Cosmic Society

Towards a sociology of the universe

Peter Dickens and
James S. Ormrod

Routledge
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Space weaponry, satellite surveillance and communications, and private space travel are all means by which outer space is being humanized: incorporated into society's projects. But what are the political implications of society not only being globalized, but becoming 'cosmic'?

Our ideas about society have long affected, and been affected by, our understanding of the universe. Our view of the universe, our increasingly 'cosmic' society and even human consciousness are being transformed by new relations with the cosmos. Large sections of our economy and society are now organized around humanity's use of outer space.

As the first book to consider the cosmos from a sociological viewpoint, this fascinating volume links social theory to classical and contemporary science, and proposes a 'cosmic' social theory. This timely book engages with a range of topical issues, including the media and communications, tourism, surveillance and globalization. Written in an accessible style for both undergraduates and postgraduates, *Cosmic Society* brings together in one place insights from politics, economics, anthropology, international studies, philosophy of science, literary studies and psychoanalysis.

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James Ormrod is a Lecturer in Sociology at the University of Brighton.

An original vision and a pedagogical text on a major issue of our time and, even more, of our childen's.

Göran Therborn, Professor and Chair of Sociology at the University of Cambridge, UK, and co-Director of the Swedish Collegium for Advanced Studies in the Social Sciences, Sweden

In the great era of nineteenth-century colonialism, lands were conquered, environments destroyed and aboriginal people exterminated often in the name of progress and enlightenment. In the modern period of cosmic colonialism, Dickens and Ormrod provide an original sociology of space demonstrating that the apparently benign character of modern space exploration is in fact the second age of colonialism. The social, environmental and cultural implications of space colonization have as yet hardly been considered by sociologists – hence the special interest and importance of their publication. Outer space is the next site of resource exploitation, possibly the next military battle ground and ultimately a safe haven for earthly elites.

Dickens and Ormrod may well turn out to be, as it were, the Marx and Engels of the political economy of space and consequently their publication is the *Grundrisse* of the mode of space production.

Arguably the most important and certainly the most ambitious book of recent sociology.

Bryan Turner, Editor of the Cambridge Dictionary of Sociology

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Diogenes (412–323 BC) was once asked where he came from. 'I am a citizen of the Cosmos', he replied. This book is dedicated to those ensuring that all citizens of the cosmos benefit from its exploration and development.

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Peter's preface

Three years ago I told a sociologist friend at Cambridge that I was working on a book about the sociology of the universe. His response was, 'Are you feeling alright, Peter?' I must admit that was akin to my immediate (though repressed) response when James first told me about his work at a party. In fact it took several weeks to recover from this young research student telling me he was working on the humanization of the cosmos. I gradually realized, however, that he was really on to something and I wanted to be part of it. For a long time I had been working on the relations between society and nature. Focussing on the cosmos seemed like an obvious way of extending this interest. But understanding the humanization of the cosmos also meant making links to other equally pressing social and political issues such as imperialism, militarization, surveillance, commodification and a globalizing media.

Once we had found a publisher (by no means an easy matter) the next thing was for James and me to actually write the book! I have found this process to be something of a rollercoaster, one also reversing the stereotypical vision of how 'senior' and 'junior' authors work together. This was no 'master–slave' relationship. James often knew much more than I did about outer space. I, on the other hand, was often on a steep learning-curve, frequently writing on matters completely new to me. James, through his own writing and his comments on my work, offered both inspiration and essential reality-checks. Joint writing can be troublesome but this has been an overwhelmingly positive experience.

James's preface

When I first met Peter in 2002 I had spent a good year trying to get a handle on what the precise focus of my doctoral research should be. All I really knew was that I wanted to say something about plans to explore, settle and develop the universe. In the context of a supposedly 'postmodern' world, I found the existence of such ideas fascinating, though I knew very little about them. I had conducted some preliminary research into the commercialization of space, space

law and planetary engineering, before stumbling across the pro-space movement: a group of organizations dedicated to promoting human activity in space. Having started research on the movement, I met Peter after a seminar he delivered at the University of Essex. From talking to other struggling PhD students it seems to be common to dread exchanges like ours in which half-formed research ideas have to be articulated to established academics. But I was struck by the genuine nature of Peter's interest, and was delighted, if a little surprised, when out of the blue a few months later he emailed to say he was interested in writing this book.

