx himself, whose saving grace, in Castree's view, was that he had inspired Smith's unifying conception of the 'production of nature', which removed the question of nature outside society. First and second generation ecosocialists, who had resurrected the ecological bases of Marx's political economy, were characterized as dualists by Castree (2000, p. 8), who claimed that they had '*reintroduced* nature's putative separateness' in their treatment of Marx.[12]

Marxist production of nature analyses, Castree declared, were superior to classical Marxism, in that they rejected altogether the idea of 'external nature', which infected even Engels's *Dialectics of Nature*. 'As Smith correctly observes', Castree (2000, p. 17) pronounced, 'nature separate from society has no meaning'. A developed Marxian approach in this realm rejected the notions of 'universal' and 'external' nature, since such conceptions inevitably led to the crudities of naturalism and dualism. The idea that the relation of nature to society conformed to a materialist, open dialectic, in which human beings and society are a part of nature, and existed in its midst, in a complex, coevolutionary reality, as Marx himself argued, was entirely rejected by production of nature analysis of thinkers like Smith and Castree, who, in the name of antiessential-

[12] It should be noted that since Smith and Castree had already faulted Marx for being dualistic, what ecosocialists were actually being charged with here was not a misinterpretation of Marx, but a failure to conform to Smith's non-dualistic, monistic 'production of nature thesis'. Contrary to such views, our own assessment is that neither Marx nor his major followers were dualistic. Rather, what Smith and Castree in their mechanistic-monistic worldviews mistook for dualism, was in reality the dialectical analysis of the interpenetration of opposites.

ism, explicitly denied any essential meaning to nature apart from society (Castree 2000, pp. 13–5, 1995, pp. 20–21, 24).[13]

The 'production of nature' argument, like the Frankfurt School approach, and first-stage ecosocialism, thus drew its argument from an either/or conception of dualism versus monism. In this view, which has no real concept of dialectical mediation, in order to escape dualism, one is forced to choose between either a 'monistic doctrine of universal nature' or its opposite, a monistic doctrine of the production of nature by society (sometimes given an added nuance by reference to *co-production*, and to a double, or hyphenated reality, etc.) (Castree 2000, p. 17). The production of nature school thus chose a kind of monist, hyper-social constructivism, such that nature and natural conditions were entirely subordinated to human production. This in essence was the view that environmental sociologists criticize as human exemptionalism, that is, the notion that human beings are largely exempt from natural laws—or can imperialistically transform them as they wish (see Foster 2012, pp. 1–27). The logical result was Smith's criticism of environmental apocalypticism. Writing about the '*real politik*' to which Smith's 'production of nature' led, Castree stated (2015, p. 291), 'certain strands of environmental and body-politics operative outside universities are now [like Smith] dispensing with "nature" as an ontological referent (see, for example, Shellenberger and Nordhaus 2007)'—a reference to the leading ideological center for capitalist ecological modernization in the USA. 'In a generic sense', Castree wrote, 'this mirrors Smith's insistence that we need new terms of radical political discourse'. Here he seemed oblivious to the fact that Shellenberger and Nordhaus (2007) represented exactly the opposite: *New terms of reactionary political discourse*.

To escape such one-sided (either idealist or mechanistic) views, which have dominated much of left theorization of the nature–society relation since the publication of Schmidt's (1970) *Concept of Nature in Marx*, it is necessary to turn to Marx's ecology itself, in which the materialist conception of history and the materialist conception of nature were seen as forging a dialectical unity. By excavating the ecological founda-

[13] Castree refers abstractly here to the 'materiality of nature' but denies its 'externality' or 'universality', which he characterizes as 'essentialist'.

tions of classical historical materialism, second-stage ecosocialist theorists since the late 1990s have moved well beyond these earlier misconceptions, creating the basis for a wider ecological synthesis. Here the analysis has pivoted on the dialectical approach implicit in Marx's triadic scheme of: 'the universal metabolism of nature', the 'social metabolism', and the metabolic 'rift' (Marx and Engels 1975, pp. 54–66; Marx 1974, p. 949).

Although, as in Marx's approach, it still makes sense logically (i.e., by way of abstraction) to differentiate nature and natural processes from society and production (i.e., the human labor process), there is no longer any pure nature completely untouched by human society; nor is there any pure realm of society free from the dire natural-material consequences of human actions. In the Anthropocene epoch, it is therefore all the more necessary to explore the complex, dialectical natural–social interconnections between the Earth system (the universal metabolism of nature) as a whole and capitalism as a system of alienated social metabolic reproduction, *within* that Earth system. Today, the drive to capital accumulation is disrupting the planetary metabolism at cumulatively higher levels, threatening irreversible, catastrophic results for countless species, including our own. It is in the theorization of this ecological and social dialectic, and in the development of a meaningful praxis, that Marx's analysis has proven indispensable.

Marx, Metabolism, and the Metabolic Rift

Second-stage ecosocialism sought to return to Marx and earthly questions. The aim was to draw on the ecological foundations of classical historical materialism to develop a more unified socio-ecological critique. Dickens was among those who took initial steps to open up such an analysis. In his 1992 book, *Society and Nature*: *Towards a Green Social Theory*, he primarily focused on Marx's early writings, such as the *Economic and Philosophic Manuscripts*, insisting that this work provides key insights regarding how the organization, processes, and relations of the capitalist system created an alienation from nature. He proposed that people's understanding of nature tends to be shaped by their lived experiences within a society dominated by commodity production. Although

some of the baggage of first-stage ecosocialism, such as an assumption that Marx in his mature works largely ignored natural limits and promoted an extreme productivism, still remained, Dickens's work nonetheless represented a turning point. He was critical of simply grafting deep ecology positions on a revised Marxism. He insisted that it is necessary to extend Marx's method, which includes both a historical-materialist and dialectical assessment of the relationship between society and nature. From a critical realist orientation, he explained that there are larger emergent properties and boundaries within the biophysical world that must be recognized, and that the capitalist system was 'overloading these self-regulating ecosystems and stretching them to a point at which they can no longer cope' (Dickens 1992, p. 80, see also pp. 76–81, 175–195 for the broader discussions noted above).

The second-stage ecosocialist scholarship that followed called into question pitting the young Marx against the mature Marx, Marx against Engels, and natural science against social science. Burkett explained that Marx's elemental ecological ideas ran throughout all of this work, even though the language and way he expressed them changed. Marx moved over the course of his studies from highly 'abstract' to 'more consistently historical and social-relational' concepts (Burkett 1999, pp. 8–9). Burkett (1999, p. 9) also pointed out that Marx and Engels were both committed to a 'materialist and social-scientific approach to nature', which serves as the foundation for extending and developing their analysis, creating opportunities for complementary work between the social and natural sciences. In other words, they insisted upon employing both a materialist conception of history and a materialist conception of nature, as necessary counterparts (Foster 2000).

The ability to analyze the interactions and transformations in the dialectical nature–society relationship was greatly enhanced by Marx's use of metabolic analysis. Here Marx's critique of political economy merged with his assessment of metabolic relations, illuminating the interpenetration of nature and society, as well as the scale and processes through which these interactions historically developed. He ecologically embedded socio-economic systems and explicitly studied the interchange of matter and energy between the larger environment and society (Foster 2000; Foster et al. 2010). In doing this, he also assessed the distinctive workings of

both natural and social systems, given that ecosystems and natural cycles operate independently of and in relation to human society and other systems. Marx's metabolic approach thus avoids the human exemptionalism that often characterizes much of the Frankfurt School and Western Marxism approaches. Social ecologist Marina Fischer-Kowalski proposed that metabolic analysis served as an effective approach for investigating the coupling of human and natural systems, given that it 'cut across the "great divide" between the natural sciences…and the social sciences' (1998, p. 62). The engagement and development of Marx's metabolic triadic scheme helped solidify the second stage of ecosocialist analyses and has served as the springboard for the third stage, with the result that this methodology is now being widely employed to address many of the most pressing ecological challenges of today.

In the early nineteenth century, physiologists introduced the concept of metabolism to examine the biochemical processes between a cell and its surroundings, as well as the interpenetration and exchanges between an organism and the biophysical world. Roland Daniels, a physician, who was Marx's friend, extended the use of metabolism to whole complexes of organisms, foreshadowing its application in ecosystem analysis (Saito 2014). It was to emerge as the basis to examine higher levels of organization, including the interchange of matter and energy between human societies and the larger environment. The German chemist, Justus von Liebig (1859), helped generalize the concept of metabolism, using it to study the exchange of nutrients between Earth and humans. He explained that soil required specific nutrients—nitrogen, phosphorus, and potassium—to produce vegetation. As plants grew, they absorbed soil nutrients. To maintain soil fertility, these nutrients had to be recycled back to the land.

Marx, who closely followed scientific debates and discoveries, incorporated the concept of metabolism into his critique of political economy, explaining that he 'used the word…for the "natural" process of production as the material exchange [*Stoffwechsel*] between man and nature' (Marx 1975, p. 209). He recognized that humans are dependent on nature and 'can create nothing without' it (Marx 1964, p. 109). For 'the earth itself is a universal instrument…for it provides the worker with the ground beneath his feet and a "field of employment" for his own particu-

lar process' (Marx 1976, pp. 286–287). As a result, there is a necessary 'metabolic interaction' between humans and the earth. Labor serves as 'a process between man and nature, a process by which man, through his own actions, mediates, regulates and controls the metabolism between himself and nature' (Marx 1975, p. 283). The labor process, including exchanges with ecological systems, is influenced by the dominant socio-economic arrangements and social institutions, giving a distinctive character to what Marx saw as the social metabolism.

The complex, nuanced ecological world view to be found in Marx's formulation of metabolic relations is evident in his conception of both a 'universal metabolism of nature' and a social metabolism (Foster 2013, p. 8). He indicated that there is a 'universal metabolism of nature' within the broader biophysical world (Marx and Engels 1975, pp. 54–66). Specific cycles and processes operate that constitute and help regenerate ecological conditions. Human society exists within the earthly metabolism and continually interacts with its external natural environment in the production of services, needs, and products. As a result, the social metabolism operates in relation to the universal metabolism of nature, which in part establishes ecological limits. Marx avoided subordinating nature to society, as well as vice versa, in order to avoid 'the pitfalls of both absolute idealism and mechanistic science' (Foster 2013, p. 8). He presented a metabolic analysis that illuminates both the universal metabolism of nature and the historically specific social metabolism of different socio-economic systems. Thus, while providing analytical distinctions, this approach recognizes that humans and the rest of nature are in constant interaction, resulting in reciprocal influences, consequences, and dependencies. These processes emerge within a relational whole, or the universal metabolism of nature.

Humans transform nature through production. However, 'they do not do so just as they please; rather they do so under conditions inherited from the past (of both natural and social history), remaining dependent on the underlying dynamics of life and material existence' (Foster 2013, p. 8). Each mode of production generates a distinct social metabolic order that influences the interchange and interpenetration of society and ecological systems (Foster 2000; Foster et al. 2010; Mészáros 1995). The social metabolic order of capital is expressed as a unique historical system

of socio-ecological relations developed within a capitalist mode of social organization. The socio-ecological interactions and exchanges are fundamentally tied to capital production and accumulation. Human social systems exchange with, work within, and draw on ecological systems in the process of producing and maintaining life and socio-cultural conditions. Yet, within the social metabolic order of capital, this materializes in a manner unlike other previous socio-ecological systems. Notably, the form and manner in which practical life activities take shape is compelled by the expansion and accumulation of capital.

Paul Sweezy (2004, pp. 86–93) explained that in their 'pursuit of profit…capitalists are driven to accumulate ever more capital, and this becomes both their subjective goal and the motor force of the entire economic system'. The compulsive necessity of this social metabolic order to accumulate ever more capital leads to continuous cycles of renewal, as novel productive and distribution methods are developed, and expansion of resources that are exploited to power industry and manufacture commodities. The needs of capital are imposed on nature, increasing the demands placed on ecological systems.

To illustrate metabolic analysis, it is useful to consider how Marx, drawing on the work of agricultural chemists and agronomists, analyzed the transformations associated with capitalist agricultural production. He explained that soil 'fertility is not so natural a quality as might be thought, it is closely bound up with the social relations of the time' (1971, pp. 162–163). In many precapitalist societies, farm animals were directly utilized in agricultural production. They were fed grains from the farm and their manure, which contained nutrients, was reincorporated into the soil as fertilizer. People who lived in the countryside primarily consumed food and fiber from immediate farms. Their waste was also integrated into the nutrient cycle, helping maintain soil fertility.

This particular metabolic interchange was transformed in large part by the enclosure movement, the rise of the new industrial systems, and social relations associated with capitalist development. A distinct division between town and country emerged, as food and fiber from farms were increasingly shipped to distant markets, which transferred the nutrients from one location to another. The nutrients in food were squandered, as waste was not returned to the soil. Instead, this waste accumulated

as pollution within cities and rivers (Foster 2000; Marald 2002; Marx 1976). Liebig (1859), in his *Letters on Modern Agriculture*, indicated that these emerging social conditions contributed to the disruption of the soil nutrient cycle. He described the modern intensive farming practices of Britain as a system of robbery that exhausted the nutrients within the soil. In *Capital*, Marx (1976) indicated that new agricultural practices, including the application of industrial power, increased the scale of operations, transforming, and intensifying the social metabolism while exacerbating the depletion of the soil nutrients.

As a result, large-scale capitalist agriculture, Marx argued, progressively 'disturbs the metabolic interaction between man and the earth' (1976, pp. 637–638). Along with the various mechanisms used to intensify production and increase profits, it created a metabolic 'rift' in the soil nutrient cycle that resulted in 'robbing the soil' and 'ruining the more long-lasting sources of that fertility' (1976, pp. 637–638). As it violated the universal metabolism associated with the soil nutrient cycle (also conceived as a law of restitution), it undermined soil fertility and the conditions that supported human society. Reflecting on the consequences, Marx lamented:

> Agriculture no longer finds the natural conditions of its own production within itself, naturally, arisen, spontaneous, and ready to hand, but these exist as an independent industry separate from it—and, with this separateness the whole complex set of interconnections in which this industry exists is drawn into the sphere of the conditions of agricultural production. (1993, p. 527)

In Marx's dialectical framework, this metabolic rift arose out of an alienated social metabolism conditioned by the capitalist mode production, which came into conflict with the universal metabolism of nature. The metabolic rift was further exacerbated and expanded due to the general operations of the capitalist system. In his discussion of 'The Genesis of Capitalist Ground Rent' in *Capital*, vol. 3, Marx explained that the drive to capital accumulation

> reduces the agricultural population to an ever decreasing minimum and confronts it with an ever growing industrial population crammed together

> in large towns; in this way it produces conditions that provoke an irreparable rift in the interdependent process of social metabolism, a metabolism prescribed by the natural laws of life itself. The result of this is a squandering of the vitality of the soil, which is carried by trade far beyond the bounds of a single country. (1991, p. 949)

In the nineteenth century, the rift in the soil nutrient cycle created an enormous environmental problem for European agriculture and European societies. Numerous attempts were made to find affordable means of enriching the soil. For example, bones were ground up and spread across fields, and massive quantities of guano and nitrates were imported from Peru and Chile to Britain and other countries in the Global North to sustain agricultural production (Clark and Foster 2009). The social relations associated with this metabolic rift expanded from the local level to the national and international levels, as the bounty of the countryside and distant lands was transferred to urban centers of the Global North. Just prior to the First World War, the process for producing nitrates by fixing nitrogen from the air was developed, allowing for the large-scale production of artificial fertilizer. Nevertheless, the failure to recycle nutrients contributes to the ongoing depletion of soil by intensive agricultural practices. As a result, the metabolic rift in the soil nutrient cycle remains a persistent problem of the modern social metabolic order (Magdoff 2011; Mancus 2007).

Dickens's 2004 book, *Society and Nature*: *Changing Our Environment*, *Changing Ourselves*, highlighted the important advancements of the second stage of ecosocialism, especially the centrality of a historical-materialist conception of both nature and society, the nature–society dialectic, and metabolic analysis. He engaged a broader range of Marx's works, exploring the depth of Marx's ecology. He considered how distinct modes of production involved different demands and interactions with the larger environment. He explained that 'the notion of an ecological rift, one separating humanity and nature and violating the principles of ecological sustainability, continues to be helpful for understanding today's social and environmental risks' (Dickens 2004, p. 81). Importantly, he advocated ways to extend metabolic analysis to contemporary environmental problems, especially those associated with cities. He proposed

that 'three metabolic problems' plague modern cities, namely 'the provision of an adequate water supply, the effective disposal of sewage and the control of air pollution'. These problems highlight how 'humanity's metabolism with nature [is] not being ultimately destroyed but [is] being overloaded in the context of a particular kind of social and spatial organization' (Dickens 2004, pp. 84–85).

Marxist metabolic research continues to thrive. In many ways, as Del Weston argued in *The Political Economy of Global Warming* (2014, p. 66), the 'metabolic rift is at the crux of Marx's ecological critique of capitalism, denoting the disjuncture between social systems and the rest of nature'. It has been employed to analyze metabolic relations and ecological rifts in contemporary agricultural, climate, oceanic, hydraulic, and forest systems (Austin and Clark 2012; Clark and York 2005; Clausen and Clark 2005; Clement 2009; Gunderson 2001; Longo 2012; Longo et al. 2015; Magdoff 2011; Mancus 2007). Other theorists have used the concept of the metabolic rift, and Marx's ecological materialism in general, to develop a 'Marxist ecofeminism' that explores the relation between the rifts in nature and in gender relations (Odih 2014; Salleh 2009). Much of this work examines how the social metabolism of capitalism as a global system has created specific environmental problems in the modern era, as it transgresses the universal metabolism of nature. The intensification of the social metabolism demands more energy and raw materials, generating an array of ecological contradictions and rifts (Burkett 2006). As capitalism confronts environmental problems or barriers—such as a shortage or exhaustion of particular natural resources—it pursues a series of shifts and technological fixes to maintain its expansion. In this way, environmental problems are addressed by incorporating new resources into the production process, changing the location of production, and/or developing new technologies to increase the efficiency of production. Such shifts generally do not mend ecological rifts and often create new problems (Clark and York 2008; Weston 2014).

It is clear that 'metabolic restoration' necessitates an ecological and social revolution to overturn the social metabolic order of capital; a revolution in which the associated producers can rationally regulate the social metabolism in accord with the requirements of the universal metabolism of nature, while allowing for the fulfillment of their own human needs (for an excellent elaboration of Marx's concept of 'metabolic restoration'

see Weston 2014, pp. 168–178; see also Clausen 2007; Clausen et al. 2015; Magdoff and Foster 2010).

Marx and Nature in the Anthropocene: Toward a Critical Synthesis

Horkheimer and Adorno's *Dialectic of Enlightenment* was written during the Second World War, while they were in exile in the USA. It was intended as an account of the extreme domination of nature that characterized all of the warring countries, all of which were in various ways heirs of the Enlightenment (though fascism represented a fatal regression). It was followed several years after by Horkheimer's *Eclipse of Reason*, which argued that via fascism in Europe and social Darwinism in the USA the domination of nature had led to a 'revolt of nature', which was being harnessed in reactionary ways to reinforce the domination of both nature and society. For Horkheimer,

> whenever nature is exalted as a supreme principle and becomes the weapon of thought against thinking, against civilization, thought manifests a kind of hypocrisy, and so develops an uneasy conscience…. Indeed, the Nazi regime as a revolt of nature became a lie the moment it became conscious of itself as a revolt. The lackey of the very mechanized civilization [capitalism] that it professed to reject, it took over the inherently repressive measures of the latter. (Horkheimer 1992, p. 123)

Social Darwinism emerged as 'the main growth of the Enlightenment' and thus represented the repressive role harnessed to the naturalistic revolt against machine civilization, creating an even greater regression. For Horkheimer, this, then, took on the form of a huge Faustian tragedy. 'The history of man's efforts to subjugate nature', he explained, 'is also the history of man's subjection of man' (Horkheimer 1992, p. 105). Yet, there was no going back:

> We are the heirs, for better or worse, of the Enlightenment and technological progress. To oppose these by regressing to more primitive stages does not alleviate the permanent crisis they have brought about. On the con-

> trary, such expedients lead from historically reasonable to utterly barbaric forms of social domination. (Horkheimer 1992, p. 127)

Projecting a highly abstract, idealist philosophical argument, he concluded that, 'the sole way of assisting nature is to unshackle its seeming opposite, independent thought' (Horkheimer 1992, p. 127).[14]

It is in this context that Schmidt wrote his (1970) *The Concept of Nature in Marx*, under the tutelage of Horkheimer and Adorno. Since Schmidt's book was written as a doctoral dissertation in the 1950s and was published in 1962, the same year as Carson's *Silent Spring*, it preceded the rise of the global environmental movement, and was not surprisingly devoid of any active, progressive ecological consciousness. As in Horkheimer and Adorno's work, the dialectic of the Enlightenment was treated as a form of the domination of nature from which there was virtually no escape.

Schmidt in fact took as his main opponents those within the socialist tradition, like Brecht and Bloch, who were promoting 'utopian' Marxist conceptions of the reunification of nature and society in revolutionary terms. Counterposing Marx to Bloch, Schmidt (1970, p. 157) insisted that Marx (like Hegel) saw the labor process as the mere 'outsmarting and duping of nature'. Marx, we are told, abandoned in his mature works his demand for 'the "resurrection" of the whole of nature' (Schmidt 1970, p. 155). Even when Marx pointed, in Schmidt's (1970, p. 162) words, to nature as a 'coproducer' with labor, it was in the context of the promotion of narrow human ends. The needs of external nature, according to Schmidt, were entirely 'foreign' to Marx's whole outlook. Bloch's 'philosophy of hope', based on his speculative departure from Marx, was thus in reality a hopeless utopian quest, which turned into an empty 'apocalypticic vision' (Schmidt 1970, p. 162).

In line with Horkheimer and Adorno, Schmidt insisted that Marx himself had acquiesced to the dialectic of the Enlightenment, and the near total domination of nature, thus giving way in *Capital* to instrumentalist reason. Marxism itself was at fault. The problem became one of 'the eclipse of reason'. Only through the reemergence of reason in his-

[14] On the question of what Horkheimer meant by the Nazi 'revolt of nature', see Bruggemeier et al. (2005).

tory, they argued, in Hegelian terms, could a solution to the alienation of nature be found. Nevertheless, this remained a tragedy: The continued domination of nature as a tool of the domination of humanity was impervious to revolutionary praxis.

It was quite different in the case of Smith, who, in accepting the main formulations of Schmidt's analysis of Marx on nature, nonetheless characterized it as a defense of the 'bourgeois' outlook, and inverted the Frankfurt School critique, so as to make 'the production of nature' Marx's ideal—a view that Smith acknowledged could not be found systematically in Marx. Here the problem of the domination of nature disappears before the unceasing expansion of the human production of nature. The environmental movement's growing resistance to this extension is characterized by Smith as 'left apocalypticism' and is condemned even more absolutely than Schmidt's criticism of Bloch's 'apocalyptic vision'—since nature, in addition to no longer having any ontological necessity, is increasingly without reality (outside of its production by human beings) (Smith 2008, p. 247).

Here we discover by way of contrast to the mechanistic production of nature thesis, the liberatory potential that still lingered within the Frankfurt School outlook, despite the deep, enduring pessimism of some its leading, most characteristic, thinkers. In its concern with the domination of nature along with the domination of humanity, thinkers associated with the Frankfurt School never ceased to raise the critical problems associated with the dialectic of nature and society.

At the inception of the Institute for Social Research in Frankfurt, in 1932, Erich Fromm, in his paper, 'The Method and Function of an Analytic Social Philosophy: Notes on Psychoanalysis and Historical Materialism', indicated that Marx's notion of the labor process as a metabolic relation represented an integrated dialectic of nature and society (Fromm 1970, pp. 153–154). He pointed to Bukharin's (1925) *Historical Materialism* as promoting this aspect of Marx's analysis. Georg Lukács, a few years after *History and Class Consciousness* (in his *Tailism* manuscript of 1925–1926) and thereafter—reflecting in part his break with Western Marxism—argued that a meaningful dialectics of nature in Marx was embodied in his theory of the labor process as the metabolic relation

between humanity and nature (Lukács 2003, pp. 96, 106, 113–114, 130–131; 1968, p. xvii). What is more, the fact that 'human life is based on the metabolism with nature' meant, for Lukács (1974, p. 43), that 'certain truths which we acquire in the process of carrying out this metabolism have a general validity'. In the most theoretically advanced part of *Concept of Nature in Marx*, Schmidt (1970, pp. 176–190) pointed, as noted above, to Marx's metabolism argument as constituting an entirely new approach to the relation between nature and society, making it possible to speak 'meaningfully of a "dialectic of nature"' and raising the possibility of a 'higher synthesis'—though Schmidt (1970, p. 11) chose in the end to decenter this part of his interpretation of Marx, characterizing it as related to 'pre-bourgeois' formations. Yet, implicit in his analysis was the possibility of a revolutionary approach along these lines. Adorno apparently took some interest in Marx's 'famous expression "metabolism with nature" [*Stoffwechsel*]', though mistakenly contended that it remained 'undeveloped' (Cook 2011, pp. 25–26).[15] Marcuse wrote:

> History is also grounded in nature. And Marxist theory has the least justification to ignore the metabolism between the human being and nature, and to denounce the insistence on this natural soil of society as a regressive ideological conception. (1978, p. 16)

What has stood in the way of such a unified ecological perspective rooted in Marx's conception of metabolism, for much of Western Marxism, has been the influence of the idealist subject–object dialectic of Hegelian and left-Hegelian thought, that is, the rejection of a materialist dialectic, which necessarily remains more complex, open-ended, and universal. A kind of neo-Kantian dualism, as in much of philosophy, relegated the notion of a nature logically independent of society (i.e., external nature, universal nature, nature before human history) as a variety of the Kantian thing-in-itself, or nature-in-itself. The whole realm of nature as such thus becomes the exclusive preserve of natural science,

[15] Adorno when he wrote this did not have the benefit of some of Marx's then still unpublished manuscripts, such as the *Economic Manuscript of 1861–63*, where Marx discussed the universal metabolism of nature. Nor had Marxian political economists yet uncovered the relation of this concept to Marx's overall political-economic critique.

viewed as inherently positivistic, and outside the dialectic and the realm of the human sciences and human freedom.

Opposed to this orientation, and distinct from the main line of early critical theory, as represented by Horkheimer and Adorno, was Marcuse's more hopeful, dissenting Frankfurt School vision, rooted in Marx's *Economic and Philosophical Manuscripts.* For Marcuse, it was possible to conceive of an ecologically based liberation movement. 'What is happening', he wrote in *Counter-Revolution and Revolt*,

> is the discovery (or rather rediscovery) of nature as an ally in the struggle against the exploitative societies in which the violation of nature aggravates the violation of man. The discovering of the liberating forces of nature and their vital role in the construction of a free society becomes a new force in social change. (Marcuse 1972, pp. 59–60)

Dickens likewise drew inspiration from Marx's early writings, emphasizing in his 1992 book, *Society and Nature*: *Towards a Green Social Theory*, that a philosophy and sociology of ecological liberation could be erected on the basis of the work of the young Marx. Later in his 2004 book *Society and Nature*: *Changing Our Environment*, *Changing Ourselves*, Dickens (2004, p. 10) criticized as sheer 'pessimism' Horkheimer and Adorno's 'fearsome anti-Enlightenment critique'. Instead, Dickens argued for a more positive, ecological-revolutionary vision, rooted in Marx's theory of metabolic rift. 'Marx's early [naturalist-humanist] background', Dickens (2004, p. 80) observed,

> led him to undertake no less than an analysis of what would now be called 'environmental sustainability'. In particular, he developed the idea of a 'rift' in the metabolic relation between humanity and nature, one seen as an emergent feature of capitalist society…. The notion of an ecological rift, one separating humanity and nature and violating the principles of ecological sustainability, continues to be helpful for understanding today's social and environmental risks.

The goal ultimately, Dickens (2004, p. 144) added, must be a sustainable and egalitarian society able to 'mend the "metabolic rift" between

nature and society'. Like many other thinkers in second-stage ecosocialism, he believed that Marx's ecological and social critique offered a way forward in the radical struggle for a society of sustainable human development.

Not all on the left would agree with second-stage ecosocialists in this respect, nor with the need to focus on the question of the ecological rift/domination of nature engendered by capitalist society. According to Smith, writing in *The Socialist Register* in 2006, the Frankfurt School always conceived the 'domination of nature' as 'an inevitable condition of the human metabolism with nature'. Similarly, 'ecological essentialists recognize a parallel attempt at domination, but they see it not as inevitable but as a destructive social choice'. In sharp contrast, Smith's own 'production-of-nature thesis' rejected both of these views. 'The domination-of-nature thesis is a cul-de-sac…the only political alternatives are an anti-social (literally) politics of nature or else resignation to a kinder, gentler domination' (Smith 2006, pp. 24–25). For Smith,

> The externality and universality of nature…are not to be taken as ontological givens. The ideology of external-cum-universal nature harks back to a supposedly edenic, pre-human, or supra-human world, systematically erasing the very *processes* of externalization which would make such an ideology sensible. (2006, p. 23)

Instead, for Smith—who saw 'second nature' as having virtually obliterated 'first nature', along with its natural processes as such, the answer of humanity's growing ecological problem was simply to 'democratize that production of nature': No more, no less (2006, p. 34). In contradistinction to Marx's own argument, such 'democratization' is conceived independently of the necessary rational regulation of the metabolism between humanity and nature, or the question of sustainable human development (see Burkett 2005). By giving a one-sided emphasis to the human *production of nature*, and nature's 'real subsumption' under capitalism, Smith (2006, pp. 27–29) dispensed with much of the basis of critical analysis, excluding any theory of ecological crisis and the resulting necessity for socio-economic transformation—concerns that he dismissed as 'left apocalypticism' (Smith 2006, p. 247).

By inverting the Frankfurt School's critical domination of nature thesis, and turning that into an uncritical 'production of nature' notion (a kind of social monism), Smith therefore effectively denaturalizes social theory to an extreme, imposing ecological blinders. What is excluded is a more developed, dialectical perspective, pointing to the alienation of nature under capitalism. An emphasis on nature as produced by society (and all remaining nature constituting produced nature) was perhaps intellectually satisfying in its identical subject–object constructivism, or 'reflexivity'—such that natural processes were all now subsumed within a determinant social context and their ontological independence lost. But such an approach tended to underestimate what Marx called 'eternal' natural condition(s). This outlook thus gave way to a social mechanism subsuming nature, divorced from any kind of real materialism—which requires first of all the investigation of material conditions in their actual manifestations. It was thus devoid of any real, worldly relation to revolutionary praxis (or materialist, ecological science) in our time. Such analyses are inherently human exemptionalist in their orientation, seeing nature now primarily in technocratic terms. Recognizing this weakness in the production of nature thesis, Castree (2001, p. 205) characterized it as 'anthropomorphic' rather than 'anthropocentric' or 'technocratic'. But the defense is clearly a weak one.

In contrast, the enduring value of Marx's ecological materialism, incorporating such critical concepts as the universal metabolism of nature, the social metabolism, and the metabolic rift, is that it points in a coevolutionary (see Norgaard 1994) and corevolutionary (see Harvey 2010, pp. 228–231) direction—highlighting the need for a new order of social metabolic reproduction rooted in substantive equality (Mészáros 1995, pp. 170–177). Here social and natural necessity, natural science and social science, humanity and the earth *become one*—in a wider, more universal struggle, pointing to a single way forward for humanity and the earth. It is this higher synthesis of the various Marxian ecological and social critiques, building on the foundations of historical materialism—and transcending other less complete solutions, which are the products of earlier incomplete struggles, in periods less threatening than our own—that we are most in need of today.

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Part III

Emerging Issues

6

Metabolic Rift Theory and the Crisis of Our Foodways

Graham Sharp

Introduction

This chapter applies metabolic rift theory to a neglected area in food studies: Processed food in general and ultra-processed food in particular. It argues for a closer link between the study of production and the study of consumption. This raises questions of disciplinary belonging and boundaries. My analysis starts from the sociology of food but a similar argument might be made using other disciplines such as political science or history. The sociology of food, I argue, has focused on consumption, leaving production and distribution to other disciplines, notably human geography. Moreover, much research on food consumption is depoliticised, and refrains from challenging the underlying structures of contemporary food systems. This is despite the fact that producing, transporting, selling, and consuming food are an important contributor to anthropogenic climate change, responsible for as much as 30 % of all CO_2 emissions (Foresight 2011). Further, there is increasing evidence

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that ultra-processed foods are having impacts on human health, in particular obesity and all the health risks associated with being overweight.

For an account of processed food that takes seriously what is at stake in the politics of climate change and human health I suggest the use of 'metabolic rift theory', first developed by Marx in the nineteenth century and more recently popularised by J. B. Foster in the USA and in the UK by theorists such as Peter Dickens.

I begin by discussing how the sociology of food has tended to restrict analysis to consumption and avoided looking at the bigger picture. Next I look at the origins of the concept of metabolic rift and show how it can be a useful tool of analysis. I also argue that metabolic rift theory should be set alongside the Marxist concepts of the formal and real subsumption of labour and the subsumption of nature. This is followed by some recent theoretical developments in what I am calling metabolic rift theory. It will be argued that some of these developments have improved the theory and enabled a wider use of the theory. I follow some recent theorists in applying metabolic rift theory to various stages of capitalist development, as well as introducing the concept of a 'knowledge rift'. I then move on to look at how this theoretical approach can be applied to modern food systems, particularly processed and fast/junk food in the developed world, often referred to as a 'productionist' food system (Lang and Heasman 2004). Increasingly we are seeing similar developments in the developing regions of the world. Lastly, I look at some potential solutions or alternatives to the productionist approach.

