

Reconstructing Nature

Alienation, emancipation and the
division of labour

Peter Dickens

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RECONSTRUCTING NATURE

One of the main features of contemporary environmental crisis is that no one has a clear picture of what is taking place. Environmental problems are real enough but they bring home the inadequacy of our knowledge. How does the natural world relate to the social world? Why do we continue to have such a poor understanding? How can ecological knowledge be made to relate to our understanding of human society?

The book argues that the division of labour is a key but neglected factor underlying people's inability to adequately understand and relate to the natural world. The argument extends Marx's theory of alienation to account for inadequate knowledge and therefore inadequate concern for nature. Using recent developments in 'critical realist' philosophy, the book aims to find ways of reorganising knowledge in the light of ecological consciousness. It also corrects the emphasis of much environmental literature by focusing on production rather than consumption.

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To Tristram and Aldous with affection

The idea of one basis for life and another for science is from the very outset a lie.... Natural science will in time subsume the science of man, just as the science of man will subsume natural science: there will be *one* science.

K.Marx (1844), *Economic and Philosophical Manuscripts*

As a consequence of a more advanced division of labour, each mind finds itself directed towards a different point on the horizon, reflects a different aspect of the world and as a result the content of men's minds differ from one subject to another. One is thus proceeding to a state of affairs, now almost attained, in which the members of a single group no longer have anything in common other than their humanity.

E.Durkheim (1898),
'Individualism and the intellectuals', *La Revue Blanche*

CONTENTS

| | |
|---|----|
| <i>List of illustrations</i> | ix |
| <i>Acknowledgements</i> | x |
| <i>Introduction</i> | 1 |
| 1 SOCIETY, NATURE AND THE BALKANISATION OF ABSTRACT KNOWLEDGE | 18 |
| <i>Nature's revenges or a crisis in understanding? On the fragmentation of abstract knowledge</i> | 21 |
| <i>Society—nature relations and the intellectual division of labour</i> | 29 |
| <i>Physics, thermodynamics and society</i> | 34 |
| <i>Society modelled on the life sciences?</i> | 37 |
| <i>The sociology of the environment: nature's real powers excluded</i> | 39 |
| <i>Explaining the divisions of mental labour</i> | 44 |
| <i>Conclusion: capitalism, nature and modernity</i> | 49 |
| 2 UNDERSTANDING ALIENATION: FROM THE ABSTRACT TO THE CONCRETE | 52 |
| <i>Criticising and developing existing work</i> | 52 |
| <i>Towards a general theory of alienation</i> | 56 |
| <i>From the abstract to the concrete</i> | 58 |
| <i>Types of knowledge, disciplines and politics</i> | 68 |
| 3 REALISM, SOCIAL CONSTRUCTIONISM AND THE PROBLEM OF 'NATURE' | 71 |
| <i>Constructionism versus realism: some recent debates</i> | 72 |
| <i>Social constructionism and realism: a false dichotomy?</i> | 73 |
| <i>On the dialectics between realism and strong social constructionism</i> | 76 |
| <i>Conclusion: strong social constructionism—why all the fuss?</i> | 82 |
| 4 WHO WOULD KNOW? SCIENCE, LAY KNOWLEDGE AND ALIENATION | 85 |
| <i>Lay knowledge: a hostility to science?</i> | 85 |