Following on from his 2004 book *Society and Nature*, this project seemed a natural extension of his interests, and I was keen to contribute what I could from the research I had conducted and was continuing to conduct in the field, though my PhD focus was being drawn increasingly towards social movement theory itself. Peter's input into that thesis was itself crucial. Very quickly he spotted the narcissistic element in what I was describing to him, something which changed fundamentally the direction and theoretical perspective of my work. Writing this book, and Chapter 1 in particular, Peter has introduced me to areas of social theory that I knew little about, and it has certainly been a long and involving journey of discovery. That I have been able to contribute to this owes much to Peter's patience and continuing openness to discussing new ideas. That it has made it to publication owes everything to his incredible ability to read, absorb and translate material.

There has been no strict division of labour between the two of us whilst working on this book. We have both worked on all the chapters, and indeed there have been a number of occasions when we have not remembered who has written what. Although we are both responsible for any remaining errors we cannot be sure which one of us is culpable!

Acknowledgements

A trans-disciplinary book of this kind inevitably incurs many debts and acknowledgements. We must particularly thank the respondents to the Mass Observation Archive based at the University of Sussex, UK. The extent to which we have relied on their excellent work will be clear in much of the following chapters. Dorothy Sheridan of the Mass Observation Archive and her staff were, as always, extremely positive. The material from the Mass Observation Archive is reproduced with permission of Curtis Brown Group Ltd, London, on behalf of the Trustees of the Mass Observation Archive © The Trustees of the Mass Observation Archive. We must also thank members of the pro-space movement interviewed by James Ormrod in 2003 and 2004. The Department of Sociology at the University of Essex has given support in a number of ways. Eamonn Carrabine and others provided extensive and valuable feedback to James while he was writing his ESRC-funded PhD on pro-space activism and he has remained very supportive throughout the writing of this book. We also owe a particular debt to Ted Benton, who read the whole text and made a number of invaluable suggestions, reminding us that our understanding of contemporary physics was by no means complete. Guy Pooley of Fitzwilliam College, Cambridge, made similar salutary comments. Emma Dickens also read the whole manuscript and was able to help us make the whole text more readable. Kingsley Dennis of Lancaster University and Jonathan Wing of British Telecom provided invaluable information and ideas while we were working on Chapter 4. Nicole Hänel provided comments on Chapter 3. Bryan Turner, John Urry and Kathryn Dean gave us much general support at the earliest stages of this project. We must also thank participants for their contributions at conferences given by the British Sociological Association, the British International Studies Association (and in particular to Jill Stuart for her kind invitation) and the American Sociological Association. Thelma Gilbert patiently sought out the necessary permissions to reproduce the illustrations. Gerhard Boomgarden of Routledge was brave enough to commission a book on this somewhat unconventional topic and Constance Sutherland and Ann Carter have been both patient and supportive while we missed a number of deadlines.

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Introduction

Cosmic society

Whereas the term 'cosmology' is often used to refer simply to the scientific study of the universe, the philosophers Steven Best and Douglas Kellner usefully suggest that a cosmology is better seen as a set of ideas about the universe and humanity's place in it (2001: 140). As numerous commentators have reported, cosmologies are one of the most primitive features of recorded societies. As reflexive beings with the ability to communicate through language, it seems that the desire to theorize the way in which human beings are related to their surroundings, not just in nature but in the cosmos as a whole, is itself quite universal. As Thomas Kuhn has noted in his historical study of the transitions between different cosmologies:

> Man does not exist for long without inventing a cosmology, because a cosmology can provide him with a world-view which permeates and gives meaning to his every action, practical and spiritual.
>
> (Kuhn 1957: 6)

In a sense this is both a book about different cosmologies – from the visions of Aboriginal tribes, for whom the universe was alive with souls, to those of today's United States military, for whom outer space represents the new high ground from which to control Earthly warfare – and a movement towards a new cosmology in itself.