My argument is that modern (ultra) processed foods are a manifestation of a metabolic rift between humans and nature and an example of the real subsumption of both labour and nature.

Problems with the Sociology of Food

This section reviews some of the literature on the sociology of food and argues that there are limitations as to what this area of sociology covers. In particular, it says little or nothing about environmental impacts. There are also shortcomings in other disciplines such as human geography or political science. Scholars working within disciplinary boundaries tend

not to look at the whole food process from production through to consumption and waste.

Reviewing the orientation of sociology of food textbooks to other disciplines' treatment of food issues, particularly human and cultural geography, reveals a research division of labour, particularly pronounced in the division of production and consumption. Mennell and co-authors Murcott and Van der Otterloo published the first book in the UK entitled *Sociology of Food* in 1992. The three authors straddled the anthropology/sociology dividing line, as Mennell was at the time Head of Department of Anthropology and Sociology at Monash University in Australia and Murcott was Senior Lecturer in Medical Anthropology at the London School of Hygiene and Tropical Medicine. They say that they are 'drawing from interdisciplinary sources', and go through the sociological classics to say what each said about food. So, for example, Friedrich Engels, who commented on the poor diets of the urban poor, is compared with Emile Durkheim and his concerns with food as symbolism for particular forms of lineage among Aboriginal peoples in Australia. Mennell et al. identified a lack of specific focus on 'foodways' (although this has been studied since the mid-1940s). 'Food and food habits, when mentioned at all were generally recorded as indicators of something else closer to the focus of sociological interest' (p. 1). Mennell et al.'s book tries to set out a theoretical framework for a sociology of food, identifying three approaches: functionalism, structuralism, and what they call 'developmental'. Sidney W. Mintz is placed in the last category.

Beardsworth and Kiel's (1996) book was an attempt at a strictly sociological overview of the whole food studies field. Germov and Williams offered a more international overview with their edited collection (1999) which is now in its third edition (2009). The contributors to the book were from the UK, USA, and Australia, with some nutritionists but mainly sociologists. Germov and Williams make explicit their desire to reach a diverse readership beyond sociology and to engage with 'wider issues of consumption and social regulation'. But, by the end of the 1990s the sociology of food was still very much within a cultural studies and social anthropology framework, with the emphasis on consumption patterns. Even within this framework the changing nature of consumption in Western countries was pretty much invisible. The mapping of

differences in foodways was still trying to catch up with the past, and the late twentieth-century globalisation of food distribution was seen as outside the field, something for political economy to deal with. Mintz's (1986) historical study of sugar showed how production and consumption were linked, but his insights were not taken through into present-day developments.

By contrast, in the last 15–20 years or so we have seen a rise of interest in food and agriculture among geographers (see, for example, Johnston and Baumann 2009; Sage 2003; Feagan 2007; Sage 2012). These scholars have taken up concerns not only in consumption but also in production. There has been a concentration of articles in international geographical journals such as *Antipode*, *Progress in Human Geography,* and *Journal of Rural Studies*. Geography scholars, when writing about food, tend to be more radical in their orientation, linking production and consumption, and more prepared to extend their analysis to a critique of capitalism and the political economy of food systems. I hope to show that metabolic rift theory can help establish a bridge between the theorisation of food production and the theorisation of food consumption. The theory originates from observations made by Karl Marx in the nineteenth century.

Metabolic Rift Theory

Marx argued that the town–country split, consequent on rapid urbanisation, was causing a crisis of agricultural soil fertility due to a lack of human and animal natural fertiliser. In such crises of the development of capitalist social and economic relations there is a breakdown or rift in the pre-existing relationship between humans and nature. Metabolic rift theory, deepened and widened in ways that I will suggest here, can help us understand the problems associated with our current food systems, the nature–society dialectic and its implications for the environment

Marx first identified a 'rift' in our metabolic relation with non-human nature in the mid-nineteenth century. He used the German term 'Stoffwechsel', literally 'material exchange', the normal term for the scientific concept of metabolism (Marx 1968). Translators of Marx's work

have had difficulty with the term and the Aveling/Moore translation (1970) of *Capital* omits it entirely. Thus an important conceptual breakthrough was obscured for English-speaking readers for nearly a century. The later Ben Fowkes translation (1976) uses 'metabolism', with the original 'stoffwechsel' in brackets. The concept can be seen as a development of Marx's earlier concern with alienation under capitalism, theorised in his *Economic and Philosophical Manuscripts* of 1844.

Marx, however, did not use the exact term 'metabolic rift' directly in his writings but, rather, alluded to it in various places in *Capital*, the *Grundrisse* (1973) and elsewhere. So, for example, in Volume 3 of *Capital* (1972) Marx talks about how humans throughout history, under all modes of production, have to have interaction with the rest of nature in order to survive.

> Freedom in this field can only consist in socialized man, the associated producers, rationally regulating their interchange with Nature, bringing it under their common control, instead of being ruled by it as by the blind forces of Nature; and achieving this with the least expenditure of energy and under conditions most favourable to, and worthy of, their human nature. But it nonetheless still remains a realm of necessity. (Marx 1972, p. 820)

The American sociologist J.B. Foster developed Marx's ideas in a seminal article in the *American Journal of Sociology* in 1999, and further elaborated his thesis in his book *Marx's Ecology* (2000). These publications set off a chain of interest both supportive and critical (see, for example, the collection of contributions in a special edition of the journal *Capitalism Nature Socialism*, introduced by James O'Connor (2001).

Nineteenth-Century Context

The starting point for Marx in trying to understand the relationship between humans and nature was the split he observed developing between the growing towns and cities and the countryside. This split, or division, manifested itself in a number of ways.

The traditional way in which agricultural soil was fertilised to maintain its health was being eroded. For thousands of years human and animal excrement had been used as a natural fertiliser but because of urbanisation this was becoming less viable and more difficult to realise. In the case of London the historian Stephen Halliday notes that 'From the early nineteenth century large quantities of sewage had been conveyed up the Grand Union Canal to Hertfordshire for this purpose … as early as 1842 Edwin Chadwick had commented on the increasing difficulty of finding a market for the contents of London's cesspools' (Halliday 2009, p. 109).

As London expanded, the logistics of transportation became more difficult. Ironically, the development and spread of the water closet in domestic housing meant that human excrement was being flushed down sewage systems into river courses such as the Thames in London. This caused multiple public health problems resulting in widespread outbreaks of typhoid in the 1850s. It was in the summer of 1858 that the stench (known as the 'Big Stink') from the Thames was so bad that it affected proceedings in the Houses of Parliament and led to new legislation enabling the financing of new intercepting, storm relief, and outfall sewers to overcome these problems.

At the same time, alternatives to human and animal manures were being developed. Imported guano (excrement of seabirds) was found to contain the necessary nitrogen, phosphate, and potassium to substitute human and animal manure. Critics of guano importation described the act as 'guano imperialism' as it was extracted mainly from islands off the coast of Peru and consequently denied the indigenous Peruvians a source of manure they had been using for several thousand years. However, an alternative view is that the Peruvian government was keen to expand exports of guano, as it increased their revenues at a time when their economy was faltering (Mathew 1970). Guano gained favour in England for a period because its costs of transport and use were cheaper than the costs of transporting human sewage (Halliday 2009).

Meanwhile, scientific and technological progress was such that non-biological inputs into crop growing began to emerge. We see the emergence of some notable scientists and entrepreneurs who saw the need to develop systems that bypassed traditional and biological techniques of maintaining soil fertility.

In 1842, Sir John Bennet Lawes from his Rothamsted experimental station in Harpenden, Hertfordshire patented a chemical fertiliser and in the following year began production in his new factory in Deptford Creek in South East London. The significance was that for the first time it was possible to maintain soil productivity with a reliable synthetic source of nutrients.

Another important figure at this time was the German scientist Justus von Liebig, the founder of agricultural chemistry, whose research influenced Marx's thinking on the relationship between humans and the soil. In 1837, Liebig was invited by the British Association for the Advancement of Science to write a report on the relationship between chemistry and agriculture. This was followed in 1840 by the publication of his *Organic Chemistry in Its Application to Agriculture and Physiology*, which was an analysis of the part that nitrogen, phosphorous, and potassium played in soil fertility and the growth of plants (Foster 2000, p. 150). In this publication's seventh edition in 1862, Liebig declared that British farming methods represented a 'robbery system' in the way that other countries, both in Europe and further afield, were robbed of their natural fertilisers such as bones of the dead and guano to satisfy British soil fertility (Foster 2009, p. 145).

The crisis of soil fertility was not fully overcome until the introduction of fossil-fuel-based synthetic fertilisers and then by industrialised forms of agricultural practices such as the separation of crop farming and animal husbandry. Essentially by creating a division of labour between animal rearing and crop growing it was believed that productivity could be raised. The development of increasingly long chains in food production has caused a metabolic rift to open up across the whole of our foodways.

Well beyond its original context of the nineteenth-century soil fertility crisis, the metabolic rift is a useful theoretical tool in examining humans' relation to the rest of nature and in the case of developments in food production and consumption can shed light on many of the contemporary problems facing societies, particularly in relation to human health and the environment. Metabolic rift theory has the potential to go beyond disciplinary divisions of labour such as the priority given by sociology to consumption compared to geography's concerns with production.

Metabolic Rift and the Subsumption of Labour

There is another theoretical apparatus that can be used alongside metabolic rift analysis, particularly in relation to the production of food. This is Marx's concepts of the formal and real subsumption of labour. Again, there have been problems in the transmission of the ideas. Marx's discussion on the subsumption of labour was omitted from translations of Volume 1 of *Capital* and did not appear in English until 1976 when Penguin published a new edition which included the so-called missing chapter added as an appendix with a short introduction by Ernest Mandel (Marx 1976/1990). In this 'missing chapter' Marx made a distinction between different stages of capitalist development.

The formal subsumption of labour was when labour formally entered into waged labour where workers sold their labour power to the capitalist. Marx gave a number of examples to illustrate his point. So, a weaver becomes a wage labourer, that is, becomes proletarianised, but still conducts her labour process as before in terms of the technology employed. It is only when the capitalist changes or alters the technology in some way and increases productivity that a real subsumption begins to take hold. This would often entail the worker working on the employer's premises such as a factory and alongside other similar workers, becoming a socialised worker. In other words, technological advances begin to alter the labour process and create greater surplus value. This movement from the formal to the real subsumption of labour is at the core of capital accumulation and the constant competitive drive towards technological developments of the productive forces.

Mandel, in his short introduction to the appendix in the 1976 edition, quotes Marx: 'the constant expansion of the capitalist market [is] absolutely necessary for the survival of the capitalist mode of production'. And if we look at food we find that, in economic terms, it is relatively inelastic: there is a natural limit to how much food a person can eat, unlike many other forms of consumption such as apparel. The relatively inelastic nature of food products sets a challenge to food producers and indeed supermarkets. How do they expand demand for such an inelastic product? It is not so much that the strategy of food producers and dis-

tributors is to encourage consumers to eat more (although some do with health consequences), rather it is a constant attempt to increase market share, most clearly seen in price wars between competing supermarkets. In the incessant competition at least two strategies are employed: 'adding value', and a constant remarketing and reinventing of products. I will return to these later in the chapter.

Challenges to the Metabolic Rift Thesis

As was mentioned above, Foster's publications (1999, 2000) encountered a mix of reactions. One scholar, Jason Moore, while welcoming Foster's analysis, was concerned about what he had left out, or more precisely what he had underplayed. Moore (2000) argues that the transition from feudalism to capitalism, beginning approximately in the sixteenth century and first realised in English agriculture, was the beginning of a series of metabolic rifts. This is in contrast to both Marx and Foster who both focused their attention on nineteenth-century agriculture and the town–country split. To be fair to Foster he does highlight the fact that Marx was not only concerned with applying metabolic rift analysis to the soil nutrient cycle but was also concerned with deforestation, desertification, localised climate change, commodification of species (when farmers experiment with different breeding techniques), contamination, and so on (Foster 2009, p. 148).

Although Moore is not specific on the technicalities, there was indeed a change in the agricultural labour process in the sixteenth century. Peasants becoming wage labourers lost their control over labour processes based on tacit knowledge acquired over many generations by the oral tradition. This can be seen as an example of Marx's concept of the formal and real subsumption of labour (and nature—see below). In the early stages of the transition from feudalism to capitalism peasants' tacit knowledge and skills come into conflict with a desire by emerging capitalist farmers to introduce new methods of innovation in order to increase productivity.

So, an important feature of Moore's argument relates to periodisation. He argues that metabolic rift analysis can be applied to various stages of capitalist development. Foster does recognise this but does not elabo-

rate other than giving some examples such as the separation of livestock from arable farming from about the mid-twentieth century (Foster and Magdoff 2000).

Although broadly sympathetic to Moore's desire to see the metabolic rift applied at a number of stages of capitalist development, McMichael and Schneider (2010, p. 461) state that '[the metabolic rift] refers to a double separation: of agriculture from its biological foundations, and of humans from nature'. Their position goes to the core argument of this chapter. Unfortunately they do not develop their argument about this decoupling of agriculture from its biological foundations and how it is manifested in the processed food sector that now dominates food systems. An example is the preoccupation with production alone rather than production and consumption together. They 'argue that farming practices must figure centrally' (p. 462) but do not consider how they impact on consumption or on distribution, although in most developed countries supermarkets are principal drivers of consumption and influencers of what food is produced and how. McMichael and Schneider do, however, make the important point that little has been said about the role of knowledge (or lack of it). Although they do not develop this theme they are hinting at a 'knowledge rift', an issue we will discuss below.

The same authors (McMichael and Schneider 2010) develop their broader critique further. They examine three interrelated aspects of the metabolic rift.

First, Marx argued that soil fertility was a mirror of social relations at the time, but he did not consider the geographical variations of soil quality from one region to another and the different capacities of such soil variations.

Second is that Marx did not examine actual agricultural practices sufficiently to understand both the complexity and geographical variation in such practices and techniques. There is a hint here that Marx perhaps spent too much time analysing farming from a distance rather than actually visiting the countryside to see for himself what was happening.

Third is the development of a 'knowledge rift'. It is this knowledge rift that can be seen to have occurred in the sixteenth century during enclosures and the proletarianisation of agricultural workers. As is well known in economic history, from about the mid-eighteenth century

through to the nineteenth century there was a mass exodus of workers from the countryside into the towns and cities to take up extractive and manufacturing employment in mines, mills, and factories. This coincided with a significant rise in the population. Schneider and McMichael (p. 477) note that many of these former agricultural workers brought with them 'culturally, historically and geographically specific knowledges about farming practices and local ecosystems' which were of no use in their new surroundings and were lost and unable to be reproduced. Those that remained in agriculture found that their local knowledge and understanding of their local ecosystem was being sidestepped and undermined by their new capitalist farmer employers who sought newer innovations and, increasingly, machinery; a clear example of the real subsumption of labour (and nature). Such innovations created a more complex division of labour as it did in urban manufacturing. The accompanying divisions of labour, the authors argue, create 'a rift in the production and reproduction of embodied knowledge of local ecosystems and potentially sustainable agricultural practices' (p. 477).

It is worth noting here that some historians of the eighteenth century have observed that in rural areas much multi-skilling took place. Horn (1980) highlights a census report for Cardington in Bedfordshire in 1782 which shows that half the population were agricultural workers while a quarter were made up of a variety of craftworkers of one kind or another (Horn 1980, p. 21). Horn uses the example of the blacksmith who not only shoed horses but acted as a vet and made and repaired various tools and implements for both domestic and agricultural use. She goes on to give a further example of someone listed in the local trade directory as 'a carpenter, grocer, tailor, "Staffordshire dealer" and house agent' (Horn 1980, p. 22). The author also notes that this system was frowned upon by Adam Smith in his *Wealth of Nations* (1982). Smith said it was inefficient compared to specialisation and division of labour, which are exactly what we see occurring in the process of industrialisation.

What both Moore and Schneider and McMichael seem to be arguing is not that the concept of metabolic rift is in any way flawed, but rather that Marx was limited by the level of scientific knowledge available in the mid-nineteenth century, and that Foster has tended to underplay the

versatility of the concept for analysing other aspects of the development of capitalism.

Moore also argues that feudalism, at least in Britain, had reached its limits of productivity and self-renewal (Moore 2002). Moore characterises capital as a closed system rather than a flow system. What he means by this is that accumulation can only take place (after a time) where there is external nutrient supply, which it is unable to produce (and reproduce) itself. Therefore capital relies more and more on a geographical expansionist logic dependent upon finding new territories (we could think of colonialism) and labour (including the role of slavery) are dependent on. As Moore states quoting Rosa Luxemburg:

> The accumulation of capital is a kind of metabolism between capitalist economy and those pre-capitalist methods of production without which it cannot go on and which, in this light, it corrodes and assimilates. (Luxemburg 1970, p. 416, quoted in Moore 2000, p. 138)

Moore (2011) argues, at length, that most explanations of the metabolic rift fall into a 'Cartesian binary'. He singles out J.B. Foster and his followers, who he refers to as the 'Oregon School' of thought. According to him these thinkers treat capital accumulation and nature as two independent components of ecological crises. For Moore capitalism *is* ecological crisis, rather than capitalism creating that crisis. Therefore the two features or component parts are one and the same thing. As he states: 'Historical capitalism does not create ecological crises so much as it has been created through them' (p. 11). Moore has elaborated on this point more recently (Moore 2014). He argues that most mainstream environmental thought centres its argument on a notion of the 'anthropocene'; that environmental damage and problems started with the Industrial Revolution and the use of coal for steam power. Taking issue with this, Moore rightly argues that the capitalist mode of production started in sixteenth-century agriculture. He uses the term 'The Capitalocene' to describe this period of world history, and states that 'capitalism is understood as a world-ecology, joining the accumulation of capital, the pursuit of power and the co-production of nature in dialectical unity'. Further, he argues that not only does human activity create biospheric changes

(e.g. climate change) but also nature has an effect on human relations as well.

What might at first sight be seen as a different argument is by made Carolan (2012), who discusses Marx's concept of formal and real subsumption of labour. Drawing on Boyd et al. (2001) he argues:

> Doing this [making the distinction between formal and real subsumption] highlights the distinct ways that biological systems are industrialised and often made to operate as productive forces in and of themselves. Formal and real subsumption allow for analytical distinctions to be made between biologically based (e.g. cultivation) and nonbiologically based (e.g. extractive) industries. Under real subsumption, capital circulates through nature (albeit unevenly) as opposed to around it, as in the case of formal subsumption. This move allows for a more forceful argument to be made about the social agency of capital itself, as having the power to literally transform nature into its own image. (Carolan 2012, p. 34)

Boyd et al. (2001) extend Marx's concept from labour to nature, and speak of formal and real subsumption *of nature*. They draw this analogy from Marxist labour theory. With the formal subsumption of nature capital has to work round the constraints of nature and its limits, such as the time taken to grow a particular crop or the perishability of certain food products such as fish. When capital works through nature, that is, the real subsumption of nature, it is 'improving nature directly rather than simply making labour more productive' (Boyd et al., 2001, p. 565). A clear example they use is the overcoming of the constraints of traditional forestry, dependent on long periods of time for trees to reach their maturity. Under real subsumption of nature we see interventions by capital through such methods of genetic manipulation that can increase overall output. This 'highlights the potential for harnessing biological growth as a source of increased productivity, with capital circulating through rather than around nature' (p. 566). A further example is given in the aquaculture (farmed fish) industry (p. 567).

Neil Smith (2006) develops this theme further, describing nature as an accumulation strategy. He argues that Marx saw the transition from formal to real subsumption of labour in both historical and analytical

terms. So, formal subsumption is characterised by capital accumulation constantly trying to expand the extraction of nature for the requirements of production. Although Smith does not comment on this, colonialism is a good example of the quest for more and more aspects of nature to plunder. The transformation to real subsumption of nature is through a 'two sided' change. As in Moore's account, capital circulates through nature although often in an unintended way, while real subsumption intensifies this process to become an 'accumulation strategy' in itself. In this process, Smith argues, 'The production of nature becomes capitalized "all the way down".' At the same time, 'the reverse process, namely the circulation of nature through capital, is similarly transformed from an incidental to a strategic process' (p. 29). In other words, when it is manipulated into the circuits of capital nature becomes a force of production.

Processed Food

The question of metabolic rift in foodways emerges clearly in relation to 'processed' food. In line with both Moore (2000, 2002, 2011) and McMichael and Schneider (2010) we can apply metabolic rift theory to the development and changes to how such food is produced. However, the definition of 'processed' is rather elusive and contested. A useful definition of processed food is as follows:

> any fully or partially prepared foods in which significant preparation time, culinary skills or energy inputs have been transferred from the home kitchen to the food processor and distributor', they include ready-meals, fast food, meals from restaurants or takeaways. (Traub and Odland 1979, cited in Celnik et al. 2012).

This is worth unpacking further. The consumption of processed foods, greatly increased over the last 40–50 years (Monteiro et al. 2013), is popularly referred to as ready meals, fast food, convenience food, or at worst junk food. However, we need to be clear about definitions of processing. Many processes have been around for centuries or millennia. For example, bread is processed from flour, derived from grain, and worked

together with water. Butter is derived from milk, which comes from cows. Cream from cows' milk is churned to produce butter. What is new is that consumers are often not aware of the processes that their food has undergone. The UK has weak labelling laws for packaged foods and what labelling does exist is often difficult to understand as it is explained often in specialist terminology; another example of a 'knowledge rift' discussed earlier in this chapter. It is this kind of processed food that I want to focus on.

For the purpose of clarity I am proposing three broad stages in which humans have produced processed food:

1. The earliest processes, which continue today, emerge in hunting and gathering where fire was first used for cooking. From the Neolithic period when agriculture developed there were more complex processes of food production from basic ingredients, such as beer, bread, and cheeses. These together can be called 'basic' processing.
2. Jack Goody (2013 [1982]) explains how from the late eighteenth century there was a proliferation of processing techniques, and identifies a number of drivers of that development. Colonial sea voyages required the storage and transportation of foodstuffs over several months on journeys. Urbanisation led to rapid population rise by the end of the eighteenth century. Scientific and technological developments gave rise to bottling, canning, and pasteurisation, while the use of ice and later refrigeration technology was also developing. It should be noted, however, that the modern processes could be dated from the spread of sugar growing in the fifteenth century onwards.

   From the mid-/late eighteenth century we see a shift from muscle, solar, and water power to fossil power, what some have described as 'carbon capitalism' (Huber 2008) or for Wrigley (1988) a 'mineral fuel economy as opposed to the earlier 'organic economy'. Steam power was used in agriculture from the late eighteenth century with low-pressure static machines used in barns for threshing. In the early part of the nineteenth century, Richard Trevithick developed a portable high-pressure machine that could be used out in the fields to increase productivity (Brown 2008).

It was not until the early to mid-twentieth century that petrol and then diesel machines were introduced increasing productivity further (Brown 2008). From the mid-twentieth century, particularly following the Second World War, we see a separation of crop farming and animal husbandry due to the introduction of nitrogen fertiliser (Foster and Magdoff 2000; Howkins 2003). With greater globalisation within the food production sector there is an increase in the distance food travels (food miles) (Mintz 2013). With increasing innovation, creating a more 'productivist' method of food production increases external energy inputs such as oil and gas. This happens directly on farms and through the manufacture of inputs such as fertilisers (Lang and Heasman 2004). These significant developments have paved the way to an increase in 'processed foods', which tends to lead to greater valorisation and hence greater profits.

3. Hyper-industrial—From the second half of the twentieth century we see the intensification of processed foods, which rely increasingly on inputs from non-farm origins. Lang and Heasman (2004) refer to this development as the 'life sciences integrated' paradigm. Social and natural scientific papers may call these foods 'ultra-processed'. It is at this stage that we can see the real subsumption of nature taking hold as discussed above.

What some authors describe as 'ultra processed food products' (Stuckler and Nestlé 2012; Moodie et al. 2013; Monteiro et al. 2013) usually contain higher amounts of fat, sugar, and salt. Since the early 1980s, food science has enabled the production of new products from cheap ingredients together with additives, and this strategy has allowed multinational food companies to produce uniform, ready to consume products (Monteiro et al. 2013). The profitability for the food producers comes from standardisation of products, reduced costs of ingredients, and flexibility in transportation together with the products' longer shelf life compared with fresh foods. Ready meals are a good example of the increase in ultra-processed foods. For the year February 2014 to February 2015 the total value of the UK chilled prepared food market was £12,280 million. And this has been rising steadily for the last ten years or so (Chilled Food Association 2015).

In an article in the *Lancet* recently, Moodie et al. (2013) spelt out clearly what contemporary processed foods consist of: 'processed substances extracted or refined from whole foods, e.g. oils, hydrogenated oils and fats, flours and starches, variants of sugar and cheap parts or remnants of animal food, with little or no whole foods' (Moodie et al. 2013, p. 671). The examples given include burgers, frozen pizza and pasta dishes, crisps, biscuits, confectionary, cereal bars, and carbonated and other sugared drinks. The article situates itself in the debates about the rise in non-communicable diseases, particularly obesity and diabetes between high-income countries on the one hand and low- to middle-income countries. Ultra-processed foods 'are more energy-dense and contain more harmful fats, and more sugars and salt, and less fibre, than unprocessed or minimally processed foods, as such' (Monteiro et al. 2013).[1] Moodie et al. note that the increase in highly processed foods as well as alcohol and tobacco consumption is rising faster in low-and middle-income countries than it did historically in what are now high-income countries. They lay the blame on multinational food companies and on nation states' reluctance to regulate.

For sociologist David Stuckler and nutritionist Marion Nestlé (2012) what they call 'Big Food' is the problem. They link a rise in transnational food and drink companies to the international obesity epidemic, claiming that three quarters of world food sales involve processed foods, and

[1] To further add to this development, even fruit and vegetables, which on the surface appear to be fresh and 'natural', have been found to be declining in nutrient levels over the last 50 or so years. Mayer (1997) reports on research conducted by the UK government over the period between the 1930s and 1980s on the mineral content of 20 fruits and 20 vegetables grown in that period. The results suggested that there was, in all cases, a reduction in mineral content of these fruits and vegetables. Mayer advances three possible reasons. First, there has been an increase in out of season and imported fruit and vegetables accompanied by changes in storage and ripening techniques. Second, different varieties are now grown. There has been an increase in plant breeding for high yields and this has often involved a decrease in varieties. Multinational seed companies are only interested in marketing seeds that they deem profitable and control the market through built-in obsolescence and patenting. And third, changes to agricultural practices which have seen a big increase in synthetic fertilisers, and heavier farm machinery resulting in ploughing and compacting of the soil which in turn affects the mineral content of the soil. These represent processes that try and extract more from what nature has to offer by trying to get round natural cycles to increase capital accumulation. Alongside this development, Lawrence (2013) brings to our attention the fact that the UK Food Standards Authority in 2003 advised that certain frozen vegetables such as broccoli, peas, cauliflower, and carrots contain more nutrients than most fresh equivalents (Lawrence 2013, p. 148).

that the largest food manufacturers dominate a third of the global market for processed foods, describing this as an oligopoly. As they state: 'Big Food attains profit by expanding markets to reach more people, increasing people's sense of hunger so that they buy more food, and increasing profit margins through encouraging consumption of products with higher price/cost surpluses'(Stuckler and Nestlé 2012).

Ultra-Processed Food as Real Subsumption

Real subsumption tends to create relative surplus value rather than absolute surplus value as in formal subsumption. This means that profits are not fixed but relate to a combination of market mechanisms and technological innovation. This is what is happening in the case of modern processed foods. Natural ingredients are mixed with or are substituted by synthetic ingredients, which have the effect of lowering costs of production, transportation, and increase storage times. This, to a certain extent overcomes the problem of food being relatively inelastic. Beyond a certain point people cannot eat more but what they are eating is becoming cheaper to produce and can be stored for longer thus reducing costs to producers and distributors and potentially increasing profits.

Appropriationism and substitutionism are two terms used by social theorists to describe how technological inroads are made into nature. Appropriationism is explained by Lawrence and Grice (p. 82) as inputs that have been manufactured or derived by 'off-farm' industries such as synthetic fertilisers and seeds known as f1 hybrids that have a built-in obsolescence. It can also refer to the industrialisation of production processes (Dickens 1996, p. 112). Substitutionism occurs when some of the ingredients of a food product are made up of chemically based substances. As Dickens says, 'What is produced on farms becomes at this stage just one input amongst many to the production of food. It must compete with, for example, other chemical inputs which have had nothing whatsoever to do with conventional farming' (Dickens 2004, p. 102). They often operate alongside each other in food manufacturing, particularly in relation to processed foods. This indicates that a move has been made from formal to real subsumption of labour and nature. Carolan (2012),

Dickens (2004), and Lawrence and Grice (2009), among others, give examples of substitution and appropriation in food production. Some of the most clear-cut cases include the following.

The first is bringing industrial machinery to the field where much of the processing can take place (Carolan 2012). Tractors and combine machines are also operated using Global Positioning System through satellite technology to guide their paths in the field. This is called 'precision agriculture' which in many cases leads to 'prescriptive planting systems' whereby the optimal inputs such as fertilisers can be measured as well as ground and soil fertility can be established (The Economist 2014). This is a controversial technology particularly among smaller farmers. There is fear that data obtained can be used by competitors to steal market share of particular crops. It certainly takes away the kind of control farmers have traditionally had using their (often tacit) knowledge built up over a period of time (see Addicott, this volume, for an extended discussion of these issues).

Similarly, large factory boats in offshore fishing not only catch fish but also process (i.e. gutting and cleaning) them on board. We have seen a big increase in aquaculture whereby fish are 'farmed' in large netted compounds.

Genetic modification to animals is now commonplace such as feeding of growth hormones to livestock (also found in aquaculture) to speed up their growth and control. Peter Dickens (2004) comments that:

> A single cow, for example, can be made to produce twin calves five times a year. Pigs are being genetically modified in ways which enable them to reach the size of an adult pig at an earlier stage. This would make them more tender for eating. Similar experiments are underway for other farm species such as chicken, as are attempts to produce fish that will achieve five times their normal size. The overall objective is to alter not only speed of growth but also levels of weight and fat. These all make the commodities more marketable. (Dickens 2004, p. 112)

In recent years, seed production in both North America and Europe has developed into a 'substitution process' whereby seeds are now 'manufactured' away from the farm and are designed to be used only once.

These seeds have legally enforced patents. One outcome of this is that available seeds have been restricted to those deemed by, usually, multinational companies, as commercially viable. Such seeds are often described as 'terminator technology' (Kloppenburg 1988, 2010).

The replacement of cane sugar with high fructose corn syrup has become popular with food manufacturers and processors in North America. Food technologists have found that high fructose corn syrup is not only a much cheaper form of sweetener but also amenable to processing techniques in a way that fructose is not. Refined cane sugar is itself an industrial product. Mintz (1986) brings to our attention that

> processed sugars, such as sucrose, dextrose, and fructose, which are manufactured and refined technochemically, must be distinguished from sugars as they occur in nature. (Mintz 1986, p. 17)

Lastly, the introduction of margarine to replace butter (Boyd et al. 2001), promoted as either a healthy alternative or more convenient as it can be spread straight from the fridge, is a clear example of substitutionalism.

Many processed or convenience food products such as ready meals contain a degree of substitution in order to maintain taste, colour, texture, shelf life, and apparent freshness. Lawrence and Grice (2009) quote Friedman (1991, p. 74) on this matter:

> [What food processors want] is not sugar, but sweeteners, not flour or cornstarch, but thickeners, not palm oil or butter, but fats; not beef or cod, but proteins. Interchangeable inputs, natural or chemically synthesized, augment control and reduce costs better than older mercantile strategies for diversifying sources of supply.

Lawrence and Grice (2009) argue that such substitutionism enables more corporate control over food production and allows cheaper ingredients to be used. 'Firms can use "sugar" made from the cornstarch, for example, rather than that derived from cane or beet—particularly if it is cheaper, more readily available and has other positive characteristics, such as being easy to manufacture' (p. 83). It is through developments in food

science that we see the penetration of new scientifically based production systems through natural ingredients creating a real subsumption of nature to capital and opening up a greater metabolic rift in our foodways between consumers and natural food.

They give many other examples of appropriated inputs derived from beyond the farm gate. Increasingly what is produced on the farm becomes material for use in later stages of food processing and manufacturing. This is also reflected in the proportion of profits the farmer can expect to receive as a proportion of total profits. Farmers' profits from what they produce have been declining in the last 50 or so years, being diverted to processors, manufacturers, and supermarkets (Lang and Heasman 2004).

Even organic farming has not escaped commodification into mainstream food systems. Carolan (2012) explains how in the USA the organic sector eventually developed legal standards that enabled agribusiness to engage in 'input substitution'. Just as in conventional agriculture 'external inputs' were permitted thus making large-scale organic produce, which captures a premium price, little different from conventional industrialised food production. In the UK, the majority of organic vegetables are imported from other countries. So, one of the advantages to the environment is lost in greater food miles (Lang and Heasman 2004).