| | | |
|---|---|-----|
| | <i>The Mass-Observation Archive study</i> | 87 |
| | <i>The Mass-Observation Archive Environment and Nature Directive: results and discussion</i> | 88 |
| | <i>Conclusion: another causal mechanism?</i> | 100 |
| 5 | INDUSTRIALISING NATURE'S POWERS | 102 |
| | <i>Working on nature: a dialectical perspective</i> | 102 |
| | <i>The fragmentation of nature</i> | 106 |
| | <i>Labouring on internal nature</i> | 107 |
| | <i>Biotechnology: working on external nature</i> | 111 |
| | <i>Lay knowledge, tacit knowledge and the division of labour</i> | 116 |
| | <i>The imposition of a reductionist abstract science</i> | 121 |
| | <i>The new technologies: constraining or enabling?</i> | 123 |
| | <i>Conclusion: alienation and the nature industry</i> | 128 |
| 6 | CIVIL SOCIETY: THE RECOVERY OF WHOLENESS? | 131 |
| | <i>Aspects of the civil society debate</i> | 132 |
| | <i>Civil society and the changing spatial division of labour</i> | 136 |
| | <i>Civil society and the commodity 'nature'</i> | 138 |
| | <i>Alienation, self-provisioning and cultures of nature</i> | 146 |
| | <i>Civil society as struggle</i> | 153 |
| 7 | KNOWLEDGE, STATE AUTHORITY AND THE DIVISION OF LABOUR | 163 |
| | <i>The state as alienated community</i> | 164 |
| | <i>'What the hell are these blokes talking about?' Knowledge and the state as alienated community</i> | 166 |
| | <i>States and the contradictions of environmental knowledge</i> | 168 |
| | <i>Re-thinking 'New Social Movements'</i> | 170 |
| 8 | GREEN UTOPIAS AND THE DIVISION OF LABOUR | 181 |
| | <i>Green Utopias and the division of labour</i> | 182 |
| | <i>Community and the problem of knowledge</i> | 189 |
| | <i>'Self-government of the producers': some innovations within modernity</i> | 191 |
| | <i>Cyberculture as virtual community: emancipation at last?</i> | 196 |
| | EPILOGUE: HUMANISING NATURE, NATURALISING HUMANS | 203 |
| | <i>Bibliography</i> | 206 |
| | <i>Index</i> | 218 |

ILLUSTRATIONS

FIGURES

| | | |
|-----|--|----|
| I.1 | Concepts of people and environment | 6 |
| 1.1 | Global warming:one of nature's revenges? | 22 |
| 1.2 | Relations between the realms consisting of entities governed by the various sciences | 31 |
| 1.3 | The circuit of capital | 43 |
| 2.1 | The relations between abstract and concrete | 59 |
| 2.2 | The relations between abstract and concrete: factory farming and the Chipko movement | 60 |
| 4.1 | The connection between environmental and development problems | 92 |

TABLES

| | | |
|------|--|----|
| 1.1 | Transformations of energy | 35 |
| 4.1 | The Earth Summit assumed that there are substantial environmental problems in the world. Do you agree? | 89 |
| 4.2 | Most important environmental problems, men | 90 |
| 4.3 | Most important environmental problems, women | 90 |
| 4.4 | Most important development problems, men | 91 |
| 4.5 | Most important development problems, women | 91 |
| 4.6 | Do future generations face the same problems? | 93 |
| 4.7 | Responses to Questions 4 and 5 by men | 94 |
| 4.8 | Responses to Questions 4 and 5 by women | 94 |
| 4.9 | How useful is modern science? Population as a whole | 96 |
| 4.10 | How useful is modern science? Breakdown by gender | 99 |

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Longer-term debts will become clear in the book. Suffice to say here that these acknowledgements were written on the centenary of the day Engels's ashes were scattered over the sea at Beachy Head, near where I live.

Peter Dickens
Lewes, 11 August 1995

INTRODUCTION

This book proposes a new view of the relations between society and nature. It focuses on the way human societies work on nature to produce the things they need. In particular, it is concerned with the technical division of labour in the workplace and the broader division of labour within society at large. Such divisions have obviously brought great benefits and must be a central element of any future modern society. On the other hand, they have fragmented our understanding of how societies relate to nature. They have been used to marginalise lay knowledge of nature. Furthermore, they have been used to neglect certain people's tacit understandings. This latter refers to the skills and judgements which people create for themselves in all kinds of work. Information and instructions associated with explicit knowledge can be quite easily formulated, copied, stored and communicated. But this is not the case with tacit knowledge, where the skills cannot be encoded, formulated, contained and stored in the form of words and symbols. The neglect, marginalisation and decay of these lay and tacit forms of knowledge results not only in a misunderstanding and misuse of the environment but in people's misunderstanding of their own organic nature.

Divisions of labour, divisions of knowledge and the consequent mistreatment of nature are therefore the key themes. But how can the necessarily complex knowledges and divisions of labour in a future society be made compatible with an improved understanding? How can such an understanding lead not only to human emancipation but to a recognition of natural limits and the needs of other species? By considerably extending and developing Marx's theory of alienation, this book tries to open up these difficult questions for debate and further research.

A MESSAGE FROM THE KOGI

In 1989 the historian and television producer Alan Ereira visited the Kogi, an archaic civilisation in Colombia that has deliberately kept itself in isolation from the rest of the modern world. Still ruled by a priesthood and still living

a culture and philosophy which has remained largely untouched by the advances of modernity, they sent the message out to Ereira that they had a message for 'the Younger Brother', all the people who lived outside (Ereira 1990).