In both critiquing different cosmologies and outlining our own suggestions as to how the universe and our place in it may best be understood, we have aimed to produce a distinctly sociological account. What in our view makes this book sociological is a concern throughout with social power. This concern is initially present in our discussion of humanity's imaginative relationship with the universe and is then developed as we turn to its increasing physical presence in outer space. Satellites, rocketry, space stations and other space activities had contributed nearly $1 trillion to the global economy in the decade up to 2004 (Pelton *et al.* 2004). This trend towards the increasing human use of outer space is largely what has inspired the writing of this book, as it provokes new questions about how humanity relates to the universe. As Best and Kellner note, 'science and technology change the equation in so far as human beings no longer just contemplate or

study the starry sky, they enter into and live in it, far beyond "gravity's rainbow".' (2001: 140) We refer to this process as the 'humanization of the universe', a phrase used by popular scientists when discussing space colonization.

Humanization involves human beings working on nature and transforming it. As Marx (1975a) recognized, humanization should be a positive process in which humans' intellectual, aesthetic and creative potentials are realized. The young Marx looked forward to a time when nature was 'humanized'. People, he argued, are a 'universal species'. They have the whole of the universe, including their own and other species, as part of their consciousness and scientific activity. A positive engagement with external nature would therefore result in this universal species no longer being alienated or estranged from it. Yet there is no guarantee that the humanization of the universe will proceed quite like this. Especially under capitalist social relations there is the potential for humanization to involve the commodification of the universe, with powerful interests seizing it as an object to be sold to others or used as an instrument of domination. The outcomes of these forms of humanization for humanity are less positive.

This book does not simply chart changing understandings of, and interactions with, the universe, important as these are. It is primarily about the relationship between these processes and the dynamics of Earthly society, our ideas about society and our experience of the self. Our claim is that these connections are so central to the constitution of social life that all societies should be considered 'cosmic', and that special attention should be paid to the cosmic nature of contemporary 'global' society.

Dialectics

Dialectics insists on recognizing the relationships between things rather than the things themselves (Harvey 1996). Things, whether they are stars or societies, are constituted by relationships. These things both form part of these relationships and have causal effects on them. The distinction between parts and wholes is therefore meaningless. Parts are integrated into wholes, and vice versa, in a process of indefinite change.

In situating cosmology within a broader system of social relationships, Best and Kellner insist:

> Cosmologies are constituted within a social context, and as such, often are influenced by, or are extensions of, social values and ideologies. Conversely, how human beings interpret the stars, planets, and natural world around them shapes how they understand their own societies.
>
> (Best and Kellner 2001: 136)

These relationships may even be made explicit. Two of the founders of sociology, Comte (1974) and Spencer (1971), deliberately described the cosmos and society together. Comte stressed that 'solidarity' between elements must exist in social systems as it did in the universe revealed by astronomy. Spencer argued that both

society and universe were evolving towards greater degrees of concentration and integration.

Dialectics is a concept normally associated with Hegel's philosophical theory of the progress of ideas through thesis, antithesis and finally synthesis. Marx took up the reins of dialectical thinking – emphasizing contradictory relationships and their role in change and progress – but applied it to the material conditions and struggles of society, rather than the realm of ideas. It is Engels' (1959) concept of dialectics that is best suited to our purpose, however. Dialectics for Engels was about acknowledging 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 became intertwined. Linking the universe and society by asserting that both of them operate in a 'dialectical' fashion is therefore a useful way of starting analysis.

Dialectics stresses the interactions between the observer and the observed or between the subject and the object. This is a major theme we will develop throughout this study. These dialectics operate on two levels. First, our observations and understandings of the universe create changes in the fundamental ways in which we experience, understand and manage our social universe. But, second, through this mechanism, change is affected on a much deeper level. By observing the universe, people in societies have transformed themselves. In *Cosmos and Psyche*, Tarnas makes the point convincingly, although for 'world view' he might better have written 'cosmology':

> Our world view is not simply the way we look at the world. It reaches inward to constitute our innermost being, and outward to constitute the world. It mirrors but also reinforces and even forges the structures, armorings, and possibilities of our interior life. It deeply configures our psychic and somatic experience, the patterns of our sensing, knowing, and interacting with the world.
>
> (Tarnas 2006: 16)

We explore the dialectic between cosmos and the self more specifically in the next two chapters (see also Dickens and Ormrod 2007). As the following chapters will suggest, by physically interacting with the universe, humans are transforming themselves once more. 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. In particular, for critical theorists, the domination of external nature was associated with the domination of internal nature, with the perversion of humanity's needs and capacities. This argument about subjectivity and internal nature borrows from, amongst others, Hegel, Rousseau and Marx, and has been outlined in our earlier work (Dickens 2004). The aim of this book is to suggest ways in which this idea, central

to sociology, can be usefully extended to encompass human relationships with the universe or cosmos as opposed to just external nature here on Earth.