Changing Lifestyles, Changing Food Consumption—With the Help of the Supermarket

It is difficult to separate developments in food technology and industrialised food systems from sociological changes in life styles and working patterns of most people. The demographic changes of modern societies such as the UK have impacted on the kinds of food that is consumed. In most wealthier countries, developments such as big increases in women's participation in the labour market, more flexible working patterns such as part time, shift work, and changes to the traditional family form have had an impact on food consumption patterns. There has been an increase in single-person households, particularly among the elderly (Buckley et al. 2007). More people buy and consume food outside of their homes than ever before (ONS Family Food 2013). Leisure patterns have changed

with much greater use of computers and more mobile communication and entertainment technologies competing for time that otherwise may be used for food preparation and cooking. Alongside these developments have been big changes in technology connected with food. The introduction of the household fridge and then freezer from the 1950s allowed more flexible food storage impacting on shopping frequency. The widespread ownership of the microwave oven has also impacted on produce range and consumption patterns of consumers. All this has taken place in the context of the rise in dominance of the supermarket as the main outlet for food retailing, giving them a lot of influence and power, particularly as the 'big four' dominate about 75 %–80 % of all food sales in the UK (Simms 2007).

Supermarkets calculate their profits by shelf space. It can be calculated whether they have more takings from the dry groceries aisles, the chilled and ready meals aisles, or the fruit and vegetables aisles. The changes cannot simply be understood in terms of an increase in processing. By 1900, a major proportion of the British diet was supplied by processing of raw materials sourced from the corners of the Empire: white bread from Canadian wheat, margarine from African palm oil, tea from India, sugar from the Caribbean, and so on.

Food manufacturers prefer processed foods because there are more profits to be made from them. All the large food manufacturers have from their origins been manufacturers of processed foods. The food chain has been getting longer and more complex. The division of labour in the production process has become more complex with a differentiation between food manufacturers which are in turn supplied with materials from food processors which are usually far removed from the activities of the primary food producers, namely farmers and growers (Blythman 2015, p. 28). The concept of value-added is key here. Each process that the food undergoes is an adding of value (valorisation) usually making the product cheaper to the manufacturer and increasing profits. Viewed in this light we can see a metabolic rift already well established for the last 50–60 years or so.

Processed Food and the Knowledge Rift

As what takes place on the farm is increasingly being seen as basic raw materials for subsequent processing by food 'manufacturers' (Rogaly 2006; Lang and Heasman 2004; Dickens 2004), the raw materials (crops and livestock) are becoming obscured or hidden in the final product as a result of various stages of processing. Food manufacture has reached a point where it is difficult for consumers to understand what is contained in typical food products. This has implications, in social theory, for the link-up between production and consumption discussed at the beginning of this chapter, typically analysed in their separate realms by geographers concerned with production and sociologists preoccupied by consumption.

An interesting example to illustrate how consumers are shielded from the provenance of their food is the incident that took place at an independent butcher's shop in early 2014 in the town of Sudbury in Suffolk, England (Smith 2014). The butcher was displaying whole or partial parts of animal carcasses in his window, including pig's heads. This led to complaints in the local paper. One of the letters read:

> I, too, have been disgusted at the needless display of multiple mutilated carcasses on display,' wrote Ben Mowles from Great Cornard, who claimed he had been forced to suspend trips with his 12-year-old daughter to the nearby sweet shop because he would 'rather not look at bloody severed pigs' heads when buying sweets.

Most meat in Britain is bought in supermarkets which butcher and package the product off site often making it difficult for customers to understand which part of the animal's body the portion of meat came from. This is another example of the separation or rift that consumers experience in the modern food system. Such lack of knowledge and understanding of how our food is made and often what ingredients it contains comes into sharp relief when a new food scare emerges such as the recent horse meat scandal (Lawrence 2013).

Raj Patel (2008) discusses the origins of the supermarket in the USA in the early twentieth century and how the layout of the shop was so impor-

tant in getting customers to buy more than they originally intended. More importantly, a rift began to develop between the consumer and where the food came from and how it was produced.

> Through a studied manipulation of space, geography and employee communication rights, the only possible point of contact between the person eating the food and the person who grew it became the label on the tin. From this point onwards, the people selling the goods were expected to know precisely nothing about its origins. And, if they knew anything, were prohibited from saying so. (Patel 2008, p. 222)

While most consumers are not entirely ignorant about what food they are buying, where it came from and how it was produced, the increase in highly processed food products has exacerbated the metabolic rift in terms of humans' relationship with and understanding of food.[2]

Increasing numbers of people find themselves consuming convenience foods because of time pressures caused by the restructuring of capitalism (Freund 2010). Long working hours for some, shift and flexible working, and, apparently more leisure activities such as TV viewing and computer games and internet all put pressure on the time spent preparing and eating. This is coupled with a decline in cooking skills. The food producers and supermarkets are very aware of these societal trends and base their sales and marketing strategy around such trends. Processed foods such as ready meals are promoted as a quick way to consume food for those who lead busy lives or lack the necessary cooking skills to prepare food from scratch.

Here is an example from a trade body promoting ready meals, which accepts as given all the constraints of modern living that consumers experience and claiming to provide solutions to those constraints.

[2] Investigative journalist Joanna Blythman (2015) has recently highlighted the way food manufacturers have been gradually introducing the concept of 'clean label'. Essentially this entails avoiding listing additives, or 'E-numbers' on food packaging, which is increasingly making consumers worried and replacing with different ingredients. The key point here is that legally food manufacturers have to list any E-numbers used in the product on the packaging, but these substitutes are classed as ingredients or processing aids so there is no legal requirement to list them. Blythman uses the example of E150 caramel, which creates a sweet flavour and a brown colour. Now it is replaced on the label with 'burnt caramelised sugar' or 'caramelised sugar syrup' or 'burnt sugar syrup' or 'caramelised sugar' (Blythman 2015, p. 67).

> Consumers crave well-prepared and nutritious ready-meals. They lead increasingly busy lives and need prepared solutions, which can be heated in a microwave oven quickly and conveniently to save time after a busy day at work. For the ready meal industry the potential is great but so are the challenges. Automated multi-head weighing and packaging provides the means to easy handling and higher profits. BILWINCO provides the solutions you need. (Bilwinco 2011)

This is from the annual report and accounts of the company Bakkavor Group Limited (2013), one of the UK's largest food manufacturers, providing 'own brand' products to leading supermarkets.

> TIME-SAVING AND COST-SAVING LIFESTYLE CHOICE
>
> People are interested in new tastes and quality ingredients but do not always have the time, skill or budget to cook from scratch every day. Fresh prepared foods bridge this gap, increasingly becoming a lifestyle choice due to their fresh appeal, ease of cooking and preparation, and availability across a range of price tiers.

Note here the emphasis on 'fresh appeal' (rather than actual freshness) and the interest in new tastes and quality ingredients without saying anything about what qualities the ingredients contain. It seems to be plugging into a particular lifestyle that not only accepts modern-day time constraints outside of working hours but also promises something novel that will interest consumers' neophilia.

Healing the Rift

As already discussed above, it is difficult to separate consuming convenience food from wider societal changes. While for some an individual approach might involve changes in lifestyle, nature and amount of paid work undertaken, growing one's own food or purchasing food ethically and so on, this is not a collective response. The neoliberal stage of capitalism has a tendency to see social problems like not having time to cook properly and resorting to ready meals as an individual problem, and it

is down to the individual to find solutions. Of course, this approach oversimplifies reality and masks both structural constraints and power relations. It has long-term ramifications for human health but validates what capital seeks to do.

By contrast, by analysing the relationship humans have with their food systems from the farm to the plate through the lens of the metabolic rift we can make a connection between production and consumption of food, which brings out the ecological significance of that relationship. There is a complex form of alienation between our consumption choices, increasingly highly processed food and how that consumption drives a food system that is so far removed from what has existed for the last 10,000 years. The health consequences of highly processed food are becoming starker. The high profits made by such foods override capital's interest in the health and well-being of most of the population even though there is growing evidence that its consequences are impacting on our overstretched health services as well as the environment.

While what I have outlined so far may seem intractable and doom laden, there are movements and individuals aware of the dangers of our highly processed food system. We have seen a big rise in organic consumption despite so much of it being imported from other countries. A number of UK local authorities are supporting the establishment of civil society organisations trying to improve both production and consumption of whole foods in their locality. Examples include Transition Towns (Hopkins 2008) and, in Brighton, the 'Brighton and Hove Food Partnership', with a similar organisation in Oxford. Such groups are focusing on more localised and urban food growing to not only reduce food miles but also make more public how food is grown and the best way to produce it. Most parts of the country now have waiting lists for allotments, which could be seen as a renewed interest in food growing. Increasingly people want not just food security but food sovereignty, where consumers and producers together control what food is produced and how it is produced (see La Via Campesina n.d.). If some of these alternatives are still very marginal to most people's experience they are a social indicator of the future, as alternative economic and social spaces working within the interstices of the capitalist economy to challenge mainstream foodways in various ways.

Conclusion

In this concluding section, I want to return to one of my starting points –that is the need to analyse both production and consumption in trying to understand the impacts of modern food systems on both humans and wider environment.

Modern productivist food, especially fast food or convenience food, represents the real subsumption of nature by capital. The food is decoupled from its biological origins. While Marxists and other radicals have looked at this real subsumption in the process of food production it is yet to be fully taken into account that this process occurs in consumption as well.

As has been seen, metabolic rift is a valuable concept to apply to the manufacture and consumption of processed food. Recent critiques have been introduced and incorporated into the analysis. Moore, and Schneider and McMichael, have made clear their view that metabolic rift theory can be applied to analyse various stages of capitalist development, and this has been important here because processed food has expanded since the Second World War and ultra-processed food is now part of the dominant paradigm. Metabolic rift is no longer, if it ever was, limited to the nineteenth-century town–country split. Questions that Marx was trying to explain with the limited scientific conceptual apparatus of the nineteenth century, and in a nineteenth-century context, such as input–output balances and closed systems, are more relevant than ever. This is despite twenty-first-century attempts at techno-fixes, or what sociologists call 'ecological modernisation'; seeking scientific and technical solutions to society's problems instead of looking for underlying causes. Carolan, Boyd et al., and Smith found a different set of terms from Marx to be useful. Again, the real subsumption of labour, and of nature—in fact these are related, as the authors point out—are as relevant as ever.

What the analysis here of ultra-processed food shows is firstly that the terminologies of both metabolic rift and real subsumption of labour/nature are best applied together. In so doing, metabolic rift theory is built up as an even more powerful conceptual approach to be applied to all sorts of areas of ecological and social life. In relation to the problems with

food studies identified at the start of this chapter—the split between the study of consumption and of production, and the attendant depoliticisation of consumption studies—this approach allows a critical understanding of ultra-processing based in the social and the natural sciences, and will allow the basis of a politics of fight-back against received foodways.

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7

Satellite Farming, Food, and Human Wellbeing

James E. Addicott

Imagine for a moment that human beings could take the same vantage point as God; up in the skies above, looking down upon farmers and the countryside, while coordinating human activities within a greater scheme of things. Through almost miraculous advances in modern science and technology, this has virtually become the case. Satellite farming means that different farming activities can now be calculated and coordinated from the skies above. Self-driving, self-regulating, and self-operating tractors, combines, and other farm equipment are increasingly becoming an everyday reality for more and more farmers in the UK.

Within sociological theory, there are deep concerns about the integration of satellite technologies into farming operations. These would include some of Marx's initial predictions about the uneven development of modern agricultural industries and the substitution of agricultural labour by machines and loss of employment in the countryside. More recently, there have been concerns that satellite technologies in farming will come to commodify the traditional, local knowledge farmers possess into data

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inputs, as a result they represent 'only another method to increase farmer dependence on off-farm suppliers and purchasers of farm products', thereby providing a further 'means for agribusiness to become integrated into field and farm-level production activities' (Knight 2006, p. 186; Wolf and Wood 1997; Wolf and Buttel 1996). A growing dependency on informational knowledge could well exacerbate a growing rift between the metabolism of society and natural environments, increasingly alienating humans from their species being (Dickens 2004). The more daunting idea for farmers is that information and communication technologies (ICTs) are causing 'a new social structure' to emerge, in which automation will lead to the 'demise of agricultural jobs', or that farm work is slowly being 'phased out' (Castells 1996, p. 202, 223). From a sociological perspective then, the adoption of satellite technologies into farming could be the worst move ever for farmers who wish to keep their jobs and family farms, and keep physically interacting with natural environments and generally working in the great outdoors. Qualitative research into satellite farming, however, reveals quite the opposite. Farmers are quietly optimistic about the potentials for satellite farming, whilst actively engaged in getting satellite-farming systems set up.

This chapter is primarily interested in causality and will address questions such as: What is causing farmers to adopt satellite farming? What is causing the current information technology (IT) revolution in agriculture? Why are farmers abdicating certain levels of their autonomy through satellite-automated systems? These are especially important questions given the warnings that social and cultural theorists have raised. Therefore, some consideration will be given to the social, cultural, and economic effects of adopting these technologies. From the outset, I wholeheartedly accept the situation is densely complex with numerous sources of causality (e.g. organism, bacteria, insects, weeds, local and global market complexities, in-farm and off-farm social power dynamics, technological evolutions or non-evolutions, and so on). Nevertheless, it still remains possible to reduce this complexity and single out certain causal mechanisms that push and pull farmers towards satellite guidance and automation. These sources of causality can be broadly categorised as chemical mechanisms, economic mechanisms, social mechanisms and cultural mechanisms and, following an introduction to satellite farming,

they are outlined in the first section of the chapter. The adoption of a historical materialist and critical realist framework of analysis brings these mechanisms clearly into focus.

However, throughout the causal analysis this chapter will present some criticism of this mode of analysis. In classical sociology, Weber critiqued Marx's historical materialist view by asserting that 'economic orientation has by no means stood alone in shaping the development of technology' but rather 'a part has been played by the imagination and cognition of impractical dreamers … and by various other non-economic factors' (1964, p. 163). More recent criticisms of historical materialism have come from reflexive modernisation theorists (Giddens 1990, p. 72; Beck et al. 2003) and ecological modernisation theorists (e.g. Huber 2004; Mol 2003), who assert that the reflexive, organisational, institutional, and innovative dimensions of a new, reflexive modernity warrant a greater emphasis in causal analyses. In this view, 'innovators, entrepreneurs and other economic agents' are 'social carriers of ecological restructuring' (Mol 1997, p. 141). The future of the environment is not only in their hands, however, since 'state agencies and new social movements' are also recognised as contributing towards a reflexive, ecological modernisation (Mol 1997, p. 141). If we adopt this view, then satellite farming can be considered a technological and environmental innovation (TEI), as described by Huber (2004), since in the early stages of design, the 'creative process' can aim to optimise technologies to maintain 'an industrial metabolism that is effectively comparable with nature's metabolism at an optimum level of efficiency'. Technologies such as satellite farming are 'socially embedded' he argues, and as a result of the 'transition to ecologically readapted technologies and practices' that reflexive modernity brings about, 'agriculture requires that those involved gain certain ecological insights, change their mindset accordingly, acquire more sophisticated knowledge, take decisions on political goals, with whom to cooperate, with whom to compete and whom to fight, how to regulate what needs to be done, and to what ends to invest available money' (5; 12; 11). While the economics are important, any study of agriculture in England cannot fail to take account of the enormous amount of innovation in design, scientific research, policy, and public subsidies that shape the industry. Neither can we overlook the amount of planning, organising,

or economic strategies that farmers are involved in when 'opting into' the adoption of satellite farming or otherwise (Giddens 1990). Furthermore, nor can we overlook the organisational powers that satellite-farming systems offer to higher social, political, and corporate powers.

It is correct to consider that through 'changing our environment we change ourselves'. However, through reflexively changing ourselves we can also change our environments. The qualitative research into satellite farming discussed later reveals findings that support a historical materialist position, and the theoretical framework provided is penetrating for the analysis of the emergence and adoption of satellite farming. It is therefore a good ontology to approach the subject from. However, research findings also reveal that farmers are actively and critically engaged in opting into satellite-farming systems and shaping economic outcomes. It is important that these dimensions of agriculture are acknowledged because if the question is 'what on Earth should be done?', then now is a good time for thinking of and actively implementing new ideas and initiatives or developing technological environmental innovations.

An Introduction to Satellite Farming

Satellite farming is more commonly referred to in the industry as precision agriculture, precision farming, site-specific farming, or sometimes, controlled traffic farming. It represents one of a number of emerging 'precision practices' (Huber 2004, p. 121) which would include precision weapons, precision landscaping, precision medicine, and precision astrophysics. Satellite farming can be best understood as the combination of two processes: 'remote sensing' and 'remote control'.

Process 1: Remote sensing: In 1964, NASA's Earth Resources Observation Systems Programme was launched. It had the aim of working towards a 'full evaluation of the Federal lands and determining their future use, as well as for improved planning of overall land use throughout the United States and the world' (McKelvey 1976, p. iii). The justification presented at the time was that 'we are restricted in our ability to make the decisions necessary for the wisest possible utilisation and conservation of the resources upon which we depend for our very

existence'. The first Landsat satellite (ERTS-1) was launched in 1972. The US Geographical Survey described the launch as one of the 'major steps forward in extending man's ability to inventory the Earth's resources and to evaluate objectively his impact upon the environment'.

NASA launched its eighth Landsat satellites in 2013 with plans for Landsat 9 to be launched in 2023. Landsat satellites equipped with different imaging equipment such as multispectral lenses that can measure radiation, capturing various kinds of information about planet Earth, such as leaf greenness (photosynthesis), soil quality, and precipitation once every sixteen days (NASA 2012). Not all remote-sensing imagery is captured by US satellites—although nearly half of the satellites in space are US satellites (41.2 %), (Maillard 2014)—for example, the European Space Agency recently launched its Sentinel-2a to remotely scan crops, and unmanned aerial vehicles or drones can also hover above crops to capture similar data and generate imagery. The digital information captured by remote-sensing satellites is supplied to farmers in the form of 'shape files' or 'image maps' that look much like a psychedelic image of the earth's surface. Red patches within the highlighted fields might indicate to both the farmer and automated farming equipment where more fertiliser is needed, whilst darker green areas would indicate where less fertiliser is required. After image maps have been processed, analysed, and downloaded from an agricultural equipment supplier or IT company, then this data can be transferred directly into a tractor's software or piece of farm equipment. At the moment, most farmers use portable data devices (or USB sticks) for this purpose, but as cloud technologies develop it will be highly likely that in the near future this data will be transferred wirelessly. The data informs the farm equipment about different zones of the fields. For example, the results of a Normalised Difference Vegetation Index scan will automatically tell the fertiliser spreader on the back of a tractor which areas of the field need more nitrogen fertiliser, less nitrogen, or no nitrogen. The end goal is an even or 'smooth' or 'targeted' application: more where needed, less where not (Blackmore 2003). All a farmer needs to do is drive through the field and the distribution rates are automatically adjusted according to each area of the field.

Process 2: *Remote control*: Not only can satellite systems remotely regulate the farm equipment but they can also auto-steer tractors. The big

break for the emergence of satellite farming came in 1991 when the US government declared that from 1993 onwards, Global Positioning System (GPS) coordinates would be made freely available 'to the international community on a continuous, worldwide basis' (Pace et al. 1995, p. 265). No longer would satellite coordination be the sole possession of international military–industrial complexes but the doors had opened for private companies and the general public to take advantage of worldwide, satellite coordination networks. Farmers using a Real Time Kinematic (RTK) satellite system can achieve up to a one-centimetre degree of accuracy using self-driving satellite systems.

As a result of the two processes of remote scanning and remote control, self-driving, self-regulating tractors, and farm equipment are now a reality. With the data collected by remote-sensing satellites, and a set of GPS coordinates picked up by a receiver, farmers can drive out to their fields to then literally sit back and let the tractor do the driving, while satellites and ICT software regulate the equipment and control the distribution of chemicals or fertilisers onto the land. While researching precision farming, I have heard several anecdotes of farmers falling asleep at the wheel or even hauling a bag of potatoes onto the driver's seat of the tractor to override the system whilst they get on with some other urgent task! It is more common for farmers to use mobile phones or social networking media, or to keep a much closer eye on the equipment to check for failures. Future designs have also been drafted for fleets of 'agricultural robots' that could work the land both day and night with minimum amounts of human intervention (Pedersen and Blackmore 2008).

Satellite coordinates are also increasingly used in the designs of combine harvesters to generate yield data. As a network of different sensors around the combine captures information such as the yields rates, moisture levels of grain, or bushel weight whilst combining the crops at harvest, digital 'yield maps' are generated. Satellite coordinates are used to zone the fields into different calculable sections. The yield maps inform the farmers about the high- and low-yielding areas of their field. Red-orange dots might indicate where yields are low, and yellow-green dots might indicate where yields are higher. Farmers and agronomists can compare the results of their chemical inputs, soil types, and yield maps to optimise input and outputs accordingly. Furthermore, using a telematics

system, GPS coordinates also enable companies to send out replacement parts to the farmers in the fields ahead of a breakdown or tell the farmers how much fuel they have consumed or ground compaction they have caused in particular parts of the fields.

Chemical Mechanisms

One of the causal factors or drivers pushing forwards the adoption of satellite farming is a tension between modern, industrial agricultural production processes, and natural environments or ecological systems. This section will highlight such a tension and explain how it functions as a causal mechanism effecting industrial societies and natural environments. To achieve this, I will narrow the scope of a causal explanation for the adoption of satellite farming to one element in particular: nitrogen (N). Nitrogen possesses causal properties activated in different conditions. These causal powers are linked to plant growth; yield increases, ecological damage and the physiological wellbeing or harm of human populations. In the following section, these causal powers of nitrogen are understood in critical realist terms as factors that eventually cause or bring about the social development and adoption of satellite and ICT in agriculture.

As modern societies interact with nature, they discover natural limitations, certain limitations thereby spur on or drive forwards the adoption of satellite and ICT in farming. Natural symptoms of large-scale industrial expansion have revealed nature's 'physical limits', which cause certain social responses, such as satellite farming. The Club of Rome's report entitled *Nature's Limits* could be considered a social response to industrial agricultural methods of the green revolution and real, physical limitations within nature (Meadows et al. 1972). Critical realists take the position that during the post-War era, environmental scientists have been discovering that nature's physical limitations function as 'causal mechanisms' with both positive and negative social outcomes (Dickens 2004, p. 81). Benton (1996) takes this notion of natural limitations and combines it with a critical realist model for understanding different 'enabling conditions' and 'limiting conditions' that arise when society interacts

with nature through labour processes. An example of an enabling condition would be in a situation where 'a naturally given water supply, in the form of a river, is utilized by a human population for agricultural irrigation and fishing'. Through farming and fishing, human needs are met and 'the combination of the socially established technology with the naturally given condition can be seen as emancipatory'. On the contrary, an example of a definite limiting condition is one in which '(h)igh levels of fertilizer runoff … will have their effects on fish populations in the river'. By viewing both labour processes, fishing and farming, as *embedded* within nature to combine 'naturally given processes, mechanisms, and conditions', then we can begin to not only reconsider but '*make possible* human need-meeting practices that otherwise would not occur' (p. 172). There could be practical potentials for satellite technologies to permit higher levels of scientific understanding of the enabling and disabling conditions of nature as well as the positive and negative effects of industrial labour processes within ecological systems.

Through the critical realist lens, some level of understanding about the social and natural 'knock on' effects of fertilisers nitrogen can be achieved by applying the theory of the First and Second Laws of thermodynamics to the fertiliser nitrogen cycle. The layered or stratified outlook critical realism offers can help our understanding of the physical and biological causal properties of nitrogen, and how it expands throughout the different levels of a hierarchical order within science. This hierarchy is outlined in the following way by Benton and Craib (2011, p. 127):

Social sciences
Phycology
Physiology
Organic/biological chemistry
Physical chemistry
Physics

Although nitrogen is a chemical element found in the biosphere, we can examine nitrogen at the bottom layer of physics. The First Law of thermodynamics allows us to understand that 'energy can neither be created or destroyed' it can only 'be changed from one form to another'. Nitrogen, a natural resource and the most common element in the uni-

verse, constitutes 78 % of air found in the Earth's atmosphere. Fossil fuels such as oil and coal are used in the nitrogen fixation process; unlike farmyard manure, nitrogen is therefore an energy-intensive fertiliser and has traditionally relied on huge amounts of fossil fuels for its production. Because of this there is a strong economic correlation between the price of coal and oil and the market price of fertiliser nitrogen. As nitrogen is extracted from the atmosphere to produce fertiliser for the soil, then energy is changed from one state to another (Dickens 2004, pp. 81–82). In the stratified view, it is at this stage that nitrogen combined with fossil fuels is raised from the layer of physics to the layer of physical chemistry. Crystal or liquid forms of fertiliser nitrogen are available for shipping to farmers for application to their crops.

After being applied to crops by farmers in England using tractors and fertiliser spreaders, nitrogen enters into the level of organic or biological chemistry as rainwater, soil and clay particles, and eventually the roots of wheat plants take up the applied fertiliser nitrogen. Industrially manufactured nitrogen nourishes the ecological metabolisms of both soil and plants. Typically, wheat plants that require more nitrogen are either yellow or light green, and plants with a suitable amount of nitrogen would have darker green leaves. Remote sensing can detect these imbalances within a field via satellites in orbit, as discussed above. After harvesting, these seeds are stored, then exported to produce food to either nourish the metabolism of chickens or pigs, and eventually humans. Nitrogen works its way up from the layer of physical chemistry, to organic/biological chemistry, towards the level of physiology.

What are the eventual demographic effects of this process of nitrogen harnessing and application? The Institution of Mechanical Engineers (2013) states that the increased fertiliser application 'has in the past been responsible for at least 50% of yield increases'. As human populations increase then to some extent nitrogen has 'enabled' or sustained world population growth. However, this demographic enabling factor looks limited ecologically. Looking forward to the future of farming in relation to world population growth, they predict that:

> Producing and distributing nitrogen fertilisers currently requires an average of 62 litres of fossil fuels per hectare. Given that the amount of land under modern farming methods is anticipated to increase by 12.5 % in the

> coming three decades, as a result of the transfer of engineering and agricultural practice knowledge to developing countries, it is projected that demand for this resource will increase substantially by mid-century. The total annual demand for fertiliser has been estimated to increase 25 % by 2030 to 223 million tonnes, of which some 62 % would be nitrogenous. (Institution of Mechanical Engineers 2013, p. 13)

It is clear then that one of the social effects of nitrogen is that it has and could continue to help to defy the Malthusian curb: an enabling factor. However, the high-energy cost of production means that fertiliser nitrogen comes with its own environmental liabilities.

Returning to the base level of physics, then The Second Law of thermodynamics can be used to understand the negative ecological natural impacts of nitrogenous fertiliser process. The Second Law of thermodynamics 'is concerned with how energy takes various forms and becomes unavailable for useful work'. With the example of coal, 'once it is burn, the ashes or waste created cannot be burnt again. Entropy has been increased' (Dickens 1996, p. 34). As fertiliser nitrogen is applied to a farm's soil, then the concentration of energy is changed from a state of high concentration (ordered, non-random) to a state of low concentration (randomised or dissipated; entropy)— the latter being a state of wasted energy. Of course, the harnessed energy is not entirely wasted since the soil and plants are nourished in the application and uptake of nitrogen. Information on how much nitrogen (energy) is required to nourish the soil and plants is available through remote-sensing technologies that satellites can provide.

But what happens to the wasted energy that is not transferred into the soil and plants? Here we should draw a distinction between organic systems and artificial systems. In an organic system, such as the natural nitrogen cycle, 'waste produced by non-human transformation of energy is largely taken back into the ecosystem'. The example offered by Dickens is of cows that breathe out carbon dioxide but which various organisms break down into the soil. This then permits plants to grow, which animals then eat: a natural, enabling condition. However, inefficient or unsustainable systems designed by humans defy this cycle of energy transferral by introducing 'new substances which cannot be broken down'. And,

furthermore, they 'are also produced on such a large scale that reabsorption by ecosystems can no longer take place' (1996, p. 34). Soil cannot contain or break down excessive applications of nitrogen; this is a natural limitation. Such interactions with natural environments reveal natural limitations, which possesses their own causal powers. Negative reactions, or 'boomerang effects', then prompt some kind of social response, such as the regulation of nitrogen applications through policy such as The European Union's RB209 (Defra 2010) or, looking to the future, through the automated control and regulation of inputs and outputs that satellite farming offers. At the upper layer of society, or politics, such regulation can be seen as responsive to social manipulations at the base level of physics.

Nitrogen leeching also has physiological effects. There have been reported cases of nitrate contamination in shallow wells that cause severe sickness, 'unusual blue-grey or lavender skin colour' and even death in young babies. This is known as 'blue baby syndrome' (Knobeloch et al. 2000). As a technological fix, satellite farming could possess both demographic and ecological enabling conditions in so far as it promises to increase food production as well as reduce nitrogen leeching and the contamination of human populations.

In response to these factors, as a new cultural or techno-cultural method, a 'management tool' or a technical fix, satellite farming could give framers the ability to regulate the input and output of natural resources into the second stage of Marx's economic model of the circulation of capital, which will be outlined in the next section. In terms of causality, satellite farming is responsive to excessive inputs of fertiliser nitrogen, limited resources such as the coal and oil used to manufacture nitrogen fertiliser, as well as the environmental limitations of fertiliser nitrogen such as leeching, and physiological limitations such as the pollution of human beings. This process could then help to intelligently manage the inputs to avoid a situation of excessive nitrogen usage. However, in their analysis of precision agriculture Wolf and Buttel (1996) point out that although satellite farming is widely presented to farmers as a 'green' technology, it is 'essentially premised on a continuing trend toward relatively inexpensive chemical input' (1270). The big question is whether or

not 'green', satellite-farming solutions are 'window dressing' or can actually bring positive, enabling outcomes.

Economic Mechanisms

There is a very strong economic undercurrent that has for a long time been pushing farmers towards larger-scale, industrial agriculture. It has also led to the growth and expansion of global markets, and it continues to drive farmers towards satellite-guided, auto-farming. Marx's theory of the 'circulation of capital' (2007, p. 279) is still highly relevant in offering a form of economic explanation as to why farmers continue to adopt increasing levels of technological automation. As already highlighted, the various factors that bring about the emergence of satellite farming are multifaceted and complex. Adopting Marx's economic theory, Harvey confesses that 'the process of using money to make more money is not the only process at work' (121). Certainly the empirical research discussed later will provide further insights into the various factors that can influence a decision to invest or 'opt into' satellite farming or otherwise. While the complexity of investment conditions is recognised by Harvey and others, Marx's theory of capital accumulation not only offers a good starting point for a reductionist and explanatory sociological analysis but also provides a unique framework for understanding human's relations with nature in production processes. Marx's idea is outlined in the following way:

> Money … purchased technology, or the means of production, and labour power. These combine with raw materials taken from nature and other commodities in a labour process to produce commodities for sale on the market. These commodities are then sold and consumed. The resulting money is either recycled back into the process (purchasing new labour power, raw materials etc.) or is taken as profit by the investor. (Dickens 1996, p. 43)

There are several theorised effects of this basic function of the circulation of capital. These will be discussed in turn below but they can be sum-

marised as (1) the scaling-up of industrial agriculture; (2) the expansion of capitalism into new territories; (3) capitalism's need for self-regulation or reflexivity; and (4) the development of Fordist-style capital accumulation towards flexible modes of capital accumulation.

Marx attributed the scaling-up of agriculture to the ongoing process of the circulation of capital. Dickens summarises the evolution in the following way:

> competition between firms [farms and agribusinesses] would lead to the increasing substitution of workers by machines. In the long run this would lead to a declining rate of profit in the economy, since profit came eventually from the exploitation of labour power, people's capacity to work. These processes would first hit smaller firms [family farms], and production would therefore be primarily located in very large-scale industrial [agricultural] enterprises. These would generate a massive working-class with nothing to lose but their chains in overthrowing the system. (1996, p. 29)

This economic effect is more commonly described within agricultural circles as: 'get big or get out'. The effects of market competition, industrial production processes, and the scaling-up of industrial agriculture on employment or dietary habits have been detailed in several US exposé documentaries such as *Food Inc.*, *Seeds of Death*: *Unveiling the Lies of GMOs*, or *Supersize Me.* Such documentaries not only detail the expansion of industrial, large-scale, agri-businesses ('mega-farms') and global agri-food industries but also outline the effects of forcing small, family farms out of business. Neo-Marxist, macro-level analyses of the adoption of satellite farming in the USA express concerns that these satellite systems will economically benefit large-scale, industrial farms (Wolf and Wood 1997; Wolf and Buttel 1996). The effects of economies of scale on smaller-scale farms in England will be discussed later, but certainly the big six multinational agri-chemical companies (Bayer, Monsanto, DoW, Syngenta, BASF, and DuPont) and agri-equipment companies (AGCO, John Deere, New Holland, etc.) hold powerful positions within global agricultural markets.

The accumulation of capital has an expansionary logic and effect. It has been argued that as capitalist economic systems push for increased

accumulation and production, the system goes into a state of overproduction (Harvey 2003, 1992b, p. 260). Such an idea can be used to explain 'Grain Mountains' in England during the 1980s that were caused by overproduction in agriculture, which forced the market prices for grain to plummet drastically. The result, it is argued, is that capitalist systems then need to expand into new territories and seek out new markets. This expansionary logic has been used to explain the development of international trade and the establishment of global markets (Harvey 2003) or outer space exploration and the establishment of satellite communications networks (Dickens and Ormrod 2007).