Their message was that modern society is ruining the world through environmental destruction. The Kogi did not know when, or even if, there would be a calamitous collapse but they did know that very large-scale changes were being made to the environment and that these were threatening human and non-human life. Their knowledge was, and still is, based on a minute observation of the world: the details of plant and animal life, for example. It is also based on their knowledge of the most sacred area of the Sierra Nevada, the snowpeaks near where they live. Ereira visited this area and found it dried up. The snow that usually covered the area year after year had almost completely gone. Like many ancient civilisations, the Kogi believe the earth to be alive. It is a mother offering sustenance. And yet, they say,

The Mother is suffering.
They have broken her teeth
and taken out her eyes and ears.
She vomits,
she has diarrhoea,
she is ill.

There are several points to this story. Perhaps the most important is that the Kogi *know* what is happening. They do not have access to modern science and knowledge. But they appreciate on the basis of their everyday knowledge and the culture handed down to them through thousands of years that something profound was occurring. Indeed, it is precisely *because* they had no access to modern ways of thinking that they were most aware of what was happening. Modernity, 'the Younger Brother', knows a great deal, they say, but this is disqualifying him from actually understanding. Modern societies decry such knowledge. Worse than this, modern knowledge is being used destructively.

Younger Brother thinks
'Yes! Here I am! I know much about the universe!'
But this knowing is learning to destroy the world,
to destroy everything,
all humanity.

The Kogi are reminding the Younger Brother that we have, for all the advances made by modern science and modern social science, very little understanding of our relations to nature. Our knowledge of the environment and of our relations to nature are characterised by considerable ignorance. This is the price to be paid for what are sometimes called the 'reflexive modernity' and 'detraditionalisation' associated with the modernisation of society (Lash 1994, Giddens 1991). Modernity seems to be characterised by people critically reflecting on the rules and knowledges handed down to them. They are taking

their lives into their own hands, making their biographies without the benefits of generations of handed-down wisdom and demanding that traditions continue justifying their existence. Such features of modernity are, of course, emancipatory in many ways. Increased scientific understanding of nature and of ourselves has, for example, brought clear and great benefits. At the same time, and most paradoxically, the simultaneous creation and marginalisation of 'lay' understanding and tacit knowledge have in key respects made modern people more ignorant of themselves and their relations with the environment.

Such failure to understand has provided a field-day for competing ideologies. According to many in the environmental movement, we are confronting imminent and large-scale catastrophe. On the other hand, according to an increasingly influential group of pro-market New Right scientists, politicians, economists and journalists' we can relax. There is no problem. No imminent or large-scale collapse has been proved by any kind of science. There have been, for example, large-scale changes in the earth's temperature over millions of years. There is no need to assume that the current changes are anything other than part of a naturally recurring cycle.

Furthermore, these commentators argue that the environmental crisis is being cooked up by socialists. Having lost the battle against capitalism the Left, in conjunction with others such as feminists, is making a comeback. This time they are inventing a new scare to frighten people and get them all marching under a red/green banner (Beckerman 1995, North 1995, Ridley 1995). Furthermore, the neo-liberals and others who argue that all is still for the best in the best of all possible worlds, argue that even if there is a problem it would certainly be unwise to take large-scale and costly measures. In the light of our ignorance, they suggest, such strategies could well turn out to be disastrously wrong in the longer run. We are all bright and intelligent people, the argument goes. Insofar as policy is needed, the best is an incremental one whereby the environment and rare species are costed and individuals and companies pay for any environmental damage they are causing. Capitalism and the market are the solution to environmental problems, not the problem.

These arguments were prefigured with the so-called 'Tragedy of the Commons' thesis. This suggests that resources which are available to all only encourage environmental degradation, as each individual person uses them as much as possible. The benefit to the individual of such use greatly outweighs his or her costs in terms of the slight decline in the quality of life spread over the population as a whole. This 'free rider problem' eventually ends up, it is argued, in such resources being rapidly exhausted and everyone finishing up with nothing. The answer, it is suggested, is well-defined property rights. On this basis the resources will not disappear since there are now owners who have an interest in ensuring that this does not happen. The argument is, however, wrong on a number of grounds. For one thing history shows private property is no guarantee that environmental degradation will not ensue. As

often happens, neo-liberals seem to be assuming an (imagined) eighteenth century world of small businesses. As Sayer (1995:157) puts it:

A smallholder might have an interest in sustainable exploitation, though market conditions might prevent them achieving this, but an international logging company has little interest in conserving trees in particular areas even if it owns the land on which they grow.