The cosmic elite and power relations on Earth

As we mentioned at the outset, in developing a sociological account of our relationship with the universe it is with issues of power and hierarchy that we must concern ourselves. Best and Kellner argue that 'cosmologies are not always benign, . . . throughout history they have been used as the basis for establishing power and legitimating social authority' (2001: 135). People have used 'their ideas about the Heavens to justify their practices on Earth' (Lerner 1991: 56). As has also been the case with parallels between social and biological thought, social and cosmic understandings often develop in close relation, and to the benefit of the existing or emergent social order. In discussing power in this context, historically speaking, we must mention the attention that has been given to what Parsons (1966) has called the 'cosmological' societies of Egypt, Mesopotamia, Rome and Ancient China. These are so called because of the centrality given in these societies to the study and worship of the Sun. As Assmann (2003) notes, the cosmology of these societies is implicated in their architecture, ritual and hierarchy. Modern astronomy was developed in the third and second millennia BC in Egypt and Babylon, stimulated by the need to run a complex empire, one in which coordination in time was required. Calendars specified the regularity of the days, months and seasons and thus assisted in the development of early forms of agriculture. Astronomy was also central in the attempt to assert political power. The sky played a key role in the organization of life on Earth, with the pyramids built on precise north–south lines, the aim being to ensure the reigning pharaohs eventually joined the gods in the heavens.

It is in these societies that the dominance of elite groups of people with access to the heavens has drawn most attention. Priests of various kinds were central to interpreting the cosmos and conducting the necessary prayers and rituals. They thus enjoyed a position of great power in their societies as, along with their kings, they were considered intermediaries between the cosmic and social order.

We refer to those in these kinds of positions of power as the 'cosmic elite' within an epoch. Exactly who constitutes the cosmic elite varies across different societies, and during our discussions in this book we extend this notion to the cosmic elite of today. These are no longer just priests, shamans and astrologers (though along with imams and the astrological elite of other world religions they continue to play a role), but astronomers, astrophysicists, aerospace engineers, astronauts and key figures in civilian, military and corporate space programmes.

Auguste Comte (1974) asserted that forms of knowledge went through three distinct stages: theological, metaphysical and positive. In the first stage, associated with traditional societies, the universe is understood in religious or mythical terms. The second stage, the metaphysical, is often seen as emerging in Ancient Greek society. This introduced the idea that the universe could be understood through human reasoning. Abstract thought, deducing things about the universe,

could uncover its mysteries. The positive or scientific stage was for Comte the pinnacle of knowledge production in each sphere of enquiry, and would be based on observations of the empirical world. Scientists were to use such observations to formulate causal laws on which basis predictions could be made and the effects of proposed interventions in the running of things judged. The forms that cosmic power takes differ in these very different eras.

The cosmos as subject, the cosmos as object

The cosmos as envisaged by 'primitive' societies, and certainly by later cosmological societies (and interpreted via priests, astrologers and other intermediaries), was very much experienced as a powerful *subject* influencing human affairs. The idea that primitive societies populated their universe with spirits, or at the very least special powers residing in things, is well established in numerous anthropological case studies (for classic examples see Tylor 1994; Muller 2003). Tarnas (2006: 16) makes a central distinction between this pre-modern cosmos and the modern cosmos. His distinction is arguably too simplistic, and in the next chapter we suggest that some aspects of the pre-modern conception of the universe still persist today. However, he does provide a neat description of the 'primal' cosmos of traditional societies as one that is itself 'alive' and not differentiated from the internal life of the individual. He goes on to contrast this with the modern universe, experienced as 'mere matter in motion, mechanistic and purposeless, ruled by chance and necessity'. This cosmos is the *object* of scientific knowledge and technological rationality. It is only with this distinction that