Another effect is the social regulation that a systematic economic crisis such as overproduction brings about. Because competitive capitalist systems continually push for more and more production of commodities and consumption of natural resources, it is argued that capitalist systems are inherently crisis prone when overproduction eventually causes market depressions. Therefore, 'some degree of collective action … is needed to compensate for market failures' (Harvey 1992b, p. 122). This would offer some level of explanation for the European Unions' Common Agricultural Policy (CAP) and the Basic Payment Scheme (BPS) that subsidises farm incomes if overproduction of commodities forces the market prices below the cost of production—which costs the average household in England £245 per year. Set aside land, field boundaries, or ecological focus areas in this view are not only ways of keeping an ecological balance with nature (wildflowers and wildlife populations) but also ways of putting land out of production and regulating markets for grain production between agricultural supply and consumer demand. If the logic of territorial expansion and regulatory forces are combined, then it would explain the requirement for satellite networks that can monitor and control industrial agricultural production from outer space. It would also explain why the establishment of satellite networks is publically funded, or why the EU, UK government, and the Rural Payments Agency are willing to use public funds to subsidise farmers' adoption of satellite-farming systems into their farming practices, as a means of self-regulating agricultural economies and preventing the overproduction of commodities and market failures. A point that will be raised later is the

way in which these same regulatory satellite systems can be used to surveil and police farming industries from outer space.

The 'regulatory' logic of capital systems that Harvey presents is contested by the theory of reflexive modernity. While Giddens accepts the general logic of capital accumulation, he argues that one of the main distinguishing features of modernity is its 'dynamism':

> The dynamism of modernity drives from *the separation of time and space* and their recombination in forms which permit the precise time-space 'zoning' of social life; the *disembedding* of social systems (a phenomenon which connects closely with the factors involved in time-space separations); and the *reflexive ordering and reordering* of social relations in the light of continual inputs of knowledge affecting the actions of individuals and groups. (Giddens 1990, p. 16–17)

Reflexive modernity comes with 'expert systems'—or, 'technical accomplishment or professional expertise that organise large areas of the material and social environments in which we live today' (27)—which can abstract and then re-embed time and space zones within different local cultures; each abstracted expert system governed by knowledge experts and system representatives. Such systems do not function as a 'second' or 'third circuit' to regulate the 'primary circuits' of capitalism, to provide a 'spatio-temporal fix' to a crisis-prone capitalist economic system (Harvey 2003, pp. 108–124), but rather a means for ordering, organising, and rationally calculating time, space and resources prior to any economic activity and to whatever end (environmentalism, capitalism, socialism, communism, cooperativism, etc.). I am of the opinion that it is important that we recognise the organisational powers of satellite farming not as a reactionary, dialectical, 'self-regulating' system designed to stabilise global capitalism. These expert systems could hold the potentials for enabling improved social, ecological, and economic for future generations.

Nevertheless, if we return to Harvey's historical materialist position, then whilst the logic of capital regulation is recognised on the one hand, and the expansionary logic of capital accumulation explained on the other, thereby offering some explanation of the emergence of global mar-

kets and local exposure to both European and global markets over the years, it is also argued that capital demands a certain level of flexibility from producers and consumers. As the circuits of capital push forward globalisation, then markets have shifted from being horizontally organised to vertically organised. This shift demands a different mode of production, referred to as 'flexible accumulation', or what is more commonly known in the farming industry as 'farm diversifications'. Harvey (1992a) summarises the former model as characterised by a 'mass assembly line, mass political organization and welfare-state interventions', and flexible accumulation as: 'the pursuit of niche markets, decentralization coupled with spatial dispersal of production, withdrawal of the nation-state from interventionist policies coupled with deregulation and privatization' (123). Such a shift runs somewhat contrary to the Keynesian–Fordist models, which require public subsidisation schemes such as the Single Farm Payment to secure food production throughout the member states of Europe. Nevertheless, flexible accumulation is also largely recognised as the result of transport and communication technologies that have transformed the material, base structure of society (Harvey 1992b, pp. 199–323; Dickens 2009; Castells 1996, p. 62). This shift towards a vertically organised agri-food sector reintegrates farming cooperatives, agri-chemical, agri-mechanical, merchants and traders, food production and retail outlets, satellite and IT companies into a more interlinked and interchangeable, homogenous system of food production and global trade (Welsh 2010; Wolf and Bonanno 2014; Dickens 2004).

If we relate Marx's economic model to the predicted savings that farmers could incur through adopting satellite guidance and remote sensing into their industrial operations, then a rudimentary cost–benefit analysis would give us some indication in theory of why farmers might invest into these technologies. Satellite farming would optimise performance at the second stage of the cycle in which technologies are combined with labour power and natural resources. Automating the physical and cognitive labour powers of humans or automatically regulating the distributions of material inputs such as nitrogen with GPS coordinates achieves significant cost reductions. The company Intelligent Precision Farming (IPF) predicts that farmers could save £32 a hectare in nitrogen fertilisers while targeted applications of chemicals and seeds should boost yields up

to 18 % over the national average (Padfield 2013). A more recent independent survey conducted by an academic at Southampton University reveals that crop yields are increased by an average of 22 % using the same system (IPF 2015). Another highly advanced self-driving system in satellite farming called Controlled Traffic Systems is reported to save up to 50 % on the fuel used in crop harvests in Denmark (Jensen et al. 2012). Because satellite farming can cause a reduction of money invested in the second stage of Marx's economic paradigm (labour power, raw materials), and an increase of commodities at the third stage of the cycle, then it would make economic sense for conventional farmers to invest into satellite farming.

At the early stages of development, the benefits of satellite farming are generally the privilege of larger estates and farms. As of 2012, 32 % of the larger farms in England were using GPS coordinates in farming operations, as opposed to 17 % of small farms. The majority of farms that used precision agriculture technologies were in the East of England (39 %) where the farms are larger, the soil is of better quality, and incomes from arable farming are higher (see Fig. 7.1). Consequently, East Anglian farms are generally wealthier and therefore have more capital to invest and greater savings to incur. If satellite farming can save £32 per acre on nitrogen fertiliser inputs, then a farmer with a one-thousand-acre farm will save substantially more than a farmer with a two-hundred-acre farm. In the South West of England, where my research is being conducted, only 15 % of farmers used GPS and variable rate applications in 2012 (The Farm Practices Survey 2012). Geographical terrain also acts as an enabler or disabler in the adoption of these technologies. The flat terrain of the East of England (especially The Fens) enables groups such as the RTK Farming Ltd to set up satellite networks to provide incredibly accurate auto-guidance systems. As a natural limitation, the rolling hills and valleys of the South West tend to block the radio frequencies required to achieve such levels of accuracy.

However, as more and more farmers invest in precision agriculture technologies and they reach global economies of scale, thereby driving down production prices, similar technologies are made available for smaller farms at lower costs. A survey conducted by Hutchinson (funded by Bayer CropScience) suggests that between 2012 and 2015 smaller-

Fig. 7.1 Precision agriculture in the UK. The left-hand map of England shows the geographical terrain. Lighter areas are higher in altitude, therefore hillier with less premium soil for crop production, while limiting advanced forms of satellite network coverage. Second from the right shows the uptake of satellite-farming technologies (The Farm Practices Survey 2012). The lighter regions represent where more satellite and ICT are being adopted; these technologies are mainly adopted towards the East of England. The far right-hand map shows farm incomes by region based on cereal production in 2012/13 (Defra 2013). The general pattern is that higher income farms mainly in the East of England produce more output, earn more money, are more able and likely to invest in satellite farming, and should therefore waste less and incur more financial savings over time.

scale farms have also begun to adopt GPS technologies. This finding really supports the idea that there is a 'trickle down' effect in the development, manufacture, and uptake of new technologies. Of course, those at the top end of the economic spectrum initially incur greater financial savings.

It is not only the farmers that stand to profit from satellite farming. Since the Space War era, there has also been a growth in small-scale private satellite industries, set to take a share of a global satellite-farming industry valued at $189.5 billion in 2012 (Maillard ibid). An example of such a company in England is Surrey Satellite Technology Ltd, whose mission is to 'offer innovative, affordable and flexible systems' to deliver 'very high resolution images … to provide high resolution data at affordable prices' (Surrey Satellite Technologies Ltd 2013, p. 4). Data abstracted from the Earth's surface and commodified by similar satellite and ICT industries can now be purchased by farming communities at a local level. And

because farmers need external help in processing their satellite crop data, in recent years there has been a growth in UK IT companies that can process this satellite data and tailor it to farmers' specific requirements. For example, IPF, a sub-section of an independent, family-run agronomy firm called Courtyard Partnership, process and supply the largest proportion of farmers with data in the UK. As of 2012, the company served over 500 farms with a rapidly increasing customer base (Padfield 2013). As more and more remote-sensing satellites are launched, and agri-IT companies developed to process data for farmers, then we can only consider this a continuing trend.

Social Mechanisms

Another broad division that is central to Marx's theory is the division between society and nature. Farmers interact with and change natural environments to grow the ingredients or raw materials for food production that eventually feed society. They are, as it were, on the 'frontline' of a modern society's collective interactions with nature.

As Marx theorised, the substitution of human labour by machines has led to a dramatic loss of employment in farm labouring roles—'displacement'—leading to disproportionate human populations within the city and the countryside. Over the past 100 years, the number of people employed in agriculture in England has fallen from 50 % to under 1 % (Castells 1996, p. 252). With a UK population of sixty-four million people, Defra reported just over four and a half hundred thousand people (0.7%) working on agricultural holdings in the UK in 2014 (Defra 2014, p. 8). With global human population growth set to reach 9.5 billion by the year 2005, and half the world's population living in urban cities, then the pressure is on to develop ways of producing food that can keep up with population growth predictions (Foresight 2011), and the fluctuation of consumer tastes and choices. Satellite farming is a proposed solution to sustainably increase food production to meet the demands of local, national and global, social metabolisms.

Not only would the substitution of labour by machinery lead to imbalances in human population densities but Marx also theorised that mod-

ern individuals living in cities would become increasingly alienated from their external natural environments with negative consequences for natural environments, especially violating 'the conditions necessary to lasting fertility of the soil' (2007, p. 253). He termed this detachment the 'metabolic rift', a term borrowed from biology to denote 'the material estrangement of human beings in capitalist society from the natural conditions of their existence', whilst also emphasising that 'large-scale capitalist agriculture created such a metabolic rift between human beings and the soil' (Foster 1999, p. 330). If we are to follow the logic of Marx's argument, then the consumers or eaters of food have become so alienated from the natural processes of food production that consumption habits reflect this neglect for the biological processes of nature. This is not only an urban estrangement from non-industrial methods of producing and processing food, but farming communities in England also buy fast foods, processed foods, or convenience foods from local supermarkets.

The spatial separation between society and nature was also to lead to divisions in knowledge about nature and ecological systems. Marx and Engels argued that the spatial separation of town and countryside also brought about 'the greatest division of material and mental labour' (1974, pp. 68–69). As communities of thinkers in the cities worked to generate more technical, scientific and computer-scientific forms of expert knowledge, farmers, farm workers, and other rural laymen were left to generate local, lay, or tacit knowledge about their local, natural environments. This concern about the division between manual and intellectual labour and knowledge also extends to the implementation of satellite farming. As a result of this spatial division of labour and knowledge, then farmers will increasingly depend upon the inputs of abstract data transferred from the city to the countryside (Wolf and Buttel 1996), rather than a bottom-up transferal of locally situated, 'grounded knowledge' from rural farmers to urban societies (Ashwood et al. 2014). Since informational knowledge provided by experts from the city directly controls the behaviours of farmers in farming practices, then this could lead to a much more intensive form of 'urban dictation' between the agricultural thinkers and doers.

The growing food demands of urban populations around the world are advancing investment in 'sustainable development' technologies such

as satellite farming. Nowhere are these appeals for the intensification of global food production more prominent than in the advertising literature of agri-chemical and agri-equipment companies, or the political discourses of politicians and technocrats that wish to encourage growth in the emerging 'Agri-Tech' sector (Freeman 2014). The debate here is whether or not these communication technologies improve the broken relations between society and nature or further exacerbate humans' alienation from natural environments: another temporary 'technical fix' that does not fully address the underlying economic and social mechanisms at play.

Cultural Mechanisms

> Owing to the extensive use of machinery and to division of labour, the work of the proletarians has lost all individual character, and, consequently, all charm for the workman. He becomes an appendage of the machine, and it is only the most simple, most monotonous, and most easily acquired knack, that is required of him. (Marx and Engles 1998, p. 10)

The greatest concerns in classical sociological and cultural theory have been about the increasing rationalisation, standardisation, uniformity, and routine intensification caused by processes of modernisation, globalisation, and industrialisation, underpinned by the momentum of the never-ending accumulation of capital. Sociologists that subscribe to Ritzer's theory of McDonaldisation argue that satellite-farming systems rationalise nature and increase the efficiency of industrial agriculture in such a way as to support a growing, worldwide 'fast-food industry' (Knight 2006, p. 185). As a result of the industrial standardisation of production processes and consumption habits, the issues of human wellbeing and happiness re-enter into the debate about modern progress. As satellite automation shifts larger degrees of control to corporate and political powers through the processes of remote sensing and remote control, then questions of knowledge, culture, human autonomy, and human happiness are raised in the face of systematic, technological automation.

Dickens (2009) and Dean (2014) address such issues well. Developing Marx's concept of the essence of humans or their 'species being' whilst adopting the Aristotelian concept of *eudaimonia*, they argue that species being is fundamental to human happiness, or human flourishing, and should be realised through autonomy or a human being's 'capacities for self-determination'. As satellite networks take more control over farmland and food production, then we can only consider that these capacities for self-determination are compromised somewhat; self-autonomy overrun by system-automation. Dickens argues that the fulfilment of a human's species being is encouraged by 'finding realisation through a better, less alienated, connection to external nature', 'understanding external nature or caring for other humans and other species' and exercising 'genuine self-determination', through various forms of 'creative work' (Dickens 2009, p. 108, 109, 113, 123). Traditionally local farmers, farm families, and farm workers have developed agricultural skills from the lay, local, or tacit knowledge 'derived from direct experience in their localities' (Dickens 1996, p. 48). This continues to be the case for indigenous or small-scale, subsistence farming societies in the world today.

However, cultural issues of deskilling arise as satellite and ICT companies convert natural environments into data, commodify and then resell that information to farmers. Dickens considers that lay, local, or tacit forms of knowledge such as practical wisdom aimed towards human flourishing. The transition to satellite farming represents a loss of local knowledge to commodified, informational knowledge and power and control have 'moved to large, concentrated and centralized corporations, with farmers becoming little more than piecework laborers', working within an 'agri-industrial complex' (Dickens 2004, p. 101). In their analysis of satellite farming in the USA, Wolf and Wood (1997) also express concern for farmer's 'experiential knowledge' or 'locally-based, time-honed knowledge' being transformed into data and information, to be commodified and resold to them as further 'production inputs' (203; 188; 187). Initial research funded by the National Farmers Union into satellite farming would suggest this to be the case. In his evaluation of satellite-farming techniques in the UK, Italy, Germany, Sweden, Australia, and Japan, Szabo (2013) reports that automated precision agriculture 'can induce new forms of stress due to information overload,

skill-degradation, boredom, complacency and over-reliance on the system' (18). Rather than technologies emancipating humans from routine-intensive forms of labour, his diagnosis might lead us to the conclusion that farm workers are fed informational knowledge like systematic robots, to 'operate' in coordination with commands from satellite and ICT networks. Certainly we should consider a lifetime of such Taylorist style, routine intensification a definite limiting condition to human fulfilment, and therefore culturally unsustainable. After all, who on earth wants their work lives entirely predetermined by a corporate elite of satellite and ICT companies?

In his discussions of agricultural practices, Weber identified certain cultural mechanisms that would turn agricultural workers away from routine-intense, modern capitalist production processes towards more traditional forms of culture that provided them a safeguard from industrial intensification. Arguing that in agriculture: 'Whenever modern capitalism has begun its work of increasing the productivity of human labour by increasing its intensity, it has encountered the immensely stubborn resistance … of pre-capitalistic labour' (2003, p. 60). As Marx and Weber did, we should consider then that if an emancipated, 'Good Life' is an option on the one hand, and monotony, uniformity, and routine intensity the alternative, the majority of people—given the choice—would go for the former rather than the latter. Not only do these systems need to be environmentally sustainable but cultural sustainability should also figure as a factor in improvement and reason for investment. Given the issues of ground rent payment and exposure to highly competitive global markets in which large-scale agri-businesses dominate, are farmers really in a position to choose a Good Life alternative or are they being forced towards systematised networks of satellite surveillance and control?

Qualitative Research

In order to understand why farmers in England are adopting satellite farming, and the qualitative effects of adoption, my research is being conducted within a local cooperative of eleven farms in the South West. The main farmers ('farm owners') were hereditary successors of Duchy of

Cornwall tenancy agreements. The farmers could be described as traditionally patriarchal, insofar as the eldest son traditionally takes 'sovereign' power and control of the farm from their fathers (primogenital acquisition). In a classical Marxian sense, these farms might also be considered 'by-part-capitalists' or 'petite-bourgeoisie' since they are private owners of some means of production (tractors, seeds, and equipment) but do not own the land or soil as a means of production. These tenant farmers pay ground rent to HRH Prince Charles, and they are in the first instance economically motivated by the requirement to cover this overhead. The larger farms (1000+ acres) tend to employ workers in the livestock side of their businesses and these workers (between five and eleven workers) would also work in tractor-driving roles. On the smaller farms (250–360 acres), the farm owners were usually the primary workers, occasionally employing the labour power of family members too. The successor farmers were generally 45–65 years old, about half being university educated, and they are 'modern' or 'conventional' in the sense that their experience and knowledge of agriculture generated within their lifetimes has mainly been based around chemical fertilisers, tractors, combines, and other forms of industrial machinery. Their wives were either career women or housewives who in some situations would work in professional roles as part-time farm bookkeepers or run the bed and breakfast (B&B) businesses to support the farms financially.

The effects of globalisation and exposure to scaled-up, global market competition have been realised in a slow and gradual process that has taken place over the farmers' lifetimes and eventually led to the establishment of the cooperative. The organisation was originally formed in the year 2000 as a means of boosting the group's collective purchasing powers. As one farmer puts it: 'the economics were difficult and at the time we felt that we could benefit from getting together and reducing our input costs' (Farmer 6; Focus Group 2, 2014). During this period, the price of breadmaking wheat had dropped to a depressing £71 a ton—way below the cost of production (Home Grown Cereals Authority 2013). By bulk purchasing commodities such as diesel, fertilisers, mobile phones, concentrates for dairy production, and services from crop advisors, the group had more collective power in negotiating with large-scale, often multinational companies on the market, as a means of reducing inputs.

This unification was therefore responsive to global market pressures and encouraged vertical organisation at a local level.

The ability to negotiate prices as a collective has more recently declined, however, since marketers at firms realised the farmers' collective strategy. While the group still continues to bulk-buy fuel, seeds, or fertilisers, the cooperative has provided the farmers with more of a forum for 'socialising and the sharing of ideas' (Farmer 5; Focus Group 2, 2014). Through knowledge shares, collective technical resolutions, benchmarking the results of different seeds, soil types, and chemical fertilisers, or sharing information about experiences with different companies, experts, and technologies, whilst also encouraging share farming on equipment or crops, the group has formed and maintained its alliance. In response to the decline of human population in rural communities, the group also offers a forum for simply going for a pint with a bunch of like-minded, neighbouring farmers to overcome the isolation associated with conventional, industrial agriculture, which, due to the reduction of workers through industrial equipment, Newby (1997) described as 'a very lonely occupation' (81). It is within this forum that the adoption of satellite farming has been discussed at a local level.

By and large, the reason for adopting satellite farming boils down to rudimentary economics. In individual semi-structured interviews, when asked: 'What usually convinces you to invest into new technologies?' The farmers were very upfront and business-like about their economic imperatives. For example, one farmer replied: 'It's hoping to make money or save money … (The new technology) has got to pay for itself … and gain' (Farmer 2; Aug 2014). Such a response was the general and reoccurring trend. Certainly a collection of such statements backs the idea that a continuing trend of the accumulation of capital is at the bedrock of conventional agriculture and pushing farmers towards satellite systems.

In these terms, as previously suggested, a cost–benefit analysis would offer some understanding about the reasons for farmers adopting these technologies. In terms of realised financial savings, the actual amount that farmers had saved using remote satellite sensing was speculative and to a large extent dubious following the harvest of 2014. The large majority of farmers could not quantify an exact saving on fertilisers such as nitrogen as a result of investing into satellite-farming data or technolo-

gies. However, one farmer claimed that 'we saved five percent on our fertiliser this year, which is a fairly consistent pattern, five to eight percent'. When asked about the increases in yields by 18% that remote sensing could supposedly offer, he stated:

> I don't know how they come up with these figures. I think variable rates will save you fertiliser; it will put it where you want it, and even out the field. Now, whether it increases productivity? It probably does. But no I wouldn't at all accept eighteen percent. I could accept perhaps five, at a stretch eight percent, but no, not eighteen percent. (Farmer 8; Aug, 2014)

Farmers who did not have digital yield mapping technologies fitted to their combines were unsure exactly how much yield was increased and inputs saved using variable rate applications of fertilisers. In some instances, farmers were still counting grain trailers as they left the field during harvesting—sometimes forgetting how many trailers had been collected. Furthermore, external variables such as global market demand, geopolitical events such as Vladimir Putin's 2014 embargo on food imports, the strength of the GB Pound against the Euro, RMB, US dollar, and so on, weed or insect damage, or weather conditions (e.g. rainfall, cloud cover, ground frost, sunlight) made it almost impossible to figure out how much yield increase satellite systems actually encouraged. However, all the members of the cooperative mentioned during individual interviews that it was useful to discuss with other farmers the advantages and gains of new technologies and benchmarking results at the cooperative's meetings.

A more exact estimation of the financial benefits of satellite farming was realised later down the line, during the harvest of 2015. A farming partnership within the cooperative had invested into a brand new combine harvester fitted with a telematics system. The reason for adopting remote satellite sensing is, as one farmer put it, to 'see a reflection in the yield across the whole field levelling out rather than necessarily having low-yielding bits and high-yielding bits, the idea is to try and level it all out, and try and get a bit more from everything' (Farmer 4; Focus Group 1, Jan 2014). The farming partnership discovered through yield maps that the field had yielded with a fairly smooth average across areas of good and poor quality soil. This was a clear indication that the variable

rate or smooth application of fertilisers across the fields was working. The final yield was a staggering 4.5 tons per acre.

Yet, even with digital sensors and satellite coordinates monitoring the crop yields, the profitability of satellite farming still remained difficult to work out. At the time of harvest, barley prices had dropped from £200 a ton in 2012 to an abysmal £85 a ton in July 2015. Barley yields were up by an average of 9.8% across the UK. The incredibly high yields did mean more hauling and drying of grain, and farmers had to consider reinforcing the walls of their barns as well as renting more storage space from an external grain company for the surplus grain—an additional expense. Therefore, money invested into capital and increased yields did not lead to more money incurred, as a simplified version of Marx's paradigm tends to assume. Nevertheless, yields were up and inputs were down. Because of the reductions that could occur at the first stage of Marx's cycle and the increased outputs of commodities at the third stage, both of which are slowly being realised within the satellite system of automated production, we should expect more farmers to adopt satellite-farming systems in the future.

Making more money was not the only reason for opting into satellite systems, however. When asked about the reasons for investing into new technologies, one farmer responded by stating: 'I suppose, ultimately, cost saving. Environmental reasons. Or, if you're not trying to save on costs you're trying to increase your output' (Farmer 6; Aug, 2014). 'Environmental reasons' were not only taken to mean the farmers' appreciation of The Great Outdoors, but, as both historical materialists and ecological modernisation theorists argue, there has been an economic realisation that nature has limitations and such disabling conditions are simply bad for business. For example, another farmer replied:

> If I were looking to invest, obviously I would be looking for up-to-date equipment and go along that route because I do think, as probably all us farmers, that (a) we want to maximise the outputs from our inputs, and (b) we don't want to waste money. And, we are all conservationists at heart and we don't want to overspray with chemicals and (a) waste them and (b) waste money ourselves and more importantly we don't want to do any more damage to the environment. (Farmer 5; Sept, 2014)

'Waste' had two meanings. First, it meant a financial waste of money. The second meaning of 'waste' is in terms of the over-spraying of chemical fertilisers and the runoffs discussed previously in critical realist terms as increases in entropy and as revealing instances of nature's limitations. This combination of the natural limitations and the economic drive to reduce inputs and increase outputs can be understood as a causal mechanism that would bring about the emergence of satellite farming as an alternative 'enabling' solution that can (1) automatically regulate inputs/outputs, (2) limit financial waste, (3) reduce chemical waste, and (4) subsequent ecological impacts.

The above quotation contains fragments of political and environmental discourses that derive not directly from the local farmers but chiefly from higher sources of political power. At a ground level, 'environmental degradation' is experienced first-hand in instances of orange scorch marks in the crops caused by accidents with the chemical sprayers, ground compaction, or occasional soil erosion. This leads to a more localised realisation of the direct harmful effects of excessive chemical distributions, but these are rare instances. It has been through expert advice from crop advisors, the media (especially local and national radio, BBC News, Farmers Weekly, or Farming Weekly), private and publically financed farming reports, policy and legislation from the UK government (Defra) and the EU's CAP that has informed farmers about the accumulative, boomerang effects of chemical inputs at national, European, or worldwide macro levels. In critical realist terms then, human interactions with physical, chemical, and organic structures in natural environments have filtered upwards and lead to certain responses at the level of social sciences (political discourses, social and environmental policy designs, etc.). Policies such as the EU's 'Greening Policy' their recent decision to introduce 'Environmental Focus Areas' to the landscapes, environmental stewardship schemes or the Defra RB209 rulebook, are responsive to ecologically harmful industrial production practices. Because of the division of labour and the division of knowledge, industrial farmers are more dependent upon advice or feedback from crop experts, academic institutions, and bureaucratic bodies to advise them on how to regulate chemical inputs at a ground level. The remote-sensing data of satellite networks facilitates

the integration of 'higher-level' observations by experts into local production processes.

While the integration of ecological data or metrics into local farming systems is important to the system of satellite farming, breakdowns or communication errors that occur as systems are set up highlight Marx's theoretical 'mental/manual' division. The data collected by satellite remote-sensing technologies should supposedly be mediated to local farmers in rural settings by an emerging class of IT companies and experts. Overwhelmingly, the reoccurring theme in conversations, interviews, and focus groups with the farmers has been about technical issues with 'compatible/incompatible' equipment. An example taken from participant observations is of one farmer partnership that purchased a fertiliser spreader and was assured by salespeople that the implement was compatible with a universal communications protocol. This was set in place by the International Standardisation Organisation and called 'ISO-BUS'. This protocol should in effect level the playing field and enable farmers to source equipment from several suppliers on the market. However, the farmers found that over a three-year period it was impossible to get the equipment to 'talk with' the ISO-BUS-Ready equipment from different manufacturers, even with repeated visits from technicians and IT experts from several different equipment suppliers. After pursuing the technical issue for three years, the farmers eventually gave up. In instances such as these, the intellectual divorce between the IT departments within multinational organisations and farmers becomes clear.

Another similar example of IT system breakdown came while attending an interview with a farmer. It was a scorching hot summer's evening and perfect conditions for harvesting. The weather in England is very unpredictable and even with highly advanced weather forecasts such windows of opportunities are hard to come by. To this farmer's frustration, the industrial engines of neighbouring farmers could be heard roaring away in the local valley while they cracked on with the harvest. However, we conducted the interview while his newly purchased combine was parked just outside the kitchen window of his farmhouse. It was stood down because he was waiting for an IT expert to fly over from Europe with a USB stick to update the combine's computer software—a technical fix the farmer could not perform himself. The intellectual divorce between

the IT departments of different competing multinational manufacturers and farmers on the local ground was clear. It is also becoming clearer the more farm equipment is being kitted out with GPS equipment. One farmer explained the division in this way:

> I think within the *whole* industry, the information does not trickle down … I think the equipment manufacturers have got guys with big brains at the top designing this kit, but in the flow of information down to the local distributor, and the training of the local technicians, and then trickling down to the tractor driver, there are all sorts of breaks in that trickle-down. And it's not working. (Farmer 8, Focus Group 2 2015)

If farming is to continue down this route, and because of the economic benefits then we should consider this the case, then there will be a growing demand for external companies that can deliver IT-based solutions to such problems. When these systems fail to work or entirely shut down, it becomes much more apparent that farmers have less control over the means of production in these areas of their farming business.

From a historical materialist standpoint, we could run the risk of overlooking these organisational or institutional dimensions to satellite farming. And there is some cause for concern here. The UK Prime Minister David Cameron (2015) recently announced proposals to slash red tape in agriculture to allow rural businesses to flourish, but then continued to mention that by the summer of 2016 a 'Single Farm Inspection Taskforce' will 'use the latest technology to streamline the approach to (farm) inspections', and this would include 'using satellite data to analyse different crop types in fields' (2). Such inspections would be carried out to ensure that farmers were complicit with the EU's CAP guidelines while receiving BPS payments. By and large, in individual interviews the farmers maintained that they were 'open minded' or 'welcomed' expert advice and guidance. However, some farmers also mentioned that they did not appreciate government inspectors trying to 'catch you out at every turn' (Farmer 13; Aug, 2014). There is clearly a difference between external guidance and external control. The tragic irony of the situation is that the same nation-state apparatus that supported and encouraged farmers in using chemicals such as nitrogen on their crops through public advi-

sory services like the Agricultural Development and Advisory Service, which contributed to grain surpluses and agricultural economic crises, is now trying to inspect and police farmers from the skies; punishments would come to farmers in the form of reductions in BPS subsidy payments (at this stage). Viewing this situation entirely in terms of ongoing economic gain, rather than the way modern societies are organised by powerful public institutions, we could run the risk of failing to see how nation-states systems, supra-state systems (EU), and international state unions (United Nations) are using satellite systems to remotely regulate and control the economies and ecologies of farming systems, for better or for worse.

Referring back to the quote above then, another relevant point is use of the word 'information' as opposed to 'knowledge'. This denotes a shift from traditional farming practices to information-driven, agri-food operations. For those who have theorised that local knowledge is increasingly substituted by informational knowledge and satellite and IT companies are appropriating (or expropriating) more control, such statements certainly clarify this to be the case. In light of this, farmers recognised that satellite farming would, as theorised, continue to decrease the physical, lay, tacit, or local knowledge generated from interactions with local environments. This would have an effect on the skills required for particular aspects of farm work. Deskilling was raised in a focus group when one farmer discussed the economic benefits of auto-steering systems:

> as long as you've got somebody who can set it up and get (the equipment) going, then you don't necessarily need a very skilled person to drive (the tractor). I've found that out because I've had [my daughter], who is eighteen, I can sit her on the tractor to do cultivating and she doesn't have to know how to do all the bits and pieces—as long as she does not drive through the hedge at the end of the field, which is quite common sense (Farmer 7; Focus Group 1, Jan 2014)

Traditional, lay, local, or tacit knowledge and the skills developed from interacting with the local environment can now be substituted by satellite-generated data to drive automated technologies. The input of data to substitute labour power at the second stage of Marx's economic

model thereby reduces labour costs and increases financial outputs at the fourth stage of the cycle. This economises the system. However, farmers still need to employ 'somebody' to set the system up and get it going. This third-party reference is to the growing industries of satellite and ICT experts that are developing beyond the farm gates and local horizons. If the farmers do not employ external IT services, then the adoption of satellite farming means more technical and computer-based labour, and the acquisition of new skills, for the farmers. Although they are not IT experts or communications engineers, they are slowly being drawn into this mode of agricultural production, as one farmer puts it:

> this whole thing (satellite farming) is *hugely* time consuming. It takes hours … trying to get the thing set up … And, actually, in your day-to-day job the amount of hours (Farmer 12) actually takes to set all the fields up, to figure out what's going to go where and then put a little chip in the tractor: When you're actually on the tractor it's very quick but it takes *hours*. It's hugely time consuming … and I don't think you save any time. (Farmer 9, Focus Group 1)

To increase efficiency, reduce labour time, and decrease labour inputs, then deskilling would occur in a practical area of their work life (tractor driving and equipment operating) and reskilling would need to occur in the technical and IT-related aspects of farming operations. In response to a discussion of this transition to informational knowledge and IT-based skills came during a focus group when the farmers were asked about the loss of lay or tacit knowledge:

> **Farmer 1:** If you go back two generations to our grandfathers who were ploughing fields with a horse, they would have had much smaller parcels of land than we do, they would have *known* the patches of land as they were going across wouldn't they, each year: 'Well, there's a sort of heavy bit of ground coming up here', 'a patch of stinging nettles always sort of grows here', or a patch there: They would have been much more *in touch* with the actual land, than what we are...
>
> **Farmer 4:** Square yard by square yard...