The position of this book within these arguments must be declared. Coming from a broadly 'green socialist' position, its author belongs firmly to that camp of people which, according to the New Right at least, is trying to manipulate and subvert the thoughts of passive populations throughout the entire world. (So far, it must be said, with rather little success.) As will become clear later, I feel extremely critical about contemporary capitalist society, its social structures, institutions and the ways it is treating the environment. On the other hand, to concentrate the attack on capitalism alone may be to miss a central problem, that of the advanced division of labour under modernity. Furthermore, it surely is the case that the free-market economists, politicians and others who insist that we do not know very much have a very serious point. All this again leads this book to the conclusion that the core problem is the division of labour and the associated divisions between knowledges. Szerszynski (1996), writing of pre-modern relations between society and nature, puts the matter as follows:

Once, it seems, we knew what to do. Until the early modern period, knowing who we were, and in what practice we were engaged, told us all we needed to know about what we ought to do.

Try as one might, it is actually very difficult to find a consensus over, for example, global warming, famine and resource crisis. As the Kogi have insisted, our great advances in knowledge have not resulted in our achieving a greater understanding. Furthermore, conventional Marxism and socialism by no means have a necessary monopoly of wisdom and insight into these matters. How, for example, do they account for extensive widespread destruction in the old socialist or 'communist' societies? This must lead us to a departure from conventional Marxism, or at least a considerable extension of what was just a small part of his work.

The purpose of this book, therefore, is to set out on a journey towards a greater understanding. This is of course an impossibly ambitious task within one book. It is rendered even more difficult by being aware of the undoubted intellectual and material achievements made by modern society (something which the anti-green movement is better at emphasising than the Left, albeit in a highly Panglossian way) while remaining cautious and critical of these same achievements. This study is just one step along the way towards an eventual wholesale reorganisation of knowledge in the light of ecological consciousness and potential environmental crisis.

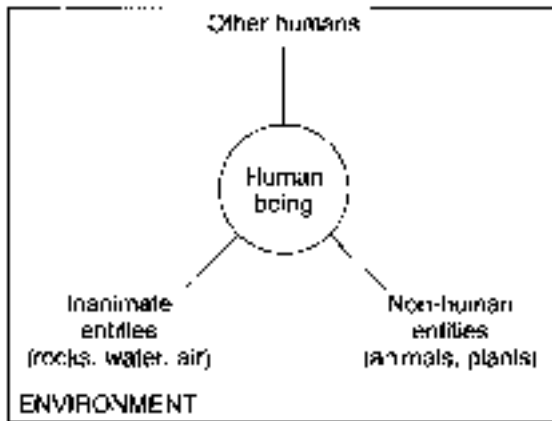
This book is partly about the physical reconstruction of nature by society. But it is also about the reconstruction of our knowledge *of* nature and our relations with it. The current organisation of knowledge about these relations (or, more accurately, its chaotic disorganisation) is a key theme. Such fragmentation obviously brings a large number of benefits. Again, few would want to reject outright the advances made by modern societies in understanding the physical, natural and human worlds. And the more that we work on nature to produce the things wanted by human beings, the more we enable human beings to develop their own capacities for innovation and creativeness. But divisions of labour are at the same time seriously disabling. They mean severe failures to communicate between different areas of knowledge.

One of the main reasons why an archaic society such as the Kogi feel confident about their relations with their environment and know what to do in relation to it is that they have a radically different understanding of it. Anthropological work on such peoples shows that they usually do not use the category 'nature' to understand themselves and their relationships with the rest of the world (Ingold 1990). As Figure I.1 shows, for them there is only one world: one inhabited by other humans, by non-human entities such as plants and by inanimate entities such as rocks, water and air. In modern societies, by contrast, a radical division takes place in how people understand their relationships with the environment. On the one hand, humans are seen in relation to a society constituted by other human beings. This is normally the province of the social sciences. On the other hand, there also exists a sphere of life called 'nature', one usually only studied by the natural and physical sciences. Human beings in modern societies consider themselves to be both social or cultural persons (a product, that is, of society) and biological or natural beings. In this latter sense they have close similarities with other beings.

The book therefore particularly focuses on the division of labour. This is the key difference between this study and others linking human societies to the natural and physical environment. Other recent work (for example, Benton 1993, Hayward 1995, Soper 1995) has very successfully linked political economy and other branches of social theory such as feminism to the environmental question. This book is firmly in line with these new directions. But at the same time it seeks to develop them with reference to the division of labour. This is one of the most central and yet most neglected features of modern society. And yet it rarely figures in discussions about our relations with nature.