> **Farmer 1**: ... and as time goes on and things get sort of 'bigger', you begin to lose that connection and you get the wind in the face, and you know the hedgerow...
>
> **Farmer 7:** We've nearly seen that in our generation, from the old-fashioned tractors to the more modern ones: I mean, you're always being sort of closed away, and I think it's a sort of tremendous change, and its taken for granted and accepted, but in a way it's quite a loss as well... (Focus Group 1; 2014)

The measurement system of 'square yard by square yard' can be traced back to the measurement system of the Roman Empire's *per scamna et strigas*, or 'breadths and lengths' (Weber 1998, p. 302–305). Throughout a long history of technological evolution, the separation and alienation of human from environment, as well as the loss of knowledge gained from physical interactions with environments, are, according to the last statement, embodied in the technology of the modern tractor cab. Because tractor cabs are increasingly designed to be office-like, with more modern conveniences, air conditioning, and IT equipment, according to Marxist theory, they therefore exacerbate the metabolic rift within the immediate space of the farm environment, and this transition would subsequently bring with it a loss of knowledge derived from physical interactions with natural environments.

But not all recollections of the history of English agriculture, natural environments, or 'nature' were considered kindly or romantically, and the reasons for investment in technologies are often linked to the harsher realities of natural environments. It is more the case that the farmers generally view technological advancements as progressive improvements. One farmer continued to recall:

> Our dad was saying about a field we were drilling which we took out of grass; the last time it had been drilled was the day before I was born, and he said, that day … we were driving an open top Fordson tractor with a drill on the back, and it was two of us, and we were bloody freezing! And, he said, three weeks later someone came into the yard with a tractor with a cab on, and he said the next time we had the opportunity we bought one... So, sometimes, it's not so romantic to be stuck out in the cold feeling like it's going to rain on your face! *Not for the guys who are doing it*! (Farmer 9; Focus Group 1, 2014)

It was clear to the farmers that certain forms of knowledge that were generated from physical interactions with nature were being phased out. Increasingly technical or scientific knowledge was the substitution; hence the majority of the interviews with farmers on satellite farming included highly technical discourses about implementing satellite farming, or scientific discourses about chemicals and fertilisers. Nevertheless, farmers could recognise English farmers' economic agencies in bringing about a structural shift from pre-industrial farming to industrial farming; the transition was not entirely imposed on them 'top-down' from the government or agri-businesses—a conclusion that a Marxist analysis would lead us to draw. Generationally, as farmers invested into new equipment with new benefits and costs, they perceived themselves as active 'agents of technological change' (Kline and Pinch 1996). They also recognise that while economic forces pushing them towards adoption are strong, their own agencies can shape the future of farming, as decisions are made to invest into satellite technologies or otherwise.

With less employees on the farm, much of the labour has been taken on by these farmers and farming families and the automation satellite farming delivers could further alleviate the intensity of physical labour or 'the drudgery'. 'Fatigue' was a reoccurring word. While some aspects of pre-industrial agriculture, such as ploughing with shire horses, can be highlighted as labour-intensive, the general shift towards Fordist-style industrial agriculture lessens labour intensity but is still recognised for increasing monotony and uniform routine. The farmers repeatedly complained about the monotony of 'driving up and down, endlessly' (Farmer 1; Aug. 2014). It was widely viewed that if satellite guidance of tractors and equipment could automate these routine-intensive aspects of farm work, then they would be welcomed; if the price is right. Contrary to Szabo's (2013) claims that satellite farming increases routine intensity and boredom, one farmer in particular claimed that satellite guidance made him feel 'chilled out' after a day's work (Farmer 4; Focus Group 1, 2014). A cultural mechanism concerning the value of increased (more routine-intensive) and reduced levels of fatigue between old and new technologies figures into the equation to invest or otherwise.

But farmers do more on their farms than drive tractors up and down all day. Of seventeenth century agriculture in England, Adam Smith

(2008) noted varying job types on a farm, such as 'the ploughman, the harrower, the sower of the seed, and the reaper of the corn'. He made the claim that 'it is impossible that one man should be constantly employed in any one of them' (4). The more general, post-Fordist shift towards flexible modes of accumulation that communication and transportation technologies facilitates fits the tradition of farming more so than modern, Fordist modes of accumulation. The farmers all concurred in individual interviews that they enjoyed 'being their own boss'. There has, therefore, always been a tradition of variety and flexibility in farming that has been carried through to present day. It would seem that unlike office workers, farmers to some extent remain beyond the division of labour. There remain lots of non-routine forms of work within the group, such as delivery driving, teaching, gardening or clearing yards, machinery or architectural repairs, accounting and IT work, stone walling, wildlife conservation, and landscaping. This is before we take into account their business diversifications. Furthermore, hedge-laying, crop walking, or stonewalling were some of the activities the farmers were involved in to improve the aesthetics of their local environments, as well as the enjoyment of working outdoors while generating practical, lay, or tacit knowledge of their local environments. While the shift towards flexibility in work life may come as a shock to those in urban environments, this shift fits in with the varied, working lifestyle that farmers are traditionally used to.

When asked in individual interviews what they enjoyed most about farming, except one, all the farmers still concurred that they loved working in 'the great outdoors'. One farmer stated: 'when you get in at the evening, you feel satisfied by what you've done … The days when I've come in feeling satisfied are not the ones when I'm sat in an office. So, it's the actual hands-on, physically *growing* a crop, and seeing it grow' (Farmer 1; Aug. 2014). As Dickens and Dean have theorised, for these individuals a sense of happiness and fulfilment is still derived from manually and physically interacting with local environments. The farmers refer to their jobs as a 'lifetime vocation' rather than a job role within an advanced division of labour. Unlike some factory or office workers, farmers could be considered fortunate in this sense. Given this autonomy and love for outdoors environments, then it is somewhat strange then that these farm-

ers would invest into agricultural technologies that seem to require more office-based skills.

The same global markets that are pushing farmers towards the adoption of satellite farming are also pushing farmers towards cooperation and diversification at a local level. When questioned about automation and the prospect of 'fully-automated farms' (such as Blackmore's concept of the MF-Scamp), only a handful of farmers considered taking increasing leisure or holiday time. The majority responded with ideas for new business ventures that could be incorporated more successfully with family time; these are family farms after all. 'Well, yeah, you'd invest your time elsewhere, whether it's more business or spend more time with your family', one farmer mentioned (Farmer 6; Aug, 2014). Another replied:

> If I *did* have spare time … I'd probably put my time into marketing my own produce … Yeah, you'll probably be, hopefully, replacing it with trying to do some good marketing and selling and that's where I'd love to have more time to do things. Like, at the moment we grow a lot, you know, we do a lot of the work, and dividing time between family and farm is tricky, but if I had an extra hour a day … I'd probably put (it) to marketing and that sort of thing (Farmer 10; Aug, 2014)

It would seem then that while certain levels of control might be given over to agro-chemical, agro-technical, and IT companies, other than the breakdowns that are caused in the advanced division of labour, the farmers are not only fine with this transition but also actively learning and applying technical knowledge to facilitate the shift. However, the intensification of conventional agriculture is not the only end goal since opportunities to diversify their businesses are opening up with flexible modes of accumulation. As Harvey (1992a) puts it, 'the postmodern turn has proved a perfect vehicle for the development of new fields and forms of profit-making' (125). Business diversifications also receive public subsidies offered by the Rural Payments Agency to boost rural economies in England. Currently, within the cooperative group the farmers are involved in diversification projects such as growing specialist crops like quinoa and linseed, B&B businesses, solar energy production, establishing a local butchery and farm shop, a small-scale rapeseed oil production

company, offering an educational outlet for local colleges, as well as a trial centre for the Home Grown Cereals Authority. What is interesting about most of these business diversifications is that generally they represent reversions back to more traditional forms of local, rural, pre-industrial, knowledge-practices and a means of diversifying to pay ground rent and make money. While the more routine-intensive, industrial areas of contemporary farming are becoming increasingly automated, intensified and appropriated by more powerful forces within the agri-food and agri-tech sector, avenues are opened up for farmers to revert to more traditional, non-routinised, socially orientated, and flexible economic and leisure activities. For these family farmers, then the intensification of industrial agriculture that satellite networks offer could offer an escape route from the intensification of industrial agriculture.

Conclusion

What is causing the IT revolution in England's agricultural industry? Tensions between industrially manufactured chemical mechanisms, which aim to boost yields and economic growth, and physical and biological mechanisms within ecological systems push forwards the design and development of TEIs such as satellite farming. The continuing logic and trend of the accumulation of capital are still in motion, undeniably. The capitalist logic of get big or get out has profoundly affected local farmers in England for quite some time now. Industrial farm equipment has over the past 100 years intensified and further routinised the routine aspects of traditional, pre-modern arable farming (drilling, sowing, cutting, thrashing, etc.). Powerful nation-state organisations have established satellite networks and zoned the planet earth in such a way as farmers can 'opt into' these spaces of digital monitoring, control, and coordination.

In terms of the qualitative effects of satellite farming, it is helpful to draw a distinction between 'routine-intensive' and 'non-routine' forms of work type, as Frey and Osborne (2013) have done in their research into the substitution of human labour by computers. Concerns and criticisms about the commodification of the local knowledge farmers possess into the form of data inputs are clearly valid, especially since conven-

tional farmers in England are pushed towards satellite control systems by economic, industrial, and ecological mechanisms, which is causing them to become more dependent on data as an immaterial input in food production. But this is happening on the routine-intensive side of a farmer's farm business. Even with satellite guidance systems installed, tenant farmers are not only still busy driving and operating farm equipment, but engaged in stonewalling, specialist crop production, crop walking, grain hauling, transport, environmental stewardships, local farm shops, and so on. These non-routine aspects of their farm work are far from 'on the demise' or being entirely 'phased out'. While farmers intensify one area of their businesses they could overcome the metabolic rift by interacting with nature through non-routine production processes, interacting with nature in different or more traditional ways, whilst developing new forms of local knowledge. The farmer's autonomy and lifetime fulfilment of their 'species being' could be realised within these time and space zones that are not automated by technologies such as satellite systems. In Aristotelian terms then, *phronesis*, or practical wisdom, could continue to develop 'under complex conditions not susceptible to routine or rule-following decision-making' (Dean 2014, p. 7).

At a local level, tensions between industrial and ecological metabolisms are difficult for farmers to observe, such as direct disabling effects that food production processes have on local and non-local ecological systems (nitrogen wastage, energy wastage). Farmers have come to depend upon the advice and guidance from an 'intellectual class' of experts from often non-local urban centres. Satellite farming facilitates the input of these external knowledge within the control system—like positive/negative feedback to a thermodynamic system or cybernetic-control system. Being able to opt into or out of various satellite networks by choice maintains the farmer's autonomy within markets as individuals and as a collective. The farmers I have worked with generally welcome such advice and realise the benefits for their environments and businesses but are opposed to being centrally controlled by urban dictators who lack local knowledge. If satellite systems, as Giddens argues, are to facilitate the 'ordering and reordering of social relations in the light of continual inputs of knowledge affecting the actions of individuals and groups', then these inputs of

external, expert knowledge need to be of high quality to enable economic and ecological stability.

Furthermore, reversions to more localised and traditional cultural methods of farming which flexible modes of accumulation offer to farmers could see the burgeoning of local family-farming businesses in the future. As satellites monitor the positive and negative effects of food production, then there is the potential here to feed that information to filter through to a consumer base of environmentally aware, 'concerned citizens' (Enzensberger 1996). Furthermore, as farmers attempt to diversify their businesses towards more traditional, locally situated forms of food production, then connecting these concerned citizens with local outlets might be a way of further weaning modern food producers and food consumers off highly competitive, ecologically unsustainable, and economically turbulent, mass-scale markets. We can expect then a kind of 'hybridisation' of local and global agricultures in which some labour time and spaces are dedicated to intensive, industrial agricultural processes, and other times and spaces are dedicated to more traditional, family-farming practices. The more the former is routinised, intensified, and automated, the more creative, flexible, and non-routine the latter may become.

Finally, the historical materialist and critical realist framework is a powerful tool for analysis since it gives us insights into these ecological and economic tensions and drivers. However, it fails to fully account for the external influences that governing bodies play in subsidising agriculture or the imposition of policies, laws, and regulations to ensure fair market competition, mitigate ecological risks, or limit monopolisation, for better or for worse. Although Harvey argues that flexible accumulation is marked by the 'withdrawal of the nation-state from interventionist policies coupled with deregulation and privatization', throughout the transition to satellite farming we can see multiple instances of political policy designs and public subsidisation schemes: NASA, The EU, The UK government, and bodies such as Defra, RPA, CAP, BPS, and so on. Through public subsidisation of markets then to some extent Marx and Engels's vision of the control over the means of production by society has partially come true throughout Europe. However, this system of public subsidisation is far from perfect, and criticisms have been made about

large landowners in England creaming off public subsidies (Monbiot 2014), as well as the effects subsidisation schemes have on commodity prices in developing cultures. Injecting public finances at the top end of the agri-chemical and agri-equipment market should continue to be a politically contested economic strategy. Although consumer tastes have some influence over market trends, by and large publically funded organisations maintain a great deal of control over agricultural economies. As a result of the CAP and BPS, then England's agricultural land has subsequently become a showground for conflicting political agendas that push in different directions for deregulation, deindustrialisation, greening policies, ecological reserves or more social access to land, and so on.

Satellite-farming systems are extremely powerful control systems for calculating, organising, coordinating, and managing economic and non-economic activities. A new public and private space is emerging in which farmers are losing traditional forms of sovereign, autonomous control over their land. However, whilst the strength of the economic forces pushing farmers in this direction should not be overlooked, underemphasised, or downplayed, it remains that in politics and consumerism, industry and activism, inputs of knowledge about reflexive modern, industrial, globalised society's interactions with nature can provide opportunities for humans to begin to imagine, envision and innovate new ways forwards, whilst steering the circulation of capital towards enabling conditions more favourable for future generations.

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8

Computers and the Alienation of Thinking: From Deep Blue to the Googlemobile

Kathryn Dean

Introduction

Peter Dickens's life's work is marked by a remarkable broadness of perspective, intellectual boldness, and political sensitivity. What is particularly appealing about this multi-faceted body of work is the ethic of human flourishing that provides its informing principles. In this respect, Dickens's focus on the relationship between 'internal' and 'external' nature, derived from Marx's famous claim that, in making a world we are also making ourselves, has been particularly inspiring. In his book *Society and Nature* (Dickens 2004), he reminds us of the destructive effects, on both human and non-human natures, of the immense revolution in thinking and doing experienced in Western Europe from the 'Age of Enlightenment' onwards. As part of the evaluation of these effects, the book includes a discussion of the implications and possible effects on our internal natures of the 'informational society' of post-Fordism.

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One of the identifying characteristics of the 'informational' society, also labelled the knowledge society or cognitive capitalism, is that social relations and the myriad activities needed for the reproduction of everyday life become mediated by computers.[1] Over a decade ago, when Peter Dickens was writing *Society and Nature*, such mediation was taking place largely, but not wholly, in the sphere of 'labour', that is, of the productive activities involving routine manual work. Presently automation has the potential to effect an analogous transformation of 'mental' or professional work. More recently, he has discussed cognitive capitalism in terms of the politics of human 'species-being' (Dickens 2009). In paying tribute to, and drawing on, Dickens's work on contemporary capitalism, I shall focus on the ways in which new computerised technologies are implicated in the 'remaking' of human thinking, doing, and knowing. These technologies include robotics and 'artificial intelligence' (AI), these being enhanced in their range and effectiveness of functioning by the possibilities associated with the use of 'big data'.

Rather neatly, two important thinkers have considered the question of human remaking associated with the post-Fordist manifestation of capitalism and have arrived at opposite conclusions. Referring to the 'postmodern condition', Jean-Francois Lyotard (1984) is pessimistic. Referring to 'cognitive capitalism', Carlo Vercellone (2007) is optimistic. Lyotard warns of the danger of human reduction via computer mediation, whereas Vercellone hopes for an unprecedented form of human flourishing once knowledge becomes the principal productive force, as Vercellone expresses it.

Writing in the late 1970s, Lyotard alerted his readers to two related potentials inhering in the emergent computerisation of thinking, relating, and acting, or cyberspace, as it was coming to be known. The first concerned the nature of knowledge itself and the likelihood that learning not translatable into 'quantities of information' would become irrelevant. The second related to the relationship between knowers and known and concerned the computer's potential for the 'exteriorization of knowledge

[1] See Castells's (1996) work on 'The Information Age' for a comprehensive treatment of the early stages of this development. Dyer-Witheford (1999) provides a Marxist analysis of the developments in question.

with respect to the "knower"', wherever the latter might be placed in 'the knowledge process'. It is important to note that in making this pronouncement in relation to learning, Lyotard was anticipating the obsolescence of *Bildung*, as he put it. By *Bildung*, Lyotard meant a principle of human nurturing understood as a form of intellectual and cultural enrichment requiring long-term and clearly focused education in thinking abilities (Lyotard 1984, p. 4; for more on *Bildung*, see Sennett 2008, Chap. 3).

In contrast to this pessimistic analysis of the computer's dehumanising potential, the Italian Autonomist thinker Carlo Vercellone anticipates the emergence of a new, socially and cognitively enriched mode of life from the present manifestation of capitalism. That is, along with others writing in the Italian Marxist tradition, he hopes for the transcendence of the mental–manual division of labour that characterised Fordist or mechanised capitalism. In a paper published in *Historical Materialism* in 2007, he uses Marx's 'Fragment on Machines' in the *Grundrisse* as the source of this argument (see Vercellone 2007; Caffentzis 2011).

In drawing on Marx's fragment, Vercellone finds in the reference there to 'general intellect' an indication of a new mode of subsumption to capital, emerging out of the 'real' mode of subsumption in which the split between manual and mental labour emerged (the distinction between 'formal' and 'real' subsumption is explored further below). Vercellone terms this new mode of subsumption 'neo-formal' and concludes that Marx's fragment anticipates the emergence of 'cognitive capitalism'. Whereas Fordist capitalism involved the radically unequal distribution of human intellectual capabilities, cognitive capitalism is correcting or minimising this inequality. This mode of capitalism, Vercellone argues, requires a 'diffuse intellectuality' developed through popular access to higher education and manifested in new accumulations of skill and knowledge on the part of increasing numbers of workers. Thus, workers who were previously really subsumed to capital are emerging into the greater freedoms and richer mode of life of the neo-formally subsumed. In fact, for him, the new mode of capitalism requires a 'cooperative social rationality' that effects escape from the toxic status of 'human capital' (Vercellone 2007, pp. 32, 31). That is, the increasing importance of new knowledges borne by the living bodies of individual workers is coming to change the ratio

of living to dead labour (or stored-up labour embodied in machines) in favour of the former.

Vercellone's optimistic judgement derives from his conviction that certain kinds of knowledge are impervious to codification and therefore they cannot be exteriorised or alienated from individual workers' bodies. Such, he thinks, is the knowledge attaching to the bodies of the workers required by capitalism today. In this, it is unlike the knowledge possessed by those craftworkers who suffered real subsumption from the late eighteenth century onwards. In being resistant to codification, the new knowledge, therefore the stratum of workers in possession of this knowledge, is resistant, also, to 'takeover' by capitalists. Yet capitalists are increasingly dependent on such knowledge. Moreover, the contemporary increase in the numbers of knowledgeable bodies relative to machines is effecting the enhancement of antagonisms through the greater ability of such workers to recognise contradictions. It is effecting the political re-energising of capital's socially necessary workers, as Michael Hardt and Antonio Negri (2000, 2009) have argued in some detail. For this reason, so Vercellone hopes, the attempted enclosure of new knowledge, by means of intellectual property rights (see also Krikorian 2010) and the imposition of monopoly rents on knowledge, is unlikely to succeed.

Lyotard's pessimism derives from his judgement that novel kinds of exteriorisation or alienation of human powers have become possible with the advent of a system of computerised machines. Lyotard does not elaborate on the concept of exteriorisation, but it makes sense to consider it in terms of the codification about which Vercellone speaks. Considered as such, Lyotard is drawing our attention to the potential inhering in computers for a new mode of codification, in this case requiring the reconfiguration of knowledge as information. Only through this reconfiguration can existing knowledge be translated into a computer-compatible language (see Gleich 2011).

In my examination of this question, I shall elaborate on the different judgements of Lyotard and Vercellone by focusing on claims about real subsumption and its nature. In doing so, I shall focus on the question of exteriorisation and codification of thinking and knowledge in terms of the distinction between explicit and tacit knowledge. Whereas in the

pre-capitalist past, the work of reproducing everyday life was carried on largely through the use of tacit knowledge involving skill and everyday cooperation, capitalism requires explicit knowledge having the precision deemed to be available only via modern sciences and mathematics. This requirement relates to the fragmented character of its divisions of labour. Thus, successful real subsumption required an epistemological revolution that rendered the everyday knowledge of craftwork irrelevant to the reproduction of everyday life. This was effected during the long mechanising or industrialising revolution through the codification of craft knowledge on the one hand, and the large-scale injection of scientific knowledge into the production process, on the other (see Dean 2014). Marx expressed the result in terms of the triumph of 'dead' over 'living' labour. Vercellone's analysis promises that this oligarchy of knowledge, as represented in the split between 'mental' and 'manual' labour, will be re-democratised through changes in the ratio of dead to living labour in favour of the latter. He is claiming, in effect, that the dead hand of a system of machinery is becoming deprived of its cognitively impoverishing and politically neutering powers.

In the following discussion, I shall explore this problem by, in the first section, considering briefly Marx's remarks on knowledge and technology in his 'Fragment on Machines' from which Vercellone derives his account of neo-formal subsumption. This discussion will include an account of the differences, as set out by Marx in 'Results of the Immediate Process of Production', between formal and real subsumption of craftwork to capital (see Marx 1973, pp.704–706; Marx 1976, Appendix). In the second section of the chapter, I shall elaborate on these differences in terms of the subsumption of living to dead labour permitted by the codification of craft knowledge. Through this codification, the tacit dimension of craft working was marginalised or made redundant. The specificities of the knowledge needs of cognitive capitalism, as manifested in the informational turn, will be treated in section 3 in terms of the AI project which has been vital to the development of new forms of codification, namely, digitalised algorithms and datafication. In section 4, the significance of these developments will be laid out by means of the modest example of the Deep Blue chess match played between a

computer program and Gary Kasparov in May 1997. Generalising from this example, the fifth section of the chapter will be concerned with the rapidly expanding use of computerised or datafied algorithms in the professions today.

Marx's 'Fragment on Machines': General Intellect and the Real Subsumption of Labour to Capital

In the notes on machines, Marx uses the concept of general intellect in relation to the contradiction between the increasing insignificance of necessary labour time in the production of surplus value and capital's undiminished focus on labour time as the only measure and source of wealth (Marx 1973, p. 706).[2] The reduction of necessary living labour time relates to the centrality of mechanised activity: the incorporation of the results of past living labour into machines. By the late nineteenth century, the increasing direct scientisation of mechanised industry was coming to change the ratio of 'dead' to 'living' labour in favour of the former. At this point, general intellect was largely concentrated in science and technological development, and, as Marx put it, the living worker 'steps to the side of the production process instead of being its chief actor' (Marx 1973, p. 705). At this point, there emerged the possibility of 'the development of the general powers of the human head' through the allocation of surplus value to human enrichment rather than capitalist profitability (p. 706).

This possibility came about as the unintended consequence of the real subsumption of craftworkers to a system of machines which required that the majority of these workers take up the occupation of machine minding (Marx 1976, Chaps. 14 & 15). The result was an extraordinary mismatch between the kind of dehumanising living labour involved in the production process and the wealth produced by that same process. So great was this mismatch that, in fact, living labour time ceased to be the

[2] On this fragment, compare Postone (2008) with Vercellone (2007). Postone (1993) provides the most extensive discussion of the significance of this point today.

'sole measure and source of wealth', that is, wealth production became *relatively* independent of the activities of living labourers. Yet capitalism, necessarily, proceeded as if this was not the case because capitalism must take the reduction of living labour time as a source of surplus value rather than of enhanced human well-being. Recognition of this 'moving contradiction' of capitalism would permit the re-direction of this surplus value away from the capitalist and towards the 'free development of individualities' (Marx 1973, p. 706). This desirable outcome is what Vercellone identifies as a potential in today's mode of capitalism. In order to evaluate the strength of this potential, I shall elaborate on what Marx had to say about the differences between real and formal subsumption of labour to capital in his Appendix to *Capital*, vol. 1 (1976).

Formal versus Real Subsumption of Labour to Capital and Changes to the General Intellect

The general intellect analysed by Marx in the remarks on machines was a radically undemocratic general intellect marked by the monopolisation of socially necessary thinking by capitalists and their necessary intellectuals (see Marx 1976, pp.1019–1065).[3] As such, general intellect took the form of an impersonal, coercive force looming over individual workers who, as Marx puts it, were no longer the 'chief actor' in the production process. Far from this being the case, they were subsumed to the 'collective worker', or system of mechanised production directed by a class of capitalists and their intellectuals.

The capitalist divisions of labour involve a mode of cooperation whereby the productive power of collective human action is vastly increased but in such a way as to diminish that of the individuals subsumed to this collective power.[4] The essential difference between formal and real subsumption, or between manufacture and machineofacture, is that under

[3] I borrow the concept of 'socially necessary thinking' from Alfred Sohn-Rethel (1978). In his indispensable work on the splitting of mental and manual labour, Sohn-Rethel discusses the multiple routes to this dehumanising outcome in Chaps. 16 and 17 (see also Dobb 1963).

[4] As Marx notes: 'In order to make the collective labourer, and through him capital, rich in productive power, each labourer must be made poor in individual productive powers' (quoted in Dobb 1963, p. 223).

the former the worker's skilled and knowledgeable body remained the source of production, whereas under the latter, the various constraints that this reliance on individual bodily capabilities necessarily entails from capital's point of view were removed by way of mechanised activity. Formal subsumption emerges out of the putting-out system and proceeds by different routes to real subsumption (see Dobb 1963, Chap. 4). One such route is that of capitalist organisation of workshop production using 'detail' craftworkers. In this case, the area of worker expertise is shrunk to fit the requirements of maximum efficiency and control. Thus, each worker becomes responsible for a small part of the operation and the smooth functioning of the workshop becomes machine-like in its procedures. As Braverman (1974, p. 82) points out: 'The generalized distribution of knowledge of the productive process among all its participants becomes, from, this point on, not merely "unnecessary", but a positive barrier to the functioning of the capitalist mode of production.' Imaginative, cooperative, organisational dimensions of the work are abstracted from workers and appropriated by capitalists, as is disposal of the objects thus produced. These necessary dimensions of the work were taken over by the profession of management which would emerge as a distinct discipline during the early twentieth century (see Braverman 1974, Pt I; see also Doray 1988). Yet the skilful use of tools remains a necessity if production is to proceed, or, the skilful knowledgeable individual worker's body remains the principle of workshop activity. Living labour remains crucial to capitalist purposes.

With the emergence of real subsumption, capital 'now establishes itself as a mode of production *sui generis* and brings into being a new mode of material production' (Marx 1976, p. 1035).[5] This new mode of production is characterised by the displacement of craft skill by machine minding and of craft knowledge and small-scale farming by science. Expressed otherwise, it is characterised by the division of mental and manual labour. At this point, as Marx points out, production is 'in contradiction, and

[5] See Dobb (1963, Chap. 6), on the different sources of proletarian 'labour' needed for the initiation of this development.

indifference, to the *producer*' who becomes the mere means of producing surplus value for the capitalist (Marx 1976, p. 1037).[6]

I shall now discuss these developments in terms of the exteriorisation of craft knowledge—its alienation from the bodies of individual craft-workers—effected through its codification.

Real Subsumption: Codification and the Exteriorisation of Craft Knowledge During the Industrial Revolution

The codification of artisanal knowledge was proposed by Francis Bacon in the early seventeenth century in terms of bringing to light the closely guarded trade secrets of craft guilds. These secrets would be represented in textualised terms through the distillation of arduous trial-and-error craft activities into formulae for making. As Bacon put it, experience would be made to 'learn her letters' and artisans' 'cunning', nurtured through bodily training, would be replaced by explicit calculation, involving the drawing up of blueprints to be used as the basis of strict regulation of bodily movements (see Eamon 1994, quoting Bacon p. 9).

This codification was one of the tasks with which Diderot and others were concerned in the course of compiling the *Encyclopedia* during the eighteenth century. What they discovered was the inability of craftworkers to 'mirror' their own activities in words. As Richard Sennett points out, this inability is not a matter of ignorance or stupidity. Rather, it relates to the inadequacy of language as a '"mirror tool" for the physical movements of the human body' as these movements have been trained for specific cultural purposes (Sennett 2008, Chap. 3, especially p. 95). This inadequacy is a feature of the relationship between language and any human activity having this dimension (more on this later). Such activities range from tying shoelaces to riding a bicycle to playing a musical instrument to driving a car to numerous professional activities from the practice of architecture to the flying of planes. Yet, through the systematic

[6] In addition to Sohn-Rethel (1978), see Braverman (1974, Pt II). Aronowitz (1992) focuses on the scientific dimension.

attentiveness of new kinds of inventors and engineers, as well as of literate craftworkers, craft knowledge was absorbed into a mechanical and mechanising universe of thinking and doing in the course of the eighteenth century. This absorption was particularly systematic and effective in Britain where, prior to the direct appropriation of the new natural sciences by late nineteenth-century capitalists, the mechanical philosophy of Newton had been broadcast, during the eighteenth century, by means of popular handbooks which were read and used by these new strata which included emergent capitalists. These strata shared the same mechanical objectifying language as well as an agreement about the importance of habits of precision and exact fit between parts (see Jacob 1997, especially Chap. 5).

The formulaic reduction of artisanal 'cunning' was one important condition of possibility for the real subsumption of craftwork to the machine. This formulaic reduction involved the exteriorising of craft knowledge in part through the alienation of the imaginative and executive powers inhering in independent craft production (as well as ownership of raw materials and the objects being produced) to capitalists, and the codification of aspects of craftwork deemed useful to the latter. Through the fragmenting 'representation' of aspects of artisans' activity, multi-sensuous, multi-material intelligent, and manually dextrous activity was made explicit through written rules expressed, ideally, from capital's point of view, in very precise, quantitative terms. This reduction was a transformation of craft knowledge into a form susceptible to mechanical use.[7]

In the process of exteriorisation effected through codification, the 'manual' dimension of knowing was reduced to the cognitively impoverished status of machine minding for the majority of craftworkers, as noted before, and the knowledge component extracted from craftworkers' bodies became appropriated by capitalists of various kinds and used as the source of blueprints and inventions. These codified representations of craftwork became the basis of the system of machines which represented the accumulated labour of past generations of workers. They were a necessity for capital's appropriation of this accumulated, or 'dead',

[7] Indifference to specificity as manifested in the historico-cultural is essential to the success of this endeavour (see Sohn-Rethel 1978, Chap. 9).

labour. In the process, what had been individuated skill-rich techniques became part of a system of technology as manifested in the Industrial Revolution.

As already noted, this system also required new strata of 'mental' workers such as engineers and managers, from the start. Later in the nineteenth century, new knowledges labelled 'science' became predominant on the 'mental' side of the labouring divide. These knowledges took codification to a higher level of abstraction than that required for the earlier mechanisation of production (see Braverman 1974, Pt II; Sohn-Rethel1978, Chaps. 16 & 18). Such were the highly specialised natural and social sciences that now became necessary to the reproduction of everyday life. At this point, knowledge, as implicated in the production of everyday life, became conceptualised as a written set of statements, of recipes, or formulae having direct and accurate reference to such objects and doings in the world. Achieving the precise referential fit between such knowledge and its objects involved a remaking of the objects in question. In effect, both representing language and the objects to be (somehow) represented had to be transformed. Making language fit for its referential purpose required that it be pared down, cleansed of poetical, rhetorical, and/or religious resonances. Indeed, the more language became distanced from everyday spoken usage, the better qualified was it deemed to be as a facilitator of knowledge development. From this point of view, mathematised symbolic 'language' was elevated over all other forms of textualisation.[8] Humans, as 'objects' to be represented, were reconceptualised in the disciplines of physiology and psychology, among others.[9]

Emergent capitalist needs for the kinds of absolute precision attainable through quantification arose with an increasingly differentiated division of labour. One of the tasks of physiology was to render the movements of workers as potential machine minders susceptible to such precision and uniformity. To this end, human bodily movement was conceived of as a 'human motor' whose parts could be disassembled and reassembled

[8] See Dear (1995) for the seventeenth-century sources of mathematics' epistemological elevation. Sohn-Rethel (1978, Chap. 15) sees mathematics as the dividing line between the mental and the manual. See also Dean (2014, Chap. 4).

[9] Much of Foucault's work can be read as a long meditation on these developments (see, for example, Foucault 1979, 1980).

to make them more productive and more predictable. For the purposes of study, individual humans were abstracted from their everyday context and their movements examined in abstraction from any everyday activity. These movements were broken down into temporally and spatially separate sections or events and observed and recorded with the help of new techniques such as photography, and of new uses of old techniques such as line drawing (see Rabinbach 1992; also Dean 2014, Chap. 4; Doray 1988; Wendling 2009). By these means, precise quantified knowledge of such movements became possible. In psychology, a new focus on the individual was effected through what Nikolas Rose (1985, p. 5) describes as an act of 'differentiation and quantification'. These individuals were also studied in terms of the capacities needed to sustain attention under the highly routinised conditions of mechanised production.[10]

The new scientists, as novel kinds of professional intellectuals, were highly knowledgeable and skilled in relation to their novel kinds of objects of knowledge and had at their disposal increasingly sophisticated technical instruments as the necessary means of both constituting and understanding these objects. Yet, insofar as they were becoming directly or indirectly implicated in the capitalist mode of productive activity, they were becoming formally subsumed to capital.[11] As with craftworkers becoming detail workers, and in contrast to the condition of proletarians, scientists' individual bodies were repositories of knowledge and skilfulness, but, in many cases, these bodies were becoming part of a system of thinking and knowing that was socially necessary for capitalism. Insofar as this was the case, formal subsumption was taking place.