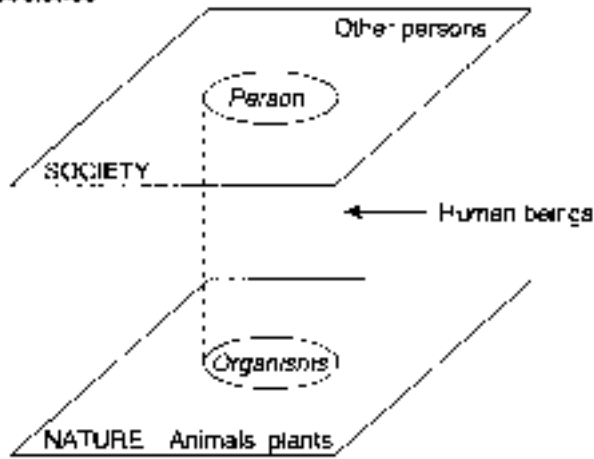
The division of labour refers to the system of work specialisation that characterises all human societies. As a result of such specialisation people become dependent on one another (Sayer 1995). The division of labour is perhaps best known as a concept used for understanding relationships between people in places of paid work. This is clearly important, but the concept also applies to the relations between people and households with respect to domestic work. Race and age, as well as class and gender also form bases for

Pre-modern societies



Human beings in pre-modern societies do not usually distinguish between 'society' and 'nature'. For them there is only one world, containing humans, inanimate and/or non-human entities. Knowledge of that world is gained through dwelling in it and interacting with it.

Modern societies



Human beings in modern societies typically distinguish between two worlds: human society on the one hand and 'nature' on the other. Yet in practice people are, as human organisms, part of both these worlds. In modern societies humans depend less on knowledge gained through direct interaction with the environment and much more on abstract knowledge gained through stepping out of the environment.

Figure 1.1 Concepts of people and environment (after Ingold 1990)

the division of labour. As Sayer and Walker (1992) argue, the division of labour is founded on the work that a society conducts in transforming nature into its needs. It is:

an irreducible technical foundation in the nature of the work to be done to produce a desired result from materials provided by nature and by history. Every labor process contains a series of ordered tasks as well as particular tools and knowledge. Where these exceed the capacity of an individual worker, who cannot master more than a finite number of tasks, a division of labor will eventuate. As jobs diverge in significant ways, owing to the nature of the specific materials, tools, or products involved, so will the skills and the ways of working of those holding different jobs.
(p.16)

Ancient civilisations such as the Kogi in Colombia are characterised by relatively simple ways of transforming nature into the things they need. They are usually involved in exchanging goods between families, tribes and settlements, but they are not engaged in anything resembling the massproduction of commodities for cash. As a result, the technical division of labour in the production process is comparatively simple. So too is the social division of labour, the division between enterprises or between different units within society at large. And, by the same token, such division simultaneously implies comparatively little social interdependence. Relations within particular small-scale societies may of course be intense. But such interdependency is comparatively uncomplicated seen in relation to today's globalised interconnections between specialised workers of many kinds. Archaic societies such as the Kogi are also founded on an overlapping of land, production and consumption. In an important sense they know where they stand in relation to their environment. This is partly because their everyday lives, unlike those of us in modern societies, are bound up with it. And it is largely because of this that they 'know' when things are going wrong.

The spatial expression of such divisions is an important but subordinate theme and we will discuss these in more detail later. Our main focus here is on the social and technical divisions of labour more generally. The labour processes and social relations of production within a society such as the Kogi are, and were, fairly straightforward and comprehensible to those involved. In modern societies, however, they are far more complex. And the argument here is that the complex divisions of labour and the processes involved in working on nature in modern societies are not simply a product of capitalism. They are a product of modernity. Our particular focus here is on the labour process. Some kind of overarching control and coordination needs to be exercised over the technical division of labour; the very complex processes by which nature is converted into the things people need and buy. Some degree of management will be needed, some kind of supervisory process by which modern production processes are coordinated. But again, this is not to

say that such supervision has to be done by the people who own, control and profit by the machines that are used. There could be other divisions of labour and other ways of managing complex production processes besides those which have evolved under either capitalism or state socialism. As Marx put it with reference to capitalism,

a musical conductor need in no way be the owner of the instruments in his orchestra, nor does it form part of his function as a conductor that he should have any part in paying the 'wages' of the other musicians.

(1981, p. 511)

The division of labour in modern society is therefore a key but neglected factor lying behind the inability of people in modern societies to adequately understand and relate to the natural world. Paradoxically, the more sophisticated have modern societies become in shaping nature, the less have they an overall understanding of that same nature.

As will become clear, such conversion of nature into things also includes the work which takes place outside workplaces, particularly that in the home. Much of this is, of course, carried out by women and children and not the industrial worker who was the focus of Marx's concerns. As in the case of paid employment, such work is of course a product of power relations, especially those between men on the one hand and women and children on the other. On the other hand, they are also partly a product of the division of labour itself. The social division of labour within society at large is to some extent also a product of the fact that not everyone can carry out all the types of task which an advanced society needs carrying out. It combines, again in complex ways, with the power relations between different groups, especially of course between men and women. It is caught up with, but is not reducible to, either the struggles between genders over work in the home or the relations between workers in places of employment.

The division of labour therefore has a dynamic of its own, one that is partly independent of the particular kind of society in which it is located. Furthermore the division of labour implies some kind of social hierarchy, all large-scale labour processes needing direction. In practice, of course, it is very difficult to disentangle the power relations actually involved in any real-world division of labour from the degree of control necessitated by the complexity of a modern production process. In any actual, real, society the division of labour is exacerbated by people trying to monopolise and defend particular skills and parts of the labour process.

But again, few people (including few environmentalists) would seriously want to return to the world of the Kogi. The dominance of a priesthood and the subordinate position of women and young people are surely wholly unacceptable to most people in modern societies. Yet modernity, and especially modernity with its green tinge, wants to have its cake and eat it, to gain from the many benefits of modernity and yet dispense with the disbenefits.

As suggested earlier, this book attempts to locate environmental issues within political economy. But the division of labour is the core theme running through the whole text. And in different ways this recurs throughout. This emphasis acts as a corrective and a supplement to the environmental literature. First, much of this work remains in the sphere of consumption, or what I later call 'civil society'. Many of the problems, however, start in the sphere of industrial production. But this latter sphere, it might be argued, is also now well recognised as the cause of environmental crises. This is true, but the particular way in which production is recognised remains insufficient. This book gives particular attention to the relationships and processes within production. These, it is argued, are the central cause of people in modern society misunderstanding their relationships with nature. It is in the conversion of nature into the commodities we need that many of the problems start.

Moreover, the issue is not simply that of how capitalism converts nature into the things we need. There is now a growing literature within radical political economy which suggests that environmental crisis is a product of capitalism's rapaciousness towards resources and other species. There is again much to recommend this argument. But it is insufficient insofar as it again does not recognise the alienation of nature which seems a central, and possibly even permanent, feature of modern society. To put this another way, it is just about possible to envisage a sustainable capitalist society, one which has adapted itself to the environmental limits within which it is operating. But the relationships and processes within modern society, involving greater or lesser degrees of local, national or international public intervention, will still leave people misunderstanding and alienated from the natural world. One chapter of this book, drawing on lay accounts of the relations between people and nature, attempts to illustrate this type of alienation. Again, all this is largely because the types of knowledge which are available for such understanding remain fragmented. The division of labour which is necessary for a modern society to progress socially and economically operates against the understanding that members of such a society need to understand their relations to their environment. In particular it militates against an understanding which links people's lay and tacit knowledges with more abstract theories and understandings.

The first three chapters of this book are linked. They sketch out, with the aid of realist epistemology, what is entailed if we are to gain a better understanding of our relations with nature. Chapter 1 pursues the notion that modern society has largely disabled itself from understanding its relations to nature through the way in which knowledge has been constructed. Humans have remarkably advanced creative capacities for developing concepts and making things on the basis of these pre-formed ideas. As Marx in particular argued in his early writings, they definitely gain and develop themselves as human beings through constructing nature in ways that they have thought through and found emotionally satisfying. Such thinking and creative action

can even be on behalf of other species. But, despite this, the way in which humans have divided their thinking and their process of transforming nature manages to deny many of the advantages which they hold over other species.

The division of labour also includes the many divisions between different types of abstract knowledge—between the natural, physical and social sciences in particular. Sayer and Walker (1992:1) rightly say that ‘the division of labor is one of the most neglected categories in contemporary political economy and social theory’. This despite the fact that it was a central theme for political economy from the eighteenth century onwards and for sociology up to the early twentieth century. Adam Smith and Emile Durkheim are of course key figures in this regard.