Real Subsumption and the Fate of Tacit Knowledge

The epistemological distinctiveness of fully realised industrialised capitalism is that, in the interests of control of workers and the maximum

[10] See Crary (2001, Chap. 1), for a discussion of the nineteenth-century psychology of attention.

[11] Marx expresses this emergent condition as follows: 'large-scale industry … makes science a potentiality for production which is distinct from labour and presses it into the service of capital' (Marx, 1976, p. 482; see also Braverman, 1974, Chap. 7). Sohn-Rethel's (1978) wonderful book is an attempt to answer the question: how did the capitalist ruling class get the intellectual labour it needed?

efficiency of productive activities, tacit knowledge must be rendered redundant or, at best, made subservient to codified, explicit knowledge, the latter preferably of a scientific or mathematical kind. In the world as shaped by capitalism, this kind of explicit knowledge is the only kind that matters. Its possession is what makes capitalist cultures 'cognitive' or 'knowledge societies'.

From this point of view, and by implication at least, all pre-capitalist cultures were, somehow, ignorant societies. Yet they managed to persist over time without the rich knowledge inheritance in which written explicit knowledge has consisted since the invention of print (see Dean 2014, Chap. 3). They persisted over time because their members were capable of interacting, in a systematic fashion, with one another and with non-human natures in such a way as to secure the conditions necessary for their own successful reproduction over time. That is to say, they were capable of knowledgeable activity (see Goody 2010, Chap. 7; Ingold 1986, esp. Chaps. 3, 4, & 7). Knowledge was stored in individual human bodies rather than in texts or in systems of machines. It was 'lived in' knowledge of how things worked rather than codified knowledge of why they worked: 'knowing how' rather than 'knowing that', as Gilbert Ryle (1963, Chap. 2) put it. This was the character of vital knowledgeable practices such as hunting and gathering, lassoing and navigating, making pots and cooking, weaving textiles and making clothes.[12] It was also the character of many apprenticeships to the crafts needed for the reproduction of urbanised everyday life up until the eighteenth century. Thus in pre-capitalist cultures, insofar as 'dead labour' existed at all, it was marginal to the conduct of everyday life. It took the form of knowledge stored in texts, and, as such, it was a resource for intellectuals rather than the means of dehumanising other categories of workers.[13]

[12] Tim Ingold (1986, 2000) is an excellent source of understanding of tacit forms of knowing in both oral and literate cultures.

[13] Ancient palace and temple cultures constitute important exceptions here (see Mumford 1967). For a discussion of the different degrees of explicitness accompanying different apprenticeships, see Crawford (2015, Chap. 6, esp. p. 133). Ingold (2000, Chap. 1) uses the concept of 'sentient ecology' to refer to modes of knowing as fusion of feeling, skills, sensitivities, and orientation, and the capabilities needed for this mode of knowing being nurtured through long experience in a specific environment. Sterelny (2012) is an important source of understanding of the varied and subtle forms of skilful and knowledgeable doing to be found in pre-modern oral cultures.

Explicit Knowledge and its Limitations

It is important to recognise that explicit knowledge is not the whole of knowledge; that most or all knowledge has a tacit dimension and that some knowledges are wholly tacit. Indeed, there is a large body of work dedicated to demonstrating the unavoidability and desirability of a tacit dimension to human knowledge, relating to the specificities of human biology and our necessary situatedness in specific environments which provide us with the conditions of possibility for living, as well as the challenges to be overcome. This dimension of human knowing has been variously discussed by a number of important theorists from Merleau-Ponty (1962) to Bourdieu (1992) to Michael Polanyi (1967).[14]

The tacit is not susceptible to description or codification. This is because it is embedded in or saturates the human body. It is developed through more or less purposefully repeated and progressively more demanding practice, and it is exemplified in such practice rather than in statements about such practice. At its most accomplished, tacit knowledge is manifested in the ability to respond swiftly and appropriately under complex, sometimes crisis, conditions. It is about the possession of intuition or the exercise of judgement, namely, an ability to grasp the nature of a problem and to decide what is to be done without (apparently) taking thought.

Even in today's capital-saturated world, much of human doing involves tacit knowledge of a 'non-conscious' or 'post-conscious' form. The primary example of non-conscious tacitness is mother-tongue acquisition that takes place through progressive absorption of knowledge and skill through active imitation of mature expert speakers. Everyday speaking is a highly skilled activity involving, as Michael Polanyi (1962, p. 95) puts it, an 'inarticulate act of intelligence' in the sense that the activity is not readily represented in the linguistic form of explicit rules. Indeed, fluent native speakers are likely to be completely incapable of reducing their speaking activity to such rules. This is one of the strongest forms of tacit knowing. Towards the other end of the scale, what comes to be

[14] On the nature and continuing, unavoidable presence of the tacit in human knowledge, see Collins (1990), Dreyfus and Dreyfus (1986), French (1999), Michie (1999), and Midgley (1989). More recently, Crawford (2015) and Sennett (2008) make the case for the importance of tacit knowing of different kinds.

tacit begins with explicitness in the form of stated or written rules, textbooks, or work manuals, which are the basis of a long period of explicit learning via purposeful observation and imitation of experts' practice. At the beginning of apprenticeships, the learner may be required to follow rules as precisely as possible when performing a task. Carrying out the task involves thinking about the rules prior to acting. This is the conscious, or more accurately, the self-conscious dimension of the learning process. However, as learners proceed through different stages of training and education, they become more and more fluent and less and less dependent on active awareness of the rules, which finally disappear into fluid, intuitive doing apparently free from thinking, hence my use of the term 'post-conscious' to help differentiate between different kinds of tacit knowing. Some knowing is wholly tacit, while some knowing has a more or less important tacit dimension. In many cases, the more expert or skilful is the activity in question, the more crucial is the tacit dimension.[15] Yet, today, for reasons to be explored next, the tacit dimension is being marginalised as never before.

Cognitive Capitalism and the Question of Subsumption to Capital Today

The difference between formal and real subsumption is a difference in regulating principles: in the former, the worker, as tool user, remains the regulating principle; in the latter, the machine becomes the regulating principle. Up to now, the individual thinker has been the regulating principle of professional intellectuals' thinking. That is to say, the knowledge required for professional practice has been absorbed into the individual professional worker's body, or 'interiorised', through a process of *Bildung*. Vercellone's concept of the neo-formal is intended to characterise a situation in which the real subsumption suffered by workers demoted to the 'manual' side of the mental–manual division of labour becomes a thing

[15] In discussing apprenticeships of this kind, Dreyfus and Dreyfus (1986) use the examples of nursing and driving (see also Carr 2015; Crawford 2015). Lave (1988) discusses different kinds of apprenticeships in some detail.

of the past. This happens as knowledge becomes the 'principal productive force' and a 'diffuse intellectuality' becomes necessary for capitalist workers. Or, the potential for the reversal of real subsumption is present. Yet there is mounting evidence to support Lyotard's fears that *Bildung is* being made redundant through the potential for new kinds of knowledge 'exteriorisation' associated with the invention of the computer as a symbol-processing machine. Realisation of this potential requires that knowledge take an informational turn. The process of conflating knowledge and information has been underpinned by the (mis)understanding of human thinking as information-processing and is presently proceeding at an accelerating pace under the banner of 'datafication'.[16] This emergent organising principle is becoming the necessary bearer of contemporary capitalism's socially necessary knowing and thinking today. As such, it is a voracious consumer of living labour and a highly efficient 'producer' of dead labour.[17] As such, also, it is effecting an epistemological mutation whereby the explicitness of science is being displaced by that of 'information', the latter expressed in the increasing use of digitalised algorithms and 'big data'. A brief discussion of the AI project will be a useful preparation for examining these new modes of explicitness.

The AI Project and the Informational Turn

Among computer scientists, tacit forms of knowing are either ignored as irrelevant to contemporary life or dismissed as marginal to the activities and concerns of the contemporary world. This approach or assumption provides an epistemological guarantee regarding the soundness of new modes of thinking and knowing associated with the informational

[16] Hakken (2003) is a comprehensive discussion of this topic (see also Mayer-Schönberger and Cukier 2013). Weizenbaum (1976) was an early warning about the humanly reductive potential of 'information technology'. See also Roszak (1988), who provides a historically focused, philosophical treatment of the extraordinary adventures of the concept of information. Gleich (2011) is a more comprehensive treatment of the same topic.

[17] See Frey and Osborne (2014) for a close analysis of the potential for job losses among 'cognitive' workers over the coming years. Dyer-Witheford (2011) speaks of a new reserve army of labour of unemployed academics. See also Martin (2014), who discusses changes in the character of the 'knowing class'. Brynjolfsson and McAfee (2011) explore the computer's emergent ability to colonise non-routine or cognitive work.

turn. The informational point of view was vividly expressed by wholemindedly enthusiastic proponents of the AI project, such as Alan Newell and Herbert Simon, who made the following claim: 'the programmed computer and human problem solver are both species belonging to the genus "Information Processing System"' (quoted in Roszak 1988, p. 22).[18] For AI pioneers who held these assumptions, AI could be attributed to computers if they proved capable of searching logically for a problem's solution. This kind of searching was precisely what human thinking is, or should be, all about.

The Turing Test

Alan Turing's thought experiment about the nature of intelligence and the possibilities of designing a computer capable of intelligent functioning was an important point of departure for these early engineers of AI. The experiment consisted of a test, or 'imitation game', which was proposed by Turing in an article entitled 'Computing Machinery and Intelligence' published in the journal *Mind* in 1950.[19] The game involved three players: a man (A), a woman (B), and a non-human computer; the test being that one of the humans, acting as interrogator, must decide which of the two other participants is the computer. This would be a test in logic, or, in explicit knowledge of a very specific form, namely, a test of decontextualised linguistic performance set up in such a way as to render human specificity irrelevant, or, at least, to attempt to achieve this irrelevance. Thus, to ensure that the 'purity' of logical linguistic performance was protected, participants were confined to separate rooms and would communicate in writing, preferably via a keyboard. This requirement rendered invisible and irrelevant the different modes of physicality implicated in

[18] For a discussion of Newell and Simon's work, see Weizenbaum (1976, Chap. 6). Haugeland (1985, Chap. 1) identifies Thomas Hobbes as the 'grandfather of AI' and an important participant in the invention of the 'modern mind' in terms of a mechanical conception of 'ratiocination', or 'computation'. This mind is understood to function as a kind of abacus by shifting bits of information back and forth as swiftly as possible. In his early work on AI, Dreyfus (1972) contrasts this mechanical conception of human thinking and knowing with the phenomenological approach.

[19] Turing's influence on the AI project is discussed in Copeland (1993), Chaps. 1, 3 & 6; see also Collins (1990), Chaps. 13 & 14; Gleich (2011), Chap. 7; French (1999); Michie (1999).

the testing activity. If, by the end of the game, the human interrogator failed to identify the computer as a computer, an exercise in artificial or machine intelligence would have been successfully accomplished.

It needs pointing out that the question of what, precisely, Turing was intending to test remains controversial.[20] In designing his game, Turing himself insisted that the question about machine thinking is not a good question. Rather, he wanted to test the differences between human and machine intelligence. The focus on linguistic performance of a logical kind suggests that he was not interested in intuitive forms of human thinking. Indeed, one interpretation of his article is that he showed that such thinking is safe from assault by machine thinking.[21] Another argues, to the contrary, that a 'hyperarticulate' computer could make subtle and important forms of human intelligence redundant (Michie 1999).

Regardless of Turing's intentions in writing the paper, its effect on early AI engineers was to encourage a systematic and enthusiastic attempt to design computer programs capable of thinking as humans think. In fact, the rationalist reduction of thinking to the explicit and disembodied was reflected in Turing's attempt to render context and the 'human biological factor' irrelevant. This reduction expressed typical Western intellectual assumptions about the supposedly 'spiritual' or immaterial nature of thinking itself.[22] By negating or neglecting the significance of embodiment and context, the paper induced optimism regarding the likely success of the AI project insofar as this was interpreted as an attempt to get computers to think as humans do. The belief that the physical substrate could be disregarded for AI purposes was immensely encouraging to participants in the project.

[20] See the contrasting descriptions of the test in Copeland (1993, pp. 37–39) and Haugeland (1985, pp. 6–9). The logical character of the test is discussed by Whitby (1999). Michie (1999) criticises the test for its indifference to the role of organic physicality in the exercise of intelligent thinking. Collins (1990, p. 182) stresses the test's concealment of the cultural dimension of human thinking.

[21] Protection from machinic assault seems to be secured because of the extraordinary complexity and necessary 'subcognitive' infrastructure of human thinking (see French, 1999).

[22] Haugeland (1985) has discussed this topic in relation to the AI project, as noted before. Midgley (1989, 1996) discusses it from the point of view of philosophy and the natural sciences. See also Carr (2015) and Crawford (2015), both of whom focus on the threat to tacit knowing today.

Insofar as physicality was taken into account, it appeared in the shape of the human brain. From the informational point of view, human brain functioning could be conceptualised in terms of the linear processing and sequencing of symbols in accordance with explicit syntactic rules relating to simple linear patterns of the 'B' follows 'A' variety. This mechanical conception of the brain served to narrow to the point of irrelevance the distance between human and machine since the thinking emanating from such a brain would be susceptible to unambiguous representations by means of artificial, decontextualised, and well-defined objects of just the kind needed by a symbol-processing machine.[23]

The early linear model of AI was displaced by a more complex model drawing on cognitive science, which was itself a combination of computer science, psychology, and philosophy, to displace linearity by complex parallel processing of networks of representations (see Copeland 1993, Chap. 9). This turn to parallel processing permitted the design of programs for machine learning, learning being evident in the improvement of performance over time without the need for reprogramming (see Forsyth 1986). The purpose of such processing was deemed to be the recognition of patterns based on statistical regularities, working with approximations, and improving its own performance. At this point, the ambition to design a machine that could think as humans think was abandoned as the true complexity of human brain functioning became recognised and the inadequacies of the simple, linear, information-processing model of the brain became clear. At the same time, the attempt to provide a comprehensive account of the extraordinary complexities of the human brain contributed to the design of complex computer programs capable of parallel, as opposed to linear, processing. The result was a symbol-processing machine that could attain human purposes without having the ability to mimic human thinking. Indeed, computers could attain these purposes, insofar as they were narrowly defined, in a far speedier, more accurate, and efficient manner than could any human (see Carr 2015, Chap. 5; Michie 1999). Increasingly, these purposes, as implicated in capital's

[23] Searle (1980, 1990) provides a detailed critique of this conception of brain functioning, and of the reduction of thinking to brain functioning. Feenberg (2002, Chap. 4) discusses the rationalism of AI engineers.

need for increasing amounts of surplus value, concern the subsumption of every aspect of living to the computer. This new kind of subsumption is being achieved by means of increasingly powerful machines capable of running extraordinarily complex programs of algorithms and of absorbing and processing large quantities of new kinds of data.

The Informational Turn and New Modes of Codification

Lyotard's fear was that as the computer came to take on important aspects of necessary thinking tasks, the concept of thinking and what are deemed to be socially necessary human capabilities would become reconfigured to fit its requirements. Under these conditions, knowledge would become reduced to the manipulation of quantities of information, a task for which computers are far better equipped than are humans. Therefore, humans would become the servants of their machines. In light of the above discussion of the fate of craftworkers, I interpret Lyotard's remarks as a warning that a similar fate awaits professional intellectuals today. Or, to put it in the terms used by Vercellone, as computerisation penetrates everyday life, new kinds of codification are permitting the exteriorisation of 'cognitive' labour in myriad professions and, thereby, the enlargement rather than reduction of the ratio of dead to living labour (see above).

Until the 1940s, information had the humble epistemological status of a telephone directory or a railway timetable. It was what was required for success in quizzes on radio and television programmes. Or, as Theodore Roszak (1988, p. 15) puts it, it was thought of as 'disjointed matters of fact that came in discrete little bundles'. The epistemological transformation of the status and function of information has been, and is being, effected by two different routes.[24] The first of these is derived in significant part from the work of Norbert Wiener (1961) who, as founder of the science of cybernetics, claimed that life is, fundamentally, the processing of information. This elevation of the status of information has been implicated in the rethinking of biological processes as a matter of

[24] Roszak's is an excellent account of the extraordinary fate of the modest little word 'information'. For another, see Gleich (2011, esp. Chap. 7).

coding, or communication, as in the contemporary sciences of genetics. Through this reconceptualisation of living processes, the biological sciences are becoming increasingly dependent on computer programs (see Keller 2002).[25] I shall return to this point later.

Yet, this elevated understanding of information did not wholly displace its more modest everyday usage that became another route to epistemological change. It fulfilled this function as the basis of the informational reinterpretation and re-description of everyday activities made possible by digitalisation and datafication. Both of these processes required precisely that knowledge be reduced to 'discrete little bundles' of 'disjointed matters of fact'. Thus, the simple understanding of information that survived from the pre-digital past was taken up into the new kind of explicitness expressed in computer programs. In short, the informational reconceptualisation of knowledge was, and is being, effected through two distinct processes. One pertains to a scientific epistemic mutation related to the informatisation of objects of knowledge, with the related need for algorithmic representation and interpretation of such objects. The other pertains to the reformatting of all aspects of everyday life to render them susceptible to datafication.

About Algorithms

An algorithm is a recipe for achieving a particular purpose, or carrying out a particular activity, in the most accurate, speedy, and efficient manner. A simple recipe will be expressed in everyday language and consist of a list of materials and a set of rules or numbered procedures for the handling of the materials. Such is a cake recipe. Less cognitively accessible manifestations of the recipe were developed in early modern Europe, where the form was used for recording technical processes. As such, it was knowledge expressed, ideally, in quantitative arithmetical terms, and, as

[25] As Jeremy Rifkin (1998) pointed out a generation ago, this development involved a 'reinvention of nature' that permitted the commodification of living processes. Suarez-Villa (2009) explores the new institutions or 'experimentalist organizations', such as Genentech in the USA, which are establishing the research regimes needed for the commodification of living processes. His overall theme is capitalism's ability to manipulate 'creativity'.

such, it differed significantly from, for example, the descriptive–historical method used by technical authors of the Renaissance such as Agricola. The latter conveyed knowledge by means of a self-contained narrative which concerned actual events anchored in time and was intended as a proxy for experiencing a practical act. As such, it was a guide to action addressed to specific individuals expected to engage in specific occupations in particular cultural environments. It was based on the assumption that the environment would provide such individuals with all they needed to engage in the relevant activity (see Eamon 1994).

In contrast to the concrete, situated character of the descriptive–historical method, the recipe was a prescription for acting that was expressed in formulaic terms expressing what was deemed to be common to myriad ad hoc rules. In relation to craftwork, it was implicated in the Baconian project, referred to above, to establish a standard practice independently of the vagaries of individual master craftworkers. In this sense, it was addressed to a desituated individual who could act independently of a teacher (see Eamon 1994, Chap. 3). It was a standardised and standardising set of instructions considered applicable regardless of time or place. Today, these sets of instructions are rendered in algebraic rather than arithmetical terms and, as such, function at a far higher level of abstraction than did their arithmetical predecessors. It is in this highly abstract form that they can be processed by the computer.

The crucial point about algorithms, as they have developed from the nineteenth century onwards, is that knowledge is reconfigured as information to be abstracted from its physical substrate and its biological bearer and becomes expressed in a refined formal language of deductive reasoning (see Gleich 2011, Chaps. 4–7; Weizenbaum 1976, Chap. 2). The digitalised algorithms used in computing consist in combinations of noughts and ones, rather than of sentences that refer directly to empirical phenomena. This means that things must be defined in simple clearly bounded terms (see Weizenbaum 1976, p. 103). A problem will be analysed down to the simplest possible level so that a question can be posed in terms of 'yes' or 'no' answers. From this simple level, complexity is built in by means of the accumulation of new branches of questions stimulated by answers at the previous level. The result is a mode of codification that requires the most advanced form of mathematical and logical expertise,

the explicitness of which is intelligible in its entirety only to a minority of specialists in the design of these algorithms. Among the experts in question, there is little or no sense of the limitations of their models, of their extraordinarily abstract character. For these experts nothing important is lost in translation of everyday or scientific thinking and knowing into an algorithmic form of explicitness (see Weizenbaum 1976, Chap. 3).[26]

The most systematic use of digitalised algorithms began in Wall Street, where a group called quants, or quantitative analysts, which included physicists, mathematicians, and engineers, put their impressive knowledge and skills to the task of developing computerised algorithmic risk assessment tools designed on the assumption that sufficiently detailed models would capture all relevant risk factors, and that risks would follow the 'normal' statistical distribution; that is to say, the assumption built into these algorithms is that the future would resemble the past.[27]

The first generation of Wall Street algorithms were built out of models, functions, and decision trees derived from human decision-making. However, from the early 1970s, the use of mathematics was required to express the unavoidable complexity of trading activities that were becoming ever more dependent on digital algorithms.[28] The traders were outsourcing their thinking to computerised programs of risk assessment and the 'objects' which they were trading were composed of decontextualised (abstracted and reintegrated) bundles of, as in the case of 'subprime' mortgages, debts, the real nature of which they were ignorant. In effect, digitalised algorithms came to displace human judgement and permitted human action without knowing or understanding (see Hakken 2010).[29]

[26] More recently, the dangers of 'data fundamentalism' have been pointed out by Carr (2015, Chap. 5, esp. pp. 122–123). Even such informational enthusiasts as Mayer-Schönberger and Cukier (2013), who claim that the universe 'is comprised essentially of information' (p. 96), express awareness of the dangers of reducing knowledge to data (see Chap. 10).

[27] Hakken (2010) provides a detailed analysis of the use of algorithms for high-speed trading on Wall Street.

[28] Steiner (2013, Chap. 1) discusses the problems attached to the attempt to express complexity in algorithmic form.

[29] Naughton (2015b) points out how poorly understood is the complex system of algorithmic decision-making on which we are increasingly dependent. His article was prompted by the arrest of an individual trader who has been accused of perpetrating the Flash Crash on Wall Street in May 2010.

Algorithms and Datafication

A recent and comprehensive discussion of this topic defines the activity of 'datafying' as follows: 'To datafy a phenomenon is to put it in a quantified format so it can be tabulated and analyzed' (Mayer-Schönberger and Cukier 2013, p. 78). The datafication of knowledge permitted by computers is a process that magnifies in a scarcely imaginable way the quantity of raw material on which algorithms get to work today. That is to say, datafication involves the most systematic, far-ranging breakdown of knowledge, of human activities, and of physical and social processes, into discrete matters of fact. This disintegrating process is facilitated by the innovations undertaken by new kinds of corporations such as Google, Amazon, and Facebook. These companies are the owners of what Jaron Lanier (2014) calls 'siren servers', his term for vast collections of computers working in a co-ordinated way. 'Big data' is the term used increasingly to refer to this development. The data are 'big' in the sense that the amount of data is so vast that it can only be handled by computers. Acquisition, storing, and processing these data would be beyond human powers.

These remarkable amounts of data are available thanks, in part, to popular readiness to provide information, almost on demand, about virtually all aspects of our lives, from our liking for pets to the way in which we walk to our smoking and drinking habits to our choice of sexual partner.[30] In the process, more aspects of reality are rendered in a data format. This is the price we are willing to pay in return for the convenience of buying and selling over the internet, for access to various apparently free services such as email, and for participation in social media. The results are indiscriminate, large, messy collections of information about (often) the most apparently trivial aspects of everyday life. Such collections are becoming a significant corporate asset.[31] As noted before, they provide the raw material on which algorithms are put to work.

[30] For a discussion of the 'immaterial' labour carried out by users of Facebook, see Coté and Pybus (2011).

[31] Lanier (2014) discusses the mass provision of data in some detail and argues for its monetisation.

The significance of the unprecedented amount of information available about so many different aspects of life is revealed in one much-cited example of the predictive powers attaching to specific uses of big data. This is Google's prediction of the spread of winter flu in certain regions and states of the USA.[32] In this case, the prediction was based on nothing but a statistical processing of the kinds and amounts of data made available through extraordinarily powerful systems of computers—the 'siren servers' discussed by Jaron Lanier. As with the Wall Street traders involved in the manipulation of bundles of debt, discussed above, no substantial knowledge of actual, empirical, everyday realities was needed to arrive at the predictions in question. Neither was scientific knowledge of the nature of influenza. Recognition of patterns, or of correlations, not knowledge of causes, was what mattered in this example. Indeed, the reinterpretation of knowledge in use here constitutes a kind of informatised positivism in that the regularities being registered are symbolic in character, in contrast to the actual regularities noted by positivists in the pre-electronic age (Dean 2014, Chap. 6).[33] This requires the cooperation of experts in a variety of disciplines and specialisms and designers of computer programs (see Martin 2014; Suarez-Villa 2009).

However, this exercise leaves neither subject nor object of knowledge unchanged. I shall return to this topic later. For now, I shall discuss a relatively modest example of this algorithmic codification of expert activity.

[32] Details of this were provided by Google in a paper published in *Nature* in 2009. Drawing on the vast data reserves accumulated through retention of the three billion inquiries submitted to it every day, Google made a comparison of fifty million most common search terms used by Americans and compared the list with Centers for Disease Control (CDC) data on the spread of seasonal flu between 2003 and 2008. What was being sought in this comparison was correlations between the frequency of certain searches and the spread of the flu over time and space; 450 million different mathematical models were used to test the search terms. The resulting predictions were compared with actual flu cases from CDC in 2007–8. The software deployed for this exercise identified a combination of forty-five search terms that when used in a mathematical model had a strong correlation between their prediction and the official figures nationwide. By using these data, public officials could have accurate information about the spread of flu almost as this was happening, as opposed to the one- or two-week lag in the availability of CDC data (see Mayer-Schönberger and Cukier, 2013, Chap. 1). Another example of such algorithmic predictive exercises concerns the use of UK Biobank data (taken from half a million individuals) by staff at the University of Uppsala to identify 'mortality predictors' over the next five years (see Ingelsson and Ganna, 2015).

[33] For more on the downgrading of knowledge of causes accompanying increasing reliance on big data, see Mayer-Schönberger and Cukier (2013, Chap. 4).

This is the Deep Blue program of chess playing which was designed on the basis of the parallel processing model of thinking put to work on such big data as were available in the late 1990s. The purpose of this discussion is to bring out the way in which the algorithmic textualisation of an expert human activity can result in a reduction of the human player. As will be seen in this example, the dead labour of many grandmaster chess players, as stored in the computer program, loomed over the living labour of the world champion.

AI and the Deep Blue Episode

Designing a program that would pass the Turing test was the prize looked for by engineers of AI. Victory was proclaimed when, in May 1997, the AI embodied in a computer program was judged to have won a chess match played with a human player, Gary Kasparov, the reigning world champion at the time. This famous event exemplifies the contradictory impulses that have characterised our relations with computers up to now: to elevate machines by making them appear intelligent, on the one hand, and to reduce humans by making them submit to the machine's functioning, on the other. It merits exploration in terms of the problems posed through the reduction of knowledge and of human thinking to explicitness of an informational kind.

The chess playing computer was developed by IBM and the Deep Blue software was designed with the help of chess grandmasters. The 'hardware' was a machine weighing 1.4 tons and powerful enough to run 256 processes simultaneously. The explicit dimensions of chess playing were rendered in computer-compatible language through the interactions of programmers and chess grandmasters. The knowledge of these grandmasters was represented in the digitalised decision-tree terms described earlier. The result was a program incorporating 700,000 grandmaster games and the capacity to evaluate 200 million positions per second. This extraordinary complexity could only be represented in computer-compatible software on the basis of the remarkable enhancement of hardware power and the increasing sophistication and complexity of algorithms available

through the developments initiated in Wall Street discussed earlier (see Steiner 2013, Chap. 5).

Over a series of six matches, this program apparently won two games against Kasparov, with three draws. Kasparov accused IBM of cheating and demanded a rematch. The cheating he claimed to have noticed was the involvement of human chess players in tweaking the computer program during games, the agreement having been that such involvement would only happen between games. Kasparov's demand for a rematch was refused and Deep Blue was retired after its supposed victory (see Kasparov 2010). But was this a victory of AI in any real sense? In what sense was the match in question a match between machine and human? Was it not, rather, a match between one group of computer-enriched humans and a single human reduced to a kind of one-dimensional chess playing?

Chess Playing: The Tacit and the Explicit

At first glance, and from the point of view of the Turing test, chess playing is a usefully precise, rule-governed activity, readily susceptible to representation in computer-compatible language. That is to say, it seems that the explicit dimension of the knowledge embodied in chess playing can be abstracted from the individual player's body and translated into computer language without significant loss. But is this really the case?

Gilbert Ryle pointed out some time ago that playing chess involves knowing how (tacit knowing) rather than knowing that (explicit knowing). Learning to play chess may happen either through explicit instruction or observational learning, or through a combination of both. That is to say, the learner may begin by learning the rules as made explicit by an experienced player or handbook, or may absorb the rules largely, if not wholly, through active, purposeful observation of experienced players at play. In the latter case, the player would be unable to recite the rules at all; in the former case, explicitness would be more readily available, although, in expert players, knowledge of the rules would have become embedded in the activity of playing, or, it would have become second

nature for the players who would no longer need to recite the rules in their heads before making a move.

Whether or not Ryle is correct in claiming that chess can be played well regardless of the presence or absence of explicit knowledge of the rules is open to discussion. In any case, most modern players of the game will have available to them systematic and detailed manuals of instruction and may be much more rule-conscious than players would have been in oral cultures, in which textualised explicitness would have been absent. Where Ryle is correct is in stressing that chess playing is an intelligent practice which has a drilling component (in the sense that the rules must always be followed) but which cannot be reduced to drill. It involves a multi-faceted disposition to engage in the activity of chess playing, not the drilled ability to reproduce, as accurately as possible, a pre-existing set of rules (Ryle 1963, Chap. 2, esp. pp. 40–44). In short, there are aspects of chess that can be represented symbolically. Handbooks are useful guides for learners and, in order to become expert players, individuals must experience the stages of playing through laboriously thought-out moves. But, where the player practises in a purposeful and systematic way with a suitably qualified opponent, this laborious thinking through will become unnecessary and, as high levels of expertise are attained, more and more of chess playing knowledge will have been absorbed into the body of the player. Only through extended bodily immersion in games-playing activity would acquisition of the capabilities associated with intuitive performance be possible.

Ryle's analysis of the thinking and knowledge requirements of chess playing was made prior to any attempt to reduce these to machine thinking. More recently, the particularities of this attempted reduction as manifested in the Deep Blue episode have been discussed by Jaron Lanier, himself an expert in computer science. In this discussion, Lanier gets to the heart of the matter of thinking and computerisation in the following sense. Lanier claims that what is happening when the computer is imagined as intelligent, and what had to happen in order to render possible the defeat of Kasparov by Deep Blue, is that aspects of the subject to which a computer cannot but be blind must be removed from consideration when designing games-playing programs. In relation to the chess game, what Lanier describes as the 'poker side of chess' had to be overshad-

owed by the 'abstract, algorithmic aspect'. That is to say, the subtleties of human interaction, such as judgement of character and interpretation of body language, not being susceptible to the precise specification needed for designing the program, were no longer to be part of the game. Moreover, Lanier asserts, participation in a game involving a computer program had an unnerving and debilitating effect on the human player who was forced, through interaction with the program, to behave more like a (highly sophisticated) machine than an expert human chess player. At the same time, what was truly victorious was not the computer but the program of 'clarity and elegance of thought' designed by a team—Deep Blue—the success of this program being dependent, as noted before, on an increase in hardware power (see Lanier 2011, pp. 33–36). The intentionality involved in the chess playing was human intentionality. On the one side was the intentionality of the programmers, informed and advised by chess grandmasters and served by extraordinary computer hardware. On the other side was the lonely human player dependent on his human knowledge and skill while also being subjected to the limitations of machinic reduction through the inhibition of his exercise of tacit knowledge. In short, Kasparov was subsumed to a machine and this subsumption was effected through the designing intentionality of other humans. This is a crucial point which draws our attention to the ineliminable necessity of the human contribution to computerised thinking and doing; a contribution that is, as Lanier points out in another context, too easily overlooked. As he notes: '[*A*]*lgorithms are actually only a repackaging of human effort* in such a way that it is anonymized and people aren't acknowledged or paid … Both big data and artificial intelligence are economic and political constructions that disenfranchise most people' (Lanier 2014, p. xii, italics added).

Regardless of the inflated claims of some AI experts, in the Deep Blue episode what was triumphant was not the computer, but the computer as tool of a tiny stratum of highly but narrowly educated and skilled humans. The imaginative and cognitive triumph of one set of humans was here secured at the expense of the quality of games-playing activity permitted to another. Deep Blue's 'success' depended on the AI inventions and developments discussed briefly above, the availability of extremely powerful hardware, the provision of accurate information on the part of

grandmaster chess players, and the ability of highly skilled designers of programs to translate this information accurately and comprehensively into computer-compliant language. At the end of this process, the computer program could achieve a human purpose—to win a chess match—but not in a human way.