But even Sayer and Walker do not fully draw out the important effects of fragmentations between different types of mental labour. Such academic disciplines as physics, chemistry, politics and sociology have clearly made immense strides on their own. Their models and concepts dominate our understanding and displace lay and tacit knowledges because they can be stored, copied, transferred and more easily sold as commodities than people’s more practical understandings. The danger now is not only that they no longer connect to everyday knowledge but that such abstract sciences are talking past each other. This, despite the fact that they are in reality intimately connected with one another. The mechanisms of the natural world are rooted in the laws of physics. The mechanisms of the social world are rooted in the laws of biology. Furthermore, human societies are, it seems, having increasingly deleterious ‘feedback’ effects on the precise ways in which physical and biological mechanisms are working out in practice. And yet the division of labour results in our ignoring these connections.

A further division of knowledge, that between abstract and concrete, is examined in **Chapter 2**. This chapter explores this division, examining the dimensions and extents of people’s estrangement from nature. Realist philosophy, or ‘critical realism’, again offers ways of reorganising knowledge. It envisages knowledge as stratified. On the one hand there are relatively enduring generative structures and causal mechanisms in both the human social and the natural worlds. These enable us to conceptualise links between the different strata of nature on the one hand and society on the other. Entities such as humans, other organisms and those of inorganic nature are seen as having latent powers or ways of acting. These combine with one another. On the other hand, and most importantly, they also combine in complex ways with contingent circumstances and other tendencies to produce what is actually experienced or observed. In other words, contingent factors are centrally important in affecting how generative structures and mechanisms work out in practice. Indeed, they may be so important that such underlying mechanisms and causal powers are not observed or experienced at all.

The central benefit of this type of epistemology and ontology is that explanation of concrete events proceeds through recognising and combining

both abstract laws and theories as well as information of a less abstract form. Realism certainly does not on its own ensure that the abstract laws and theories we use are actually right. It is just as possible for scientists and social scientists using a realist framework to make 'howlers' as those using any other kind of framework. But it at least gives some sense of overview and a sense of the kinds of theories that are needed if we are to connect different types of knowledge. It can be used, for example, to begin sketching in how sciences such as physics, the natural sciences and the social sciences relate to one another. But as Chapter 2 suggests, it indicates the forms in which such sciences need to be constructed to be compatible with one another. Living organisms, for example, need to be seen as carriers of potentials and capacities which may or may not be realised. This is in contrast to, for example, the more fashionable view of organisms as 'survival machines' whose underlying purpose is to replicate genes into future generations (Dawkins 1976). Later chapters show, for example, some recent developments in the life sciences which are realist in outlook and constitute a very marked improvement on an approach which sees organisms as mere gene-replicators.

There is no suggestion here that biologists should become sociologists, or even vice versa. The important thing is to link different areas of intellectual work and share similar perspectives on the ways in which organisms (including the human organism) are organised and how their powers and capacities relate dialectically to their environments. The idea of creating 'One Science' is Utopian and not necessarily desirable. Chapter 2 indicates how different types of abstract knowledge can be combined with other information to build up theoretically well-informed understandings of concrete events. It suggests that when Marxists, feminists and others talk of alienation from nature they need to explore the multiple and combined forms in which such alienation takes place. Such combinations, I argue, lie behind many contemporary forms of 'green politics'. The argument is developed with the aid of two case studies. One is concerned with indigenous peoples' relations with nature and the other with factory farming.

A central debate within contemporary environmental studies is between those who believe in the possibility of realism and those who would dismiss this type of understanding. The latter group of people, sometimes referred to as 'social constructionists', argue that all knowledge is a social construction...full stop. In other words, there can be no question of underlying causal mechanisms and powers. According to this line of argument, theory is only a product of language and power-play. There are no particularly privileged knowledges. There is no reality over and above that described by language and discourse. 'Strong' social constructionism of this kind is in part a result of the very division of labour of which this book complains. It is, in part at least, a product of the social sciences' asserting that they have a total understanding of the world, natural and human alike. Chapter 3 attempts to take stock of these arguments. It also attempts, with the aid of some illustrations, to show