The diminished quality of that games-playing relates to the demotion of the tacit dimension that expert chess players necessarily bring to the game and the related elevation of the digitalised explicitness and extraordinary processing power of the computer. As exemplified in the Deep Blue chess game, the non-algorithmical aspects of chess playing dropped out of sight and out of the game, and not only on the part of the computer program. In agreeing to participate in the exercise, Kasparov was implicitly agreeing to his own machinic reduction. He was, whether wittingly or not, remaking himself so as to be 'machine fit'. He was colluding in the fetishisation of the computer (see Lanier 2011, p. 36).[34]

Computerised Algorithms and the Generalised Threat of Real Subsumption

I have chosen the Deep Blue episode because it brings out in clear terms what is to be gained and what lost in the translation of human expert activity into digitalised algorithms. This example can be generalised beyond the narrow scope of chess playing because it demonstrates how the alienation of human knowing and doing through their 'exteriorisation' is not, or need not be, confined to the age of industrial capitalism. As I have begun to argue, with the advent of enhanced hardware power and vastly improved software, fed by big data, the use of algorithms is facilitating new kinds of subsumption of living labour to the new kind of dead labour in which large systems of computers—Lanier's 'siren servers'—consist.

Now, as has been seen, Vercellone hopes that the knowledge embedded in the bodies of contemporary 'knowledge workers' is resistant to codifi-

[34] Weizenbaum (1976) provides an extended critique of the human tendency to fetishise computers.

cation or exteriorisation. Indeed, the impossibility of total linguistic capture or representation of such tacit, bodily knowledge has been stressed by theorists writing since the emergence of the AI project during the 1950s. The problem of the tacit dimension of knowledge, also referred to as the 'subcognitive' or 'subliminal' aspect of thinking and knowing, was one that proved vexing to thoughtful designers of, and commentators on, that project (see Collins 1990; Gleich 2011). These thinkers did not assume that all knowledge can be rendered explicit and they were highly critical of those who understood thinking solely as a matter of manipulating pieces of information (see above). Yet, what is happening increasingly today is a kind of codifying takeover of areas of human endeavour that had been deemed, not only by Vercellone, impervious to such appropriations. Corporate enthusiasm for this development is expressed in increasing investment in the design of software that mimics human brain functioning (Rushe 2014). Here I shall discuss briefly three examples of these developments: automated cockpits, digitalised biology, and driverless cars.

It is in the area of air travel that much, if not most, of the psychological and behavioural research on the results of the aggressively pursued automation of expert activity has taken place (see Carr 2015, Chap. 3). The general thrust of such research is that while air travel has been rendered safer by means of this automation, the related deskilling of individual pilots has resulted in a new kind of catastrophic accident. A notable example of such accidents is that which befell a US commuter flight between Newark and Buffalo in February 2009. In this one-hour flight, pilots had little to do except attend to computer readouts from five large LCD screens and exchange messages over the radio with air traffic controllers. As the aircraft approached Buffalo airport, it experienced a loss of lift with the risk of aerodynamic stalling. In accordance with the stall warning system, the autopilot was disconnected, leaving the aircraft in the hands of the human pilot. Unfortunately, the pilot in question did the wrong thing, directing the plane's nose upwards rather than downwards, with the result that the plane crashed and all on board were killed. The report on this accident concluded in part that the pilot's action was inconsistent with his training and revealed 'startle and confusion' rather than what would have been expected from a rigorous and

prolonged period of apprenticeship to piloting, namely, the ability to react appropriately, apparently without taking thought, so as to take command of the plane under crisis conditions not anticipated by the computer program (see Carr 2015, pp. 44–45; for the official report, see National Transportation Safety Board 2009). Given the pilot's experience in a commercial aircraft, such automaticity of response is no longer to be expected since its maintenance as an individual skill requires repeated practice. On a typical commercial flight today, the pilot holds controls for about a minute or two when taking off and for another minute or two when landing. In effect, the pilot functions as a computer operator rather than expert in flying.

The systematic replacement of human pilots by automated cockpits is one example of the subsumption of the living labour of mental workers, or professional intellectuals, to the dead labour of digital machinery. A more complex example, the character of which can only be sketched in here, comes from the discipline of biology. As shown by Ellen Fox Keller, the new computational biology involves the use of digitally enhanced microscopes which permit sight of ever tinier objects of knowledge and ever more of these. This richness of available objects is such as to confound human understanding. As the data provided by computers are beyond the capacity of humans to process, biologists are turning to computer imaging software to select and highlight data of particular interest and to display these in a way that is perceptually manageable for humans (Keller 2002, p. 223). In effect, the 'objects of knowledge' with which the biologist is interacting are computationally constructed and require for their interpretation the use of digital algorithms (Keller 2002, p. 224).[35]

Finally, engineers of AI and of robotics have apparently succeeded in achieving what Hubert Dreyfus, for one, had deemed to be an impossibility, namely, a driverless car that has been thoroughly tested under a variety of traffic conditions and been judged a success. The Googlemobile

[35] Further, as Katherine Hayles notes, the use of such software has become necessary for the interpretation of fMRI scans which also provide their human users with more information than they can handle (Hayles 2012, pp. 67–68). The problem of human interpretation of digital patterns is now being addressed by, for example, the medical school at the University of California at Los Angeles where attempts are being made to build a 'reliable catalog of digital patterns' (See Carey 2015).

is one such car which is equipped with laser range-finders, radar and sonar transmitters, motion detectors, video cameras, and GPS receivers. Thus equipped, it has the ability to navigate turbulent real-world conditions and can respond fluidly to the unexpected. That is to say, it can mimic the tacit dimension of human knowing but without possessing human understanding (see Adams 2015; Carr 2015, Chap. 1; Naughton 2015a). This is a notable incursion into the domain of the tacit.[36]

Conclusions

Writing in the spirit of Peter Dickens regarding the relationship between internal and external nature, I have attempted to show how the external nature of post-Fordist or cognitive capitalism, as manifested in the system of digital computers, is inflicting novel forms of cognitive immiseration on professional intellectuals. Contrary to what Vercellone hopes, new modes of codification, as manifested in digitalised algorithms and datafication, offer unprecedented opportunities for colonising the intellectual labour of those professionals whose living labour has been essential to capital itself up to now. Moreover, as seen in the example of computer-assisted biology, these new practices are enabling the codification of the very life process, or, as Nick Dyer-Witheford has put it, they permit 'futuristic accumulation' of a wholly novel kind (Dyer-Witheford 2011, p. 276).

Taking the Deep Blue episode as an enlightening example of such codification, I have attempted to show what is lost, in human terms, through the alienation of chess players' activities to computers. Contrary to how the episode was interpreted, it was not the machine as such that secured Deep Blue's apparent triumph over Kasparov, but the team of experts that included the different forms of living labour of the grandmaster chess

[36] Aronowitz and DiFazio (2010) consider such incursions in terms of the Taylorisation of design activity in engineering and architecture. Charles (2012) focuses on the standardisation of education by means of digitality and privatisation in British universities. See also Peters (2009); Peters and Bulut (2011). As noted above, Hakken (2010) discusses the role of digitalised algorithms in high-frequency market trading. More generally, a recent study by the UK Commission for Employment and Skills has suggested that computerised algorithms are likely to replace professionals in professions ranging from accountancy to legal work during the coming years (see Milmo 2014).

players and of technologists who codified grandmaster knowledge and experience in a computer-compatible language. These different forms of living labour were the necessary source of the dead labour incorporated in the IBM computer and the Deep Blue program. As computer programs become more complex and as the design of sensors improves, more and more of professional thinking, knowing, and doing becomes subsumed to dead labour.

The impoverishment of the inner natures of professional intellectuals is directly related to the degeneration, through informatisation, of knowledge required for the functioning of these programs. Informatised knowledge is a very weak or thin kind of knowledge indeed. Weak knowledge is knowledge gained at a distance from the actual object of knowledge (see Weizenbaum 1976, Chap. 2). An example of strong knowledge would be the knowledge gained from living in a city as opposed to that gained by studying a map of the city. In this case, strong knowledge is tacit knowledge acquired through direct bodily engagement with an environment that is necessary for life. It is knowledge as know-how. Another manifestation of strong knowledge is that of the modern sciences, whether these take the form of close and systematic observation of natures or laboratory experimentation. The former involves the accumulation of knowledge of how different natures behave, or of the parts of which they are composed; the latter involves the identification of the causes of things through the abstraction of natural things or parts of things from their normal environments and their manipulation in isolated laboratory conditions. These different kinds of modern science have enabled extraordinary interventions into the natural world—human and non-human—with effects both good and bad.

Now, the new kind of informatised knowledge involves a mode of codification at several removes from the natural world and a 'representation' of that world dependent on accumulations of data so vast that they preclude human comprehension. Digitally permitted life sciences provide a striking illustration of this development. This new kind of knowledge requires the work of computer scientists, mathematicians, and statisticians who function as designers and reviewers of big-data analyses and predictions. These are experts in symbol manipulation of an extraordinarily abstract kind. As such, they live in rarified environments designed

to encourage 'creativity' and therefore lack strong knowledge in both of its manifestations, knowledge of the ordinary everyday world, and of the natural sciences.[37] These experts identify and evaluate the selection of data sources; they design and choose analytical and predictive tools and provide an interpretation of the results.[38] They are optimistic to the point of hubris in their judgements of the potentials of automation. They have little or no sense of the limitations of this particular form of explicit 'knowledge'.

Algorithmically coded informationalised knowledge is concerned with correlation rather than causation. Being algorithmic in character, correlations have only the most distant reference to actual objects and happenings in the world. So, when things go wrong, it is difficult, if not impossible, to trace the problem back to its real-world source. It becomes difficult, if not impossible, to decide at what point in the chain of algorithms the problem is to be located. Hence the thinness of correlational knowledge derived from algorithmic codification. Yet this thin knowledge is powerful in that it is used to effect changes in the everyday world. However, it does not merit the power it possesses since it is not up to the task of dealing with the myriad unintended consequences that its use is bound to incur. Thus in relation to the new life sciences, Dyer-Witheford (2011) describes the emergence of a planet factory, permitted by digitalisation of the life sciences, as a system with no future, subject to catastrophe rather than crisis.

With increasing dependence on computer 'thinking', there will be less apparent need for *Bildung*, as Lyotard feared. If the present trend continues, the long-term education of individuals for engagement in systematic, intellectualised thinking and/or skill acquisition will become redundant from capital's point of view. Neither the laboriously acquired craft skills that were essential to the reproduction of pre-capitalist everyday life, nor the laboriously acquired intellectual skills, particularly as manifested in the natural sciences, that have taken their place, will appear to be necessary. Regarding the latter, while the natural sciences retain their impor-

[37] See Suarez-Villa (2009, pp. 31–55) on the commodification of 'creativity' by contemporary capitalism—technocapitalism, in his terms.

[38] The emergence of this new kind of intellectual has been described as 'the rise of the algorithmist' (see Mayer-Schönberger and Cukier 2013, Chap. 9).

tance, as noted above, they do so as digitally reconfigured, therefore as increasingly dependent on computer-generated correlations rather than on knowledge of natural powers, with the possibility of myriad unintended consequences.

The generalised shrinking of human experience and of knowledge associated with these developments is not a necessary outcome of computer use. Rather, it is the use impelled by capital's need to reduce its dependence on expensive (and always potentially unruly) living labour. The present use of automation is informed by the capitalist principle that the machine will always perform better than the human. This is the principle that informed the AI project, and it is the principle impelling the development of automation today. However, this dehumanising approach to such development is not the only one available. It would be possible to design machines to serve rather than displace human doings: to remove from humans the burdens of repetitive, routine doings so as to free them for more rewarding kinds of activities. Such is the adaptive, or human-centred, use of automation. This is automation designed so as to balance the human need for meaningful work and the wish to benefit from the computer's speed and accuracy. Given this approach, human situational awareness and the exercise of skills would remain necessary through the allocation of routine tasks to the computer and the retention by the human worker or user of responsibility for decision-making in complex situations. Thus the cockpit could be designed so as to serve the pilot as opposed to reducing him to the lowly status of computer operation. Indeed, an example of such design has been developed by Boeing, which, rather than attempting to make planes 'pilot-proof' as is the case with Airbus, is introducing a human-centred cockpit whose automated features cannot override the human pilot's decision. This type of design will require the high maintenance of the pilot's skills (Carey 2015, Chap. 7). If generalised, it would permit the restoration of a favourable ratio of living to dead labour, at least among intellectual workers.[39]

[39] A rehumanising use of automation would also effect the release of the army of cybertarians (see Huws 2003) who function as mere adjuncts of screens and gadgets in the call centres and warehouses of our digitalised age.

If subsumption to capital is to be overcome, we need to understand, among other things, the significance of today's degeneration of knowledge, as well as of human activity. We also need to understand the potential for rehumanising uses of digital computers. Presently, the world is being remade in a way that reduces humanity and the production of knowledge, both reductions being directly related to what capitalism thinks it needs. Presently, too, there are many instances of resistance to capital's increasingly parasitic and overweening doings. Unfortunately, there is little sign that these different activities can fuse into a powerful social movement informed by a narrative of what a better world would look like and of how we might work together to attain it.

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9

Society, Nature, and Experience: Jouissance on the Margins

Peter Dickens

Introduction: Experiencing Marginal Spaces

Orford Ness is an isolated 1551-acre shingle spit facing the North Sea, off the Suffolk coast of Great Britain. On the one hand, the place offers a distinct and spectacular experience of humanity's relations with external nature. The site is about 2000 acres in size and is a fragile environment for rare bird, plant, and insect life. Avocet, hawk, redshank, oystercatcher, and many other migratory waders all breed there and it is the largest vegetated shingle spit in Europe with a very wide range of rare plant life (National Trust 2003). It is now protected as an Environmentally Sensitive Area, a Site of Special Scientific Interest, and an Area of Outstanding Natural Beauty.[1]

[1] This protection includes the exclusion of attempted organised tourism to the site. During one visit to Orford, I witnessed the warden trying to stop a Spitfire fighter plane flying at a very low level over the site. The plane, which is now privately owned and used for tourist purposes, was carrying a passenger over this wartime site at considerable speed and, in the process, scaring off many nesting birds, one of the site's chief attractions.

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But, on the other hand, these qualities collide with the zone's other main characteristic. From the early twentieth century, it has been a secret testing site for the bombs, missiles, and gunnery used in the two world wars. In the Second World War and the Cold War, it was also made the setting for a new radar system designed to detect and track Soviet aircraft movements, missile launches, and the Sputnik satellite.

Orford Ness has long been a place 'on the edge' in social, political, and spatial terms. And, since at least the Early Middle Ages, this edgy quality has often generated strange encounters and experiences. In the Early Middle Ages, for example:

> Ralph of Coggeshall, a naked wild man covered in hair was caught in the nets of fishermen at Orford Ness. The man was brought back to the castle where he was held for six months, questioned and tortured. But he said nothing. He was taken to Orford church where he was interrogated about his Christian faith. But it was clear that Christianity meant nothing to him at all. The wild man was then released into the harbour which had been netted as a means of stopping his escape. But he swam under the nets, shouted with joy, and was never seen again. (Thompson 2000)

'Marginal' places are often associated with troubling encounters and practices. But how can we conceptualise these qualities? So far, most of the conceptual work on threatening or 'dark' spaces has used the work of Foucault as their starting point. But this chapter argues that the framework offered by Henri Lefebvre (1991, 2014), particularly his focus on the body and the experience of 'jouissance', can be used to offer significant insights into how people relate to such places. As we will see, Orford Ness simultaneously generates both positive and negative experiences. And negativity constantly interacts with positivity and creativity in dialectical fashion.

Lefebvre versus Foucault on Marginal Spaces

Foucault has been a major influence on contemporary studies of 'liminal', ambiguous spaces (Shields 1991). He made the useful distinction between 'utopia' and 'heterotopia'. The former consists of good places

that actually do not exist. The latter are places of transgression and resistance that actually exist (Foucault 2008). An example of the latter is the nineteenth-century prison (Foucault 1977). Here, transgressive, even 'dangerous', persons were contained until they were able and willing to participate in wider society.

But there are confusions in Foucault's concept of 'heterotopia' as to the relation between space and society. Is it the physical spaces themselves that are 'heterotopic' (a question presumably of particular interest to Foucault's architectural audience)? Or is it the practices within these spaces which render them 'heterotopic'? Or are we dealing here with changing overlaps between societies and physical spaces? Notwithstanding these difficulties, Foucault's work has stimulated a wide range of excellent studies of different kinds of 'strange', 'sinister', and 'heterotopian' places (Lennon and Foley 2010; Dehane and Cauter 2008; Buda 2012; Seaton 2009; Sharpley and Stone 2009; Stone 2009; White and Frew 2013). One particular category within the Foucauldian tradition, and one which has a particular resonance for the present study, has recently received considerable attention. This is the somewhat paradoxical notion 'dark tourism', a form of vacation entailing visits to battlegrounds, places of genocide, assassination, bomb attacks, and concentration camps. These are often conceived by the above literature as 'heterotopian'.

But there are difficulties here in understanding what 'dark tourism' is actually referring to. It is a very wide category, one containing a number of 'shades of dark'. As Sharpley and Stone (2009, p. 249) put it, 'dark tourism is an unhelpful term'. The concept creates good newspaper headlines and hints at a ghoulish interest in the macabre but, once elaborated and separated from Foucault's original framework, it becomes a somewhat descriptive and atheoretical term. Similarly, as Sharpley and Stone also argue, the blanket categorisation of visits to places associated with death as 'dark tourism' simplifies and hides a multitude of meanings and purposes with respect to both their production and consumption (2009, p. 250). The theoretical and ontological bases of 'dark tourism' are also very limited. As Sharpley and Stone themselves argue, little attention has so far been paid to exploring why tourists may be drawn towards sites or experiences associated with death and suffering and the implications for tourists' experience (2009, p. 11).

The theoretical basis for this work is varied but it gives particular emphasis to the work of Giddens (1991). He argued that in contemporary society, people are besieged by anxiety and dread and that, largely as a result of the decline of religions offering a sense of security and meaning, we 'bracket out' unpalatable existential issues. Specifically, we no longer confront death and dying on an everyday basis. Death and its meaning are therefore sequestrated from the public realm, but this is only at the expense of increasing the sense of anxiety and terror when people actually are confronted by reminders of their mortality (Stone 2009). 'Dark tourism' offers extreme forms of such reminders. This focus on 'dark' places has been taken up by Cooke (2012). Referring particularly to the literary work of W.G. Sebald (to whom I return), Cooke focuses on places where 'death is made present' (2012, p. 60). Shock is the result.

The preferred starting point here is the work of Henri Lefebvre (1991, 2014). His perspective has deservedly attracted widespread attention and application, not least because he has addressed the various relations between social, economic, and political power and places 'on the margin'. But his work is also useful because it distinguishes between different meanings of 'space' and indicates what 'heterotopian' spaces actually consist of and how they relate to other forms of space. Furthermore, and this takes us back to the work of Giddens, Stone, and Cooke discussed above, his notion of 'jouissance' provides us with important insights into the experience of places linked to death. More specifically, it points to the contradictory qualities of 'dark spaces', these being juxtaposed with 'normal' society from which considerations of death have again been 'sequestered'. A further emotionally destabilising juxtaposition is the result, one including the juxtaposition between 'dark zones' and nature.

The perspective developed here takes as given the forms of alienation or 'estrangement' outlined by Marx, which remain key features of contemporary society (alienation from one another and from external nature being amongst these key features). But in certain circumstances, and particularly where the subject encounters threats of death, disaster, and destruction, these general forms of alienation or estrangement take a new and mentally disturbing form.

Producing Space: Lefebvre's Triad

Lefebvre's best-known contribution is his important distinction between 'spatial practices', 'representations of space', and 'representational space'. Each category is envisaged by Lefebvre as in dialectical relation to each other (see Fig. 9.1).

'Spatial practices' refers to space as a product of dominant economic and political forces. More specifically, the term refers to space in which economic and political power in capitalist society is materially produced, reproduced, combined, and exercised.

'Representations of space' refers to the many forms of language, symbols, and signs that allow material practices to be talked about and understood. Writing is one form of representation and later we find writers attempting to describe material practices in this liminal zone with literary representations. But writing, language, and communications of all kinds can of course challenge social and political power and we later find many visitors to this liminal zone attempting, sometimes with difficulty, to contest the social and political relations which caused this place to be made.

This brings us to Lefebvre's 'representational spaces'. These are the places often generating contradictory experience but their main impor-

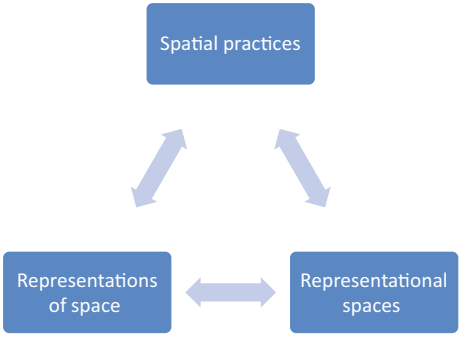

Fig. 9.1 'Spatial practices', 'representations of space', 'representational spaces' (this diagram, after Lefebvre, originally appeared in Dickens, 2014, and is reproduced with permission of Peter Lang)

tance lies, as Lefebvre's framework suggests, in the fact they are where alternative, countercultural, ways of life are imagined, created, and experienced. Such zones offer what Lefebvre calls 'a sheaf of possibilities, the best and the worst' (cited by Stanek 2014, p. xxxi). Yet they are also often sites of contest, with some people's ideas of 'good' being very different from those of others. Note here the two-way arrows in Fig. 9.1. Lefebvre's point about 'representational spaces', for example, is again their ambiguity. On the one hand, they may be influenced and created by oppressive social and political orders but they can also be a source of utopian ideals, imaginary landscapes, optimism, and utopian plans.

As mentioned, the three elements of Lefebvre's triad have at their core the body and its relationship to these elements. And it is the body that is relatively neglected in work based on Lefebvre's framework. The body, its capacities for work, consumption, and imaginative creation, is clearly central to the spatial practices and spatial representations. And, as Lefebvre describes, the body has a very specific importance relative to the making of 'representational spaces'. Lefebvre's examples of the latter are such spaces as Southern France bordering the Mediterranean. Spatial practices and representations of space are clearly evident here, commercialised 'leisure' being a growing product. But this area, like of course many others, is on the physical and social 'edge' of society. And in this sense, countercultural practices are here developed and enjoyed. For example, using a Lefebvrian framework, Shields (1991) has offered examples of seaside towns, honeymoon retreats, and other areas on both the physical and social 'edge'. As such, they are zones where the more 'normal' codes of personal and social conduct remain in abeyance and may indeed be constantly flouted.

For Lefebvre, therefore, places on social and physical edges are zones separate from commodified forms of 'pleasure' created and sold by the leisure industries. It is in this kind of context that a strong sense of jouissance is, Lefebvre suggests, attained. Jouissance is important to Lefebvre's analysis, though it has not been adequately fed into later work inspired by later Lefebvrian studies. The word cannot be simply translated into unadulterated 'enjoyment' or 'pleasure' (Stanek 2014, p. liv). Rather, it suggests a mixed sense of emotion, a sense of pleasure and joy combined with danger and even pain. Lefebvre's most recent book illus-

trates what he means by jouissance. It shows him sea-bathing in rough waves off the Mediterranean coast (2014, p. xvii). It is this sense of jouissance which reverberates throughout Henri Lefebvre's work (Stanek 2014, p. 168). It refers not only to the sense of mixed enjoyment in a particular place but also to the enjoyment that can be found in 'normal' commercialised and commodified life.

The ambivalent meanings ascribed to 'jouissance' by Lefebvre have distinct psychoanalytical connotations, yet Lefebvre explicitly rejects a psychoanalytic perspective on the grounds that it is a form of knowledge that 'struggles to reduce' (2014, p. 103). He seems to have believed that the many complexities of uncertainty, ambiguity, and contingency in human practices are reduced by psychoanalytic theory, with theoretical constructs such as the subconscious 'pleasure principle' and 'the death instinct' obliterating the multiple contradictions of everyday life. Such constructs, Lefebvre strongly implies, are reductionist; militating against a full and adequate understanding, one which needs access to social and political theory. Psychoanalytic theory, according to Lefebvre, 'destroys real life', that is, the spontaneity of everyday existence which people can and must enjoy.

But, as this chapter later suggests, it may well be unwise to completely dismiss psychoanalytic accounts. So, although Lefebvre's interpretation is doing the explanatory work necessary for this chapter, we must remain open to the possibility that psychological mechanisms may offer at least some partial explanations of people's encounters with a place 'on the edge' such as Orford Ness. For example, the contrasting and contradictory nature of this place (one combining visions of potential terror with nature) resonates quite strongly with Melanie Klein's psychology (Klein 1998). She envisaged the human psyche as dividing experience into 'good' and 'bad', this being a means of protecting the ego or sense of self. Orford Ness seems to correspond with just this kind of division. Lacanian psychoanalysis has some parallels with that of Klein. He too was interested in the combination of pleasure and pain; one generating, he argued, an inner compulsion to engage in and repeat seemingly painful experiences. And 'jouissance' was precisely the word he often used to describe these contradictory processes (for a Lacanian account of 'dark' spaces, see Buda 2012). As outlined later, experiences of Orford Ness

often seem to mirror this same process of people actually liking the combination of pleasure and pain. Unlike Klein, however, Lacan gave much emphasis to language. This he saw as the means by which people make their identity and forge their relations with the outside world. Yet there are occasions, he argued, when 'language fails', when something experienced is so strange that language is no longer adequate as a form of description. As outlined later, there are hints of just this failure of language in people's accounts of Orford Ness. Finally, and perhaps most obviously, the work of Freud himself seems to have some potential application here. As later described in more detail, Freud's notion of 'the uncanny' may have a particular value for understanding experience of strange places (2003). The phrase refers not simply to terror but also to a fusion between fear and the familiar, the latter including a threatening experience or place being also familiar. This is of course one instance of a more general process theorised by Freud, and one which seems to often feature in people's experience of Orford Ness. This is 'the return of the repressed', the recalling of memories and associations which have been repressed and which we would rather forget about (Freud 1995, pp. 28–29).

Again, Lefebvre is right to suggest that psychoanalysis can greatly exaggerate the importance of the subconscious relative to social relations and social processes. But despite such criticisms, we cannot deny (or repress) the fact that the subconscious exists and may well throw important insights onto people's experience of 'places on the edge'.

Now using a framework similar to that of Henri Lefebvre and focusing mainly on his understanding of 'jouissance', this chapter turns to a case study of a particular place on the margins: Orford Ness.

Spatial Practices: Orford's Troubling History

Private capital and state power have long been closely combined in this area of 'spatial practice', with economic, political, and military power being combined to invent and test increasingly destructive forms of weaponry in this remote setting. A more potent contrast with the place's refuge for wildlife is difficult to imagine.

We must first sketch in the processes of capital accumulation and imperialism associated with death and war (see Lenin 2010; Luxemburg 2004). Imperial Germany's dearth of vast empires such as those held by Britain led to both world wars. But at the same time, the British government also attempted to protect its empire with war preparations and engagement in war itself (Heartfield 2012). Cecil Rhodes, the British politician and mining magnate, had argued in the late nineteenth century that imperialism made good, practical, common sense not only in terms of capital accumulation but also in terms of ensuring social harmony at home.

> My cherished idea is a solution for the social problem, i.e. in order to save 40,000,000 inhabitants of the United Kingdom from a bloody civil war, we colonial statesmen must acquire new lands to settle the surplus population, to provide new markets for the goods produced by them in the factories and the mines. The empire … is a bread and butter question. If you want to avoid civil war, you must become imperialists. (Cited by Lenin 2010, p. 84)

The earliest forms of aerial bombing such as those developed at Orford Ness signalled a new way of spreading and maintaining empire. It was known as 'control without occupation'.

Science has been increasingly recruited into these military practices. In the Orford Ness case, scientific experts (known endearingly during the two world wars as 'boffins') have been increasingly drawn from universities to combine with private sector companies to create new kinds of armaments.[2] The bombing techniques developed in the First World

[2] Well before the Second World War, a form of 'military-industrial complex', one which incorporated academics as well as representatives of industry and state, was being made in Britain. Professor Robert Hanbury, a radio engineer from the University of London, was recruited by Sir Henry Tizard into a new team including Sir Robert Watson-Watt who was then Professor of Physics at the University of Dundee (for further details, see Heazell 2010). The new forms of weaponry and surveillance developed at the Orford Ness site were largely conducted by government. But they were also created in close conjunction with the growing, privately owned, armaments-based, industrial economy. The aircraft used for testing this weaponry, should the need arise, for bombing Germany were designed and built by private capitalist companies. Similarly, a whole new group of 'V bombers' was later created with the express purpose of carrying the atom bomb to the Soviet Union. The designers were again private sector enterprises; Vickers, Handley Page, and Avro, but with heavy financial backing and support from government (Hamilton-Paterson 2010). The weap-

War at Orford Ness were made still more dangerous and widespread during the interwar and Second World War period. New ballistics tests were conducted here, with faster aircraft testing increasingly dangerous bombs (Heazell 2010). 'Improved' forms of bombing were made still more accurate and were applied against the Hottentots in South Africa during the early 1920s (Lindquist 2012)). Rocketry and munitions were also developed here until 1945, this mirroring the practices being conducted at Peenemunde, where Wernher Von Braun and his co-workers were inventing and testing V1 and V2 rockets designed to terrorise and kill Londoners.

A second important technological innovation, one which scientists working at Orford Ness were secretly inventing from the 1930s onwards, was radar. This kind of 'spatial practice' was of course used during the Second World War to monitor incoming Nazi aircraft. This entailed further development of a military–industrial complex, the 'spatial practices' of surveillance also being closely related to innovations in the private sector. The invention of radar was, for example, highly dependent on radio components developed in the 1920s and 1930s and on the cathode ray tube invented for the nascent television industry.

The Cold War generated yet more powerful and spatially extended practices at Orford Ness, the objective once more being another form of long-distance surveillance over great distances. At the same time that Soviet audiences were being thrilled by spy stories in novels and movies centred on the Cold War, Orford Ness was made the centrepiece of secret Western attempts to monitor the 1957 Russian satellite, Sputnik. In 1972, an 'over the horizon' radar system was built there, intended to monitor the movement of missiles and nuclear tests in the USSR and Eastern Europe. This was the secret Cobra Mist Project (see Fig. 9.2), financed by the US government, designed by the Radio Corporation of America, and constructed by Balfour Beatty, a British construction

ons tested at Orford enabled record profits to be made by the private aircraft and armaments manufacturers operating well beyond Orford. One indication of the private sector's 'success' at this time is that in 1939, the Inland Revenue found that the Society of British Aircraft Producers was making an average profit of 10 %, a rate set to increase in later years. But government remained loathe to tax these profits on the grounds that such a move would be 'a shock to business confidence' (Heartfield, p. 36).

Fig. 9.2 The Orford Ness secret 'Cobra Mist' project—designed to detect missile launches and aircraft movements in the Soviet Union during the Cold War. The aerials shown are part of an array originally covering 135 acres. The 'blockhouse' building on the bank of the River Ore was the project's control centre. The general public is still denied access to the site. *Source*: Andrew Houston

company. It was, however, unsuccessful. The signals received back were confused, either due to atmospheric interference or because the Soviet authorities deliberately blocked the signals (Heazell 2010).[3] The site, with its existing aerials, masts, and the headquarters 'blockhouse' building spread over 135 acres was used by the BBC World Service until 2012 and remains to this day closed to visitors. And this has inevitably contributed to the many conspiracies and rumours about this strange, contradictory place. The real purpose of the Cobra Mist project, it is even still believed by some, was to track and hide unidentified potentially hostile flying saucers (BBC 2002).

[3] A useful official, and until recently secret, account of the Cobra Mist project is given in Fowle et al. (1979). This paper also shows the extent of this surveillance project, covering not only the Soviet Union but also the East European countries in the Soviet bloc.

Between 1956 and 1972, Orford Ness was made a central element of a still more fearful 'spatial practice', one designed not simply to damage the major cities of the Soviet Union but to completely obliterate them (Cocroft and Alexander 2009; Heazell 2010). The place's distinctive 'pagodas' (see Fig. 9.3) were used to test parts of the 'Blue Danube' atom bomb then under development. An example of such a bomb, one which usually brings excited holiday chatter to a halt, is available for public inspection.

The pagoda buildings were designed to absorb any accidental explosion to the fuses used in atom bombs, allowing gases and other material to vent and dissipate in a directed or contained manner in the event of a major accident. The roofs were in effect designed to collapse onto the building, immediately sealing it with a lid of concrete.

The collection of structures at Orford Ness, including the pagoda projects, met with some resistance at the time. In June 1964, the East Anglian branch of the Committee of One Hundred, the active wing of

Fig. 9.3 Orford Ness and the 'Pagoda' Nuclear Weapons-Testing Facilities. (Photo: Simon Wellings, all-geo.org. Reproduced with permission)

the Campaign for Nuclear Disarmament, marched as far as the perimeter of Orford Ness. But they were turned back by the local police (Heazell 2010, p. 185).

Orford Ness can therefore be seen as a key, central, but until recently very closed, node in the imperialising, profit-seeking processes outlined above. It was central to the invention of new weapons used in imperial wars, to the creation of a profits bonanza for the industrial sector, to the incorporation of science into military enterprises, and to the organisation of British industrial capitalism in a form appropriate for a world war. Orford Ness was therefore a central hub for all the above developments. Yet it was physically far removed from them and, most importantly, made into a highly secret zone. This reminds us of the arguments by Giddens (2005), Stone (2009), and Cooke (2012) regarding 'the sequestration of death' in contemporary societies. In certain circumstances such as those at Orford Ness, we are again confronted by the brute reality of death. And, as documented and reconceptualised later in this chapter, this is a key reason why places such as this are experienced by people as unnerving and 'strange'.

This brings us to the contradictions and ambivalences of Orford Ness. While Orford Ness was clearly a product of rapid military expansion and capitalist growth in Britain and abroad, it has for some time been a 'closed' heterotopia in the sense that its contents and practices were deliberately made secret and highly inaccessible. In Foucault's understanding, whereas the outside world is supposedly 'normal' in the sense that dangers are contained, heterotopias are 'strange'. But Foucault's point, which is quite distinct from that of Giddens, is that these two apparently contrasting characteristics relate very closely to each other. Indeed, they actively need each other. In the Orford Ness case, the contradictions could not be more clear. Orford is 'secret' but it needs, and is needed by, an open, apparently peaceful society. This closed, highly secretive, site was a means by which 'normal' (read 'British' and 'democratic') society outside could be maintained relative to perceived, and in some instances real, threats from the Nazi and Soviet states.

Such were the modern 'spatial practices' conducted here. The result was, and still is, an impressive example of military archaeology starting with the development of aircraft bombing techniques and finishing with

preparations for nuclear war using intercontinental ballistic missiles. Orford can also be seen as 'heterotopic' in that it is product of *unplanned* additions and accretions over a long period. As a result of the interwar and post-war expansions, it is now a landscape of bomb craters, a river, an aerodrome for early aircraft, and marshes occupied by plants, insects, and seabirds. As shortly described, the experience of this place combined with one of Europe's main wildlife sites is simultaneously troubling and uplifting to visitors. 'Manmade' elements such as military buildings and equipment, on the one hand, are juxtaposed with 'natural' landscapes; the latter containing, for example, hares, seabirds, and rare plant life. This kind of collision persists today, with visitors being kept well away from wildlife. This allows the wildlife to thrive while enabling tourists to avoid stepping on buried unexploded ordnance. At one level, the place feels 'open' in that most of it can be readily observed. But in important respects, it again remains closed, this even leading to conspiracies about strange military practices supposedly *still* taking place there, with the authorities *still* having something to hide. These kinds of contradiction seem to resonate quite closely with Kleinian psychology. Adult life, she argued, consists of attempting to over-ride the simplistic divisions between 'good' and 'bad' associated with childhood. But a place such as Orford Ness opens up these divisions again, reducing the adult psyche to a state usually associated with infancy.

Representing Orford Ness: The Work of W.G. Sebald

We turn here to the experience of the writer W.G. Sebald, specifically his account of a visit to Orford Ness which resonates strongly with Lefebvre's concept of jouissance. The following sections also use the concept of jouissance and its contradictory qualities to understand the meanings other adults attribute to Orford Ness and the meanings children give to this place.

W.G. Sebald (1944–2001) lived and worked in Germany until 1967 when he was appointed as a lecturer (and later professor) of European

Literature at the nearby University of East Anglia (see BBC Radio). He wrote a number of texts which are now highly regarded as examples of creative writing, these including travelogues describing a large range of enigmatic, odd, and even sinister experiences. The notion of jouissance can be usefully extended to understand what is taking place.

Sebald's experience of the Orford Ness site was one such strange encounter, his account forming part of his book *The Rings of Saturn* (2002). His description of a visit to Orford Ness is a small element of a much larger narrative describing a long walking journey around East Anglia. This text, like many of his other books, describes encounters with a large range of bizarre and unsettling objects. These encounters must have been in drastic contrast with his life as a professor in a university but they also seem to be a means of recovering and confronting memories, including those of his childhood (Patt 2007; Schwartz 2007).

The ambivalences and contradictions of Orford Ness between society and nature are very clear in Sebald's account. He recounts, for example, his shock when a hare darts out from beneath his feet when he was viewing the pagodas used for atomic weapons testing. And at the same time, Sebald makes constant reference to the spatial practices which created this place. He initially illustrates his account with hazy, dreamlike, photographs he has taken of the 'pagodas'. He refers to the nuclear bomb testing facilities as sites for developing 'weapons systems' and yet also as burial mounds 'for the mighty and powerful'.

These allusions and metaphors seem initially to be a way in which Sebald distances himself from the realities and horrors which stemmed from this place.

> From a distance, the concrete shells, shored up with stones, in which for most of my lifetime hundreds of boffins had been at work devising new weapons systems, looked (probably because of their odd conical shape) like the tumuli in which the mighty and powerful were buried in prehistoric times with all their tools and utensils, silver and gold. My sense of being on ground intended for purposes transcending the profane was heightened by a number of buildings that resembled temples or pagodas, which seemed quite out of place in these military installations. (2002, pp. 235–236)

Yet, as he comes closer to these bomb testing structures, he starts to express much greater mental upset. He again uses fantastic metaphors to describe the place. But these now include speculation about the end of society itself. The remains of Orford Ness are made to represent the very apocalypse which the experiments conducted here were designed to bring about. New, still more threatening, accounts are described by Sebald's text as he approaches the blockhouses designed to test nuclear weapons.

> The closer I came to these ruins, the more of any notion of a mysterious isle of the dead receded, and the more I imagined myself amidst the remains of our own civilization after its extinction in some future catastrophe. (2002a, b, p. 237)

Sebald's representations of this zone containing 'pagodas', 'temples', and 'tumuli of the mighty and powerful' must have been made in the full knowledge that this place was a zone designed to develop and deliver highly destructive weapons. In *The Natural History of Destruction*, a book written at about the same time as *The Rings of Saturn*, he recounts in very graphic detail the horrors resulting from aerial bombing campaigns conducted by the Allies. These include the 'blitz' of German towns and the bombing of Hiroshima. In *The Natural History*, Sebald chastised his compatriots for 'forgetting what they do not want to know' and 'overlooking what is before their eyes' (2004, p. 41). But *The Rings of Saturn* is a similar kind of denial. He describes the very disturbing invention and production of war weapons with metaphors, fantasy, and vague photographs.

Why did he use these forms of representation to describe the actual spatial practices underlying the production and catastrophic use of bombs? Here, we can turn to recent literary studies of Sebald (Long and Whitehead 2004). As was the case with many German people of his generation, such descriptions would have been too much to bear. To do so would have been an intolerable mental burden. The fantasies expressed in his text (such as the weapons production sites being 'temples') perhaps brought some sense of mental security, given the mass destruction with which he was thoroughly familiar. These visions therefore suggest an added dimension to the term jouissance, pleasure being obtained in

conjunction with pain. They are a pleasurable way of re-living old and threatening associations.

This is confirmed by those commentators on Sebald who have argued he is constantly attempting, perhaps often subconsciously, to come to terms with Nazi Germany, the Second World War, and the Holocaust (Zilkosky 2004). In his own writings, Sebald confirms a formative connection between himself and the Second World War. He writes that his own life had only a few points of real, material connection with the war. But these points, 'while entirely insignificant in themselves, have nonethe-less haunted my mind' (2003, p. 78). The sense of mental disturbance described by Sebald is clear when he spells out the 'haunting' he experiences here. In reviving buried memories, the place not only brings a drastic shock and contrast with his present-day life. It is also a way of reviving and partially re-living earlier, often very troubling, experiences. Again, experience of the site is one of jouissance, or pain-mixed-with-pleasure.

Sebald's account resonates closely with Freud's (2003) notion of the uncanny (Long and Whitehead 2004; Patt 2007). In his contribution to *Patience* (a film based on *The Rings of Saturn*), Adam Phillips suggests that Sebald may well have read Freud's book *The Uncanny* and may have based this account of Orford on this reading. This is indicated in, for example, a passage in which Sebald reflects on his journey back to Orford from the Ness:

> As I was sitting on the breakwater waiting for the ferryman, the evening sun emerged from behind the clouds, bathing in its light the far-reaching arc of the seashore. The tide was advancing up the river, the water was shining like tinplate, and from the radio masts high above the marshes came an even, scarcely audible hum. The roofs and towers of Orford showed among the tree tops, seeming so close that I could touch them. There, I thought, I was once at home. And then, through the glowing dazzle of the light in my eyes, I suddenly saw, amidst the darkening colours, the sails of the long-vanished windmills turning heavily in the wind. (2002a, b, p. 237)

It is difficult to be certain about what Sebald is implying in this passage but if Adam Phillips is right about Freud's influence, this passage

certainly resonates with the notion of 'the uncanny', as described earlier. Thus, visiting strange places such as Orford Ness can be seen as a subconscious and relatively harmless means of 'revisiting' impulses and experiences which have been subconsciously repressed. Ward (2004) suggests, for example, that the excerpt from Sebald above refers to the opening chapter of *The Rings of Saturn*, where Sebald describes his experience of now defunct windmills. These are, in Sebald's words, 'like relics of an extinct civilisation' (2002a, b, p. 30). 'Sometimes I think, when I look over there that everything is already dead.' The conical shapes of these 'dead' windmills therefore represent not only defunct societies and their technologies but also death itself. In a similar way, Orford Ness, with its associations with disused technologies and death, is another way of subconsciously re-living and coming to terms with repressed instincts.

Yet it is important to remember that in Freud's theory, such 'reminders' can have positive as well as negative connotations. There is certainly something about Orford Ness which Sebald finds deeply sinister and dangerous. And these sentiments are understandable, given Sebald's extensive knowledge of how the towns of Nazi Germany were destroyed by the kind aerial bombing invented and tested at Orford Ness. But, on the other hand, there is also an explicit and important reference in the quotation above to a place where Sebald 'was once at home'. He never lived in the village of Orford, so this particular place could not have been literally his 'home'. Is he referring to this part of Britain, one he had made his home after leaving Germany where he was born and was raised? And, if so, perhaps the phrase 'once at home' refers to his shock at experiencing Orford Ness, which was such that he no longer considered this area of Britain, and perhaps indeed Britain itself, to be his 'home'? But it is at this point that the psychoanalytic literature may again be useful. Sebald's many visits to such uncanny sites and experiences can be interpreted as his continuing and apparently endless search for a home, one replacing not simply the 'home' of Germany or Britain but also the 'home' where he had grown as a young child. A number of commentators on Sebald's work emphasise the links between his writings and his own life (see, for example, Long and Whitehead 2004; Patt 2007). 'Home' in Sebald's case was where he was brought up not by his mother or father (the latter

being in the German army) but by his maternal grandfather (Patt 2007; Schwarz 2007).

Representational Space: Jouissance at Orford Ness

Lefebvre made a very clear distinction between 'spatial practices', 'representations of space', and 'representational spaces'. And he strongly implied that 'representational spaces' are where freedom is to be realised. But in practice, it is difficult to be over-clinical about these distinctions and the potential of different kinds of space for human emancipation. This is because people are, whatever their circumstances, always coming to terms with contradictions presented to them in whatever kinds of space.

The End of War?

Attempts have been made to erase the contradictions here between military power and wildlife. Unsurprisingly, there were no original intentions to make Orford Ness 'represent' a particular set of practices such as war and preparations for war. It was placed on the social and spatial margins precisely to avoid making these connections. But perhaps surprisingly, attempts have later been made to let it fall into a ruined state and to use this deterioration to symbolise an end of war. In this sense, it has been made into a 'representational space' by architects and aestheticians. Their idea was that this now dilapidated and crumbling space could represent 'the end of war'.

When the National Trust acquired the site in 1993, the initial plan was to simply destroy and remove all the military remains. But, in place of this plan, an attempt was made to represent the place as 'a beautiful ruin'. The idea was to leave the buildings and structures on the site to deteriorate. This plan to aestheticise the place was put forward by Jeremy Musson, an architectural historian then working for the Trust. He believed the value of the site lay in its ruinous state. He was well aware of the military ori-

gins of the place but argued that allowing the ruination of the site could be made to represent the passing of war and harbinger of a harmonious and peaceful society. Woodward put this objective somewhat poetically as follows:

> The Ness of shifting shingle … was a palimpsest of twentieth century history, from the wooden huts of the First World War to the Cold War's Pagodas. In a new and hopefully more peaceful century the ruins would crumble into extinction in exposure to the wind and waves, as if the earth was being purified by Nature. (2002, p. 223)

Such was Musson's approach to representation. And, in choosing this particular perspective, the National Trust was adopting an aesthetic known as 'The Picturesque'. This notion has well-established origins buried deep in British philosophy and can be seen as an early form of psychology. Especially significant in this context is the work of the eighteenth-century theorist John Locke. He argued that the mind works by making associations between accumulated memories (Locke 2007 [1748]). Thus, smoke from a cottage chimney signifies the warmth of a fireplace within the home. Similarly, a castle turret resonates with the romance of chivalry. By extension, Musson is suggesting that a deteriorating site devoted to military invention would be interpreted as the end of war. In this way, the visitor's experience is seen as incorporating a moral narrative, in this case, 'a meditation on time transience and humanity' (Woodward 2002, p. 232).

But in practice, the attempt to make this crumbling military site represent the end of war is highly problematic and mystificatory. As Saussure's work has argued, there is no necessary relation between a signifier and a signified: in the present case between a ruined place where weapons were once experimented with and a particular 'signified' such as 'the end of war'.

The nature of the problem as it relates to Orford Ness is spelt out well by one of the place's visitors, Sophia Davis (Davis 2006). At the time of her visit, she was an MPhil student in the History and Philosophy of Science at the nearby University of Cambridge. She strongly criticised

this attempted connection between a ruined Orford Ness and a more peaceful society.

> Although the Trust may have been highly non-interventionalist in terms of the structures themselves, the prospect of the collected buildings has been arranged to provoke a contemplative engagement with ephemerality. At Orford Ness, the implications to the visitor is thus that science in the service of War, the 'civilisation' of secret science on one of whose sites they are intruding is over. This despite military science's present continuation. Indeed, one newspaper article's subtitle called Orford Ness 'a graveyard for secret military experiments'. (2006, p. 39)

So for this visitor at least, the attempt to represent Orford Ness as symbolising the end of war is highly misleading. For her, this space not only fails to represent 'the end of war'. In fact, it represents just the opposite, a stark reminder of 'military science's present continuation'.

Experiencing Orford Ness: Visitors' Accounts

Written accounts of how Orford Ness is experienced by visitors again highlight the forms of contradictory experience in 'spaces of representation' and 'representational spaces'. These again illustrate the various forms that jouissance can take.

A series of surveys was undertaken by the National Trust asking visitors for written responses to the site and these allow us to study how people experience this place and the meanings they attribute to it. These responses show little or no recognition of the National Trust's original aesthetic intentions. Responses are again predominantly characterised by ambivalence and contradiction.

The following quotations from visitors' notes consistently show that jouissance, with all its contradictory qualities, prevails in this marginal space. But these written accounts also show that the sense of strangeness stems not simply from the juxtapositions and contradictions of the place but also from the fact that language is often itself a difficult means of articulating contradictory experience. As briefly mentioned earlier,

Jacques Lacan refers to words failing under ambivalent and shocking circumstances and this seems to be a good case in point:

> I am shocked—yet fascinated. (Katie 3.9.96)

> I was fascinated by the tranquillity and the "mystery" of the place. (Roger 25.8.95)

> Very interesting, and a little spooky (Margaret 24.7.97)

> Beautiful, wonderful and strange (Lyndon 8.5.98)

> Very interesting. But with a strange, eerie, almost sinister feel to it. (anon. 29.9.01)

> Eerie and fascinating in equal measure (anon., n.d.)

A few people combine feelings of 'strangeness' with a stronger acknowledgement of the spatial practices which created this place. But this place again remains far from generating any sense that war has ended. Rather, an underlying ambiguity and tension prevails. On the one hand, Orford Ness is very often described as 'beautiful' and 'strange'. On the other hand, it inevitably remains associated with armaments production and testing.

Even in their ruined state, the military structures can again be seen as what Freud (1896), called 'the return of the repressed', a constant reminder of something visitors may well wish to forget. A form of *jouissance* again prevails, one combining such words as 'beautiful' with 'chilling' in the same sentence. The place has both negative and positive meanings. Here are some more examples:

> A part of our history not to be repeated—it is hauntingly beautiful. (A Johnstone, 6.9.06)

> A very strange experience—seeing what was done to a very beautiful and unique stretch of coastline. A chilling monument to the Cold War. (Daniel, Hertforshire)

> There is a wonderful air of mystery and peace at a place so involved in being nasty to each other. (Tim, 18.7.02)

Yet there is again an important sense in which these responses can also be considered 'positive' and 'political', this in the sense that they start envisaging new, more emancipated ways of life even within a place previously dedicated to prosecuting two world wars. To understand, this we must incorporate the contradictions and ambiguities experienced on the site with the sense of jouissance stemming from the contrast between experience of this place and that of 'normal', everyday life.

The National Trust questionnaires sought comments on whether Orford Ness should be made more like a 'normal' tourist site and, in particular, whether it should be commercialised with a 'tea shop' or a 'gift shop' which would sustain and entertain adults and children. In short, should the place be made more like society as a whole? The answers are very instructive. They were a firm 'no' from almost every responder and this is important despite, and indeed because of, this place being experienced as 'strange', 'spooky', even 'dangerous'. The great majority of visitors are captured by the discomforting juxtapositions between wildlife and objects associated with death and destruction. And they want the place kept in just that way. For example, Katie (writing on 1.9.01) found it to be an 'eery and atmospheric place—keep it unspoilt! No tearoom/shop is needed. Please keep it as it is! No tearooms or refreshments. Too atmospheric for it is a lesson to learn from history'. Resistance to any kind of commodification is a common demand. 'Don't tidy it up', writes the Bennett family (26.10.95). 'Orford is a display that does not try to emulate Disneyland. Disney is for children, this is not. Please keep it that way' (anon.). 'Please don't let it get "commercial"', write Alan and Marie (10.7.97). 'Please leave it as it is now; and no teashops! The atmosphere would be totally spoilt', writes an anonymous visitor.

A relatively small number of visitors make still more assertive connections back to the zone's original spatial practices. One writes: 'it is sinister and a reminder of the way humankind is not respecting the planet or the life upon it. Still we don't learn. Reject War.' People attributing these kinds of meanings to Orford Ness are definitely not seeing the place as symbolising the end of war. On the contrary, the connections with war are all too clear. At a still more explicitly 'political' level, a very few visitors' experiences even begin to resonate with historical materialist perspectives on imperialism and war as represented by Lenin (2010), Luxemburg (2004), and Harvey (2003, 2006). One visitor describes his experience

of Orford Ness as 'interesting, but why no mention of the RAF's role in imperial control, bombing Iraq and parts of Africa in the 1920s, presumably using experience gained at Orford Ness?' (Richard, 15.9.02). These visitors, like many others, find the place has both attractive and sinister associations. But here, such experience is being transformed into an assertive attack on the economic and political power underlying the creation of the place. In these cases, it may seem that any sense of mystery or fear is being replaced by a much more considered social and political analysis.

We now turn to children's experience of Orford Ness. Their accounts again illustrate a strong sense of jouissance. A conventional sociological analysis might suggest that children playing in this very remote and 'liminal' place between earth and sea are separated here from the controls normally exercised by adult-dominated society. Not yet fully socialised, and perhaps under less than usual control by adults, children are engaging in practices and thoughts not normally 'allowed' in respectable, adult-dominated society.

But, if we take the contribution of psychoanalysis at all seriously, this explanation is only part of the picture. Unlike the case of adults, the excitation and jouissance of a young child has not been largely reconstructed through language or 'the symbolic order'. And the result is that words are again 'failing' as they attempt to describe their experience. The fusion of fear and enjoyment in their accounts stems from them not yet having the adult vocabulary to describe their experience. Children were, for example, asked by the National Trust what they enjoyed most and least about the site. We find Alexi enjoying 'how it is very ghostly'. Emily writes: 'I really enjoyed it because it was slightly spooky. I thought the museum was cool because of the bomb.' Megan also enjoyed 'The Atomic Bomb' most, and actively criticised the National Trust for 'not enough bombs'. Again, children are here clearly experiencing a combination of fear and pleasure, but they are experiencing their encounters as a form of unconstrained fun, enjoying themselves considerably under conditions of potential or imagined danger.

'Bohemians' and Jouissance at Untrue Island

As we have seen, whatever aestheticians and architects may intend in terms of a structure's interpretation, there is absolutely no guarantee that they will be interpreted that way. Crumbling military buildings are not

understood as 'the end of war'. But, as we have also seen, this does not suggest that no general processes are in operation when we experience a place such as Orford Ness. Rather, experience operates at a different, more general level. Again, the experience is best understood by the word 'jouissance', a combination of pain and enjoyment.

This last section develops this argument by showing how people's contradictory experience of Orford Ness can become still more positive, optimistic, and even celebratory. The sense of horror and negativity is partly transformed into one of considerable positivity and the creation of alternative ways of life. Contradictory experience is being converted into something closely resembling Lefebvre's 'representational space'. Yet, we must remember, as Lefebvre himself points out, that the power of a 'representational space' stems not only from the space itself but also from the juxtaposition with other types of space, including those previously used for dominant 'spatial practices'. The juxtapositions at Orford Ness are a strong case in point.

An assertion of Orford Ness as a 'representational space', one offering more liberated and fulfilling ways of life, can be illustrated with a number of sources. For example, Lolo Williams, a naturalist and regional coordinator of the Royal Society for the Protection of Birds, makes connections between Orford Ness's past based on bomb design and surveillance to the present-day occupation by wildlife. But he now sees the purpose of the site as 'gone' and he envisages its ruins as a giant wildlife site made into a setting for species of many kinds. This kind of switch from negative to positive is possible through possessing deep knowledge of the natural world, one which allows him to overcome the sense of fear and alienation from nature which afflicts the wider population and to propose highly positive ways in which species diversity can be enhanced. (The 'barn' occupied by the owl is now a ruined barracks building dating from the First World War).

> Nuclear bombs were born here, tested, stressed, pushed and pounded, designed to end the world. Now they're gone. The buildings fade into the land and the accidental design of evolution. The barn owl. Its wings beat silently. Special feathers make no noise, helping it hear prey, detected by a carefully convex face funnelling sounds to accurate ears. (Williams speaking in BBC 2013)

A second example is the 'Untrue Island' group established at Orford Ness. It has found a way of living not only with these contradictions but even using this zone in new and positive ways. Hegel, writing two centuries ago, was one of the first philosophers since those of Ancient Greece to argue that art in its many forms is one way in which human beings can collectively create fresh, sometimes subversive, understandings of society and its values (Hegel 2000; Maker 2000). And, by the same token, Hegel also suggested that artists and other 'bohemians' are a class of people most likely to overcome estrangement. These are people on what we have earlier termed the social and political 'edge'. They operate beyond mainstream society and, by the same token, are well qualified to envisage and create alternative, ideal kinds of society. But again, there is a psychological process at work here, one combining with the social level.

A group of 'bohemians' at Orford Ness is now showing how a strange ambiguous place such as Orford Ness can be imagined as a representational space. The title 'Untrue Island' expresses the shared feeling that seeing is actually not believing. The combination of ruined buildings and the many forms of rare wildlife make it an extremely difficult place to understand relative to everyday experience on the mainland. Furthermore, as members of the group stress, the place was founded on, and continues to be based on, official lies and deceptions (access to large parts of the site is still forbidden). All these qualities combine to make Orford Ness 'untrue'. Here, the negativity over the place's historical connections is certainly recognised. But again, the jouissance experienced here is now generating visions of a 'representational space', even a utopian zone. Negativity is converted into a springboard for fantastic new creations, these taking the form of popular spectacle, poetry, and music. The pervading secrecy, ambiguity, and disorientation of the place is now consciously or subconsciously (or a combination of the two) transformed into a positive set of meanings for future, more emancipated, societies. But again, note the extraordinary contradictions. Celebration and creativity are again taking place within a massive uninhabited zone and a scattering of disused military buildings and weaponry.

Combining different forms of expertise and entertainment, this loose-knit 'Untrue Island' group deliberately exploits the place's complex and

dangerous 'strangeness' as a means of contesting war and secrecy. Positivity is arising from negativity. Images of the pagodas are now used not to represent military power but to generate and celebrate life-enhancing practices. In these ways, jouissance is producing visions of an alternative, collectively made social order.[4]

This is one small instance of how a small group of people with complementary skills, forms of knowledge, and experience can combine to give an ambivalent, strange, and frightening place on the social and physical 'edge' a coherent and celebratory set of radically alternative meanings. It is now far from being simply a dangerous and 'strange' place but, for these people at least, one in which fantasies about enjoying new kinds of collective life are actually being made and realised.

A powerful physical symbol in this respect is the conversion of military buildings into use for peaceful and celebratory purposes. 'The New Armoury' best sums up the contradictions and, more importantly, the positivities stemming from the Untrue Island group. It is a bomb-proof weapons store now converted into an auditorium for public performances. The New Armoury is referred to below in Robert MacFarlane's account of Orford Ness. His words demonstrate well the positivity and creativity being made to develop in this 'representational space'.

> What at last transpired is a strange and hybrid thing. The audiences are ferried over the Ore, and then walk for a mile through the site—past sculptures by the artists Jane and Louise Wilson—to reach the New Armoury. The piece is an hour in length, consisting of part improvised jazz and part pre-composed music, the text part-spoken and part-sung, all by Arnie and his fellow musicians. But because the Armoury is open to the weather—doorless at both of its vast and ruined ends—the other performer will, of course, be the Ness itself.

[4] For an account of how artists and musicians have represented Orford Ness as a place of positivity and creativity, see National Trust (2012) and MacFarlane (2012). Furthermore, local primary school children are now contributing to understanding this place as a 'space of representation'. With the aid of models made of pebbles and driftwood they are, with the assistance of their teachers, representing alternative ways of rebuilding and reusing Orford Ness (see Tribley 2013).

But how are we to account for this positivity? Is it simply the product of the negativity and strangeness of Orford Ness? The answer, if we again recognise the contradictory nature of jouissance, is more complex. The art, the music, the celebrations, and the creation of an enormous wildlife site out of military ruins are again attempts to achieve a kind of joyful satisfaction in the middle of a zone earlier devoted to war preparations. A new kind of social order is being made to emerge from the horrors associated with the old.

Conclusion: Living with Contradiction

This study of a strange, 'edgy', place has much wider and more general implications. The experience of jouissance, more specifically the ways in which negativity and positivity interact with each other, has been illustrated here by examining how people react to an 'extreme' place 'on the margin' and full of contradiction. But this does not mean that this type of experience is limited to such places such as Orford Ness. Rather, a more general point is being made here with the aid of this extreme place. Negativity is not simply repressed. Rather, it acts as a spur to positivity and creativity. Freud is again useful here. His idea of 'the death instinct' does not mean that people are literally attempting to destroy themselves. Rather, he is referring to the constant propensity to make life anew, leaving sinister and death-related inclinations 'dead' and behind. Freud's emphasis was on the subconscious drive to constantly make life anew in this way. But, as this chapter has described, the process is also social. It is one in which people make life anew by resisting dominant, in this case militaristic, forms of power.

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Afterword

I first met Peter Dickens when he joined the Red–Green Study Group many years ago. The Group was formed in 1992 in order to promote red–green socialism, now ecosocialism, by drawing on the overlap between those parts of the red and green traditions that recognised that capitalism was the primary source of both social injustice and ecological unsustainability. I had heard of Peter's work but was not at all familiar with it. As I got to know him better at our meetings over the years I soon realised how important his ideas are and what a lovely person he is. However, it was not until I read the chapters in this *Festschrift* that I became fully aware of the breadth of his scholarship, the wide range of issues he has studied and written about, the quality and originality of his thought, and the ways in which his work has continually developed and changed and, of course, inspired others.

The title of the book perfectly captures what is perhaps the central insight running through all Peter's work, the dialectical relationship between human action and non-human nature. As we act on non-human nature, we not only change it but also change ourselves. The changed non-human nature in turn influences the way we then act on it and we again change ourselves. Following Marx's first contradiction between pri-

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vate ownership of the means of production and the social character of production, and O'Connor's second contradiction between the capitalist mode of production as a whole and non-human nature, Peter proposes a third contradiction, between capitalist social relations and our human internal nature, our alienation from an understanding of ourselves and our relationship to the social and natural world. He emphasises the way in which capitalist production relations have a deleterious effect on people's psychological well-being, modifying human nature in its own image, but he also recognises the irreducible existence of unrealised latent human potential. This is an important area for further research as it reminds us that we act not just on non-human nature but also on social reality, through various forms of resistance and pre-figuration, and in doing so change ourselves in positive ways towards a collective, solidaristic empowered consciousness.

The philosophical foundation of Peter's work is that of 'critical realism': realism in that the objects of knowledge exist objectively, subject to natural or social laws, independently of our knowledge of them; critical in that we cannot directly access these objects and laws and our knowledge and scientific understanding of them is a social product that is always provisional and subject to revision. In discussing the different stages in the development of capitalism, Peter emphasises the important distinction between the formal and real 'subsumption' of labour. In the early stages of capitalist development, although workers became wage labourers the work they did remained relatively unchanged as craft work, drawing on the tacit knowledge they acquired through experience. With the growing application of technology and science, machinery was substituted for direct labour and workers increasingly became machine minders, losing their tacit knowledge. Initially this applied to manual work but with the development of computers and automation it applies increasingly also to white-collar and professional work. This poses sharply the contradiction between the potential of advances in scientific and technical knowledge to liberate us from psychologically unproductive work and the distorted form that knowledge takes, and the alienated use to which it is put, within capitalist social relations.

The discussion and application of Peter's work in the chapters of this book point to several directions for future research, among which I thought the following are of particular interest and importance. Ted

Benton argues that Peter's use of evolutionary theory as a co-determining factor with historical materialism has been his 'distinctive emphasis' in seeking to understand our 'internal nature'. However, he suggests that this is 'a particularly precarious and challenging association for social scientists to make', given the reactionary reductionist use historically and currently made of it. Peter has confronted this danger in his *Social Darwinism* (2000) but it remains an increasingly influential trend in evolutionary psychology and neuroscience which needs to be constantly combated.

Kate Soper, while recognising Peter's insights into environmental alienation in the form of 'the commodification of nature; the cognitive estrangement resulting from the lack of "direct engagement" with it; and the metabolic rift that has accompanied industrialisation', nevertheless poses the question of 'what it is that can legitimately count as an "authentic" or "non-alienated" relation to nature'. She is herself uncertain about this and her chapter is a stimulating discussion of ways of thinking about the issue, concluding that 'recognition of the otherness of nature … as a corrective to the dominance of our own constructions and a reminder of how things could be other than they are' is the only theoretical offering on environmental alienation that she finds persuasive.

A related way of thinking about this might be in terms of the way in which capitalism ruptures the pre-existing organic connection between society, economic activity and non-human nature by instituting the economy as a system separate from the rest of society, with its own laws of operation, so that society and its interaction with non-human nature is shaped to serve capital, rather than economic activity being shaped to serve society in ecologically sustainable ways. The way in which 'things could be other' can then be thought of as (re)creating a modernist organic connection in which a self-governing society controls economic activity while consciously mediating its relationship with non-human nature in an ecologically sustainable manner.

John Bellamy Foster and Brett Clark suggest that there have so far been two stages in the development of ecosocialism: the first a polarised debate between those asserting the primacy of non-human nature and those arguing for the social production of non-human nature; the second, of which Dickens was a pioneer, emphasising a nature–society dialectic and metabolic analysis. Further work is needed to examine the extent to

which these apparently different positions are real and fundamental for our understanding or rather are differences of emphasis and theoretical formation. What is clear is that the concept of the 'metabolic rift' popularised by Foster has become central to our understanding of the relationship between capitalism, knowledge and non-human nature.

This is evident, for example, in the creative use Graham Sharp makes of the concept in examining the transitions that have occurred in food production and distribution, giving rise to 'ultra-processed' food and a 'knowledge rift', in the sense that people have little idea of what is contained in the food they consume. The concept of a knowledge rift is also relevant to the ongoing research of James E. Addicott and Kathryn Dean in their respective analyses of 'precision farming', computers and artificial intelligence, in which they highlight the double-edged effect of the scientific knowledge underlying these developments which on the one hand undermines existing tacit knowledge and on the other is alienated from its potentially liberating possibilities by being shaped to further capital accumulation. This links to the point made in the discussion of Peter's consideration of 'subsumption' above and also connects with work undertaken by the Red–Green Study Group on pre-figuration, in which people actively seek to live and organise in ways that draw upon and develop their individual and social tacit knowledge in cooperative and solidaristic directions.

In the final chapter of the book, Peter's restless curiosity is again evident in a new and perhaps unexpected direction with his discussion of the 'marginal' or 'liminal' spit of Orford Ness, a nature reserve and area of outstanding natural beauty but also the site of the remains of decades of military ordnance and radar testing. Drawing on his interest in psychoanalysis, he examines the reactions of visitors to the Ness in his usual stimulating way, combining sharp lateral theoretical insights with fascinating empirical material, making use of Henri Lefebvre's concept of 'jouissance', the experience of pain mixed with pleasure. Embracing the mixture of pain and pleasure, as Peter does in his work, is perhaps something we can all learn from when seeking to combine Gramsci's 'pessimism of the intellect' in the analysis of today's forbidding world with his optimism in believing another world is possible and working together to achieve it.

Pat Devine

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