how these perspectives relate to, and are indeed dependent on, each other. One of the main conclusions drawn from this chapter is that a distinction needs to be made between, on the one hand, theoretically informed accounts of the concrete (as particularly proposed by academics) and, on the other, the lay and tacit knowledges gained in the course of everyday life. These three forms of knowledge are often conflated and it is important to separate them if we are to develop a satisfactory general understanding of people's alienation from nature and from their own being. But the main theme of this chapter is that, while all forms of knowledge are socially constituted, this should not be used to deny the possibility that there exist real causal mechanisms which are generating the concrete events we can observe, feel and communicate about. Furthermore, the large-scale intellectual industry currently surrounding 'strong social constructionism' is making a great fuss of a routine part of social life. Social constructionists of the 'strong' variety are really elaborating on the self-evident fact that people use language to describe how the world works and that this language is socially constructed. The fact that language is caught up in power relations is an important consideration. But it need not be treated as a wholly new revelation and one worth concentrating on at the expense of discovering the mechanisms in the natural and social worlds affecting how the material world actually works.

The complexity of lay knowledge is the main theme of **Chapter 4**. This is a case study of attitudes towards scientific understandings of relations between society and nature. It uses material from a special survey undertaken by the Mass-Observation Archive at the University of Sussex. It is an attempt to show what might be actually meant when we say people are alienated from nature. Rather little is known about the kinds of knowledge which lay people actually have. This study first shows not only complex but often contradictory attitudes towards science. A number of leading sociologists argue that modernity is characterised by increasing reflexivity. As regards relations to the environment this is supposed to imply systematic and wholesale criticism of modern science by the population at large. But this turns out to be only partly true. Most people do indeed see science as an evolving and vulnerable enterprise, but they combine this with a view which continues to place considerable faith in science as indeed reflecting how the real world works. Thus the contributors to the Archive have, like academics and everyone else, a socially constructed knowledge of their relation with the environment. But from a theoretical viewpoint it is not well informed. They have taken on board much of the understanding offered by scientists but, despite this, they remain very unclear as regards their relations with the environment. This leads to a (somewhat tentative!) proposal that the languages people use to understand nature and their relationships with it may be a product of people's innate causal powers to make sense of their circumstances. The ways in which they try to make sense of their experience is through the transposing of the familiar on to the non-familiar. Nature, for example, has in the past often been conceived as a female entity, one which is caring but which

is subject to retribution if used exploitatively (Merchant 1980). Few people (or at least few people in modern Western society) construct nature in such a way now. But they are prone to transfer their experience in the human social world on to their understanding of nature. This helps people to gain a sense of being, of connection with the world. And arguably it is the product of powers within the human psyche itself.

Having developed a general understanding of alienation, one based largely on the largely necessary division of labour in modern society and the separation of abstract from lay and tacit forms of knowledge, the remaining chapters are intended to develop such an understanding with reference to the main areas of contemporary social life. Given the emphasis of this book on the division of labour, it should come as no surprise that industrial production is given special attention. This accounts for the early prominence of **Chapter 5**, a section of the book giving special attention to genetic engineering and the emergent reproductive technologies. Here the raw materials being incorporated into the production process are not inert. In this case the inputted materials are living beings and their causal powers for growth and development. Modern industry characteristically disassembles elements of nature as a prelude to their reconstruction. In these particular industries the parts given such attention by the scientists and their subordinates in the production process are elements such as the gene and parts of the human body. Their separation and manipulation to produce new combinations of living things bring about potential gains to human and other species which often go unrecognised by the environmental movement. These include the mass-production of food and the curing of certain types of illness.

But while recognising their potential for good, this chapter also recognises their 'down-sides'. Does the solution to mass-hunger lie less in technical fixes and more in political strategies to end what Susan George (1986) calls the 'planned scarcity' of food? If so, where does this leave the technology? Such reconstructions of nature bring simultaneous disadvantages. These include the possibility of disastrous unintended consequences through genetic engineering. One of the best-known unintended consequences is the case of the so-called 'Beltsville Pigs'. They had their growth boosted by cow genes. But they went lame with arthritis at an early age and had heart problems and bulging eyeballs. Similarly, an additional gene (one suspected of being linked to cancer) was introduced into another group of pigs. This made them excellent as commodities, their hams and shoulders growing big and meaty. But by the time they were three months old their legs were unable to support them (Ryan 1995). Similarly, sheep in Australia have been injected with hormones bioengineered to cause wool-shedding. These so-called 'self-shearing' sheep suffered from sunburn and the effects of excessive heat. Bizarrely, they are now wrapped in large nets to hold the wool close to the sheep's bodies. Similar problems, all deriving from attempts to enhance the value of animals or to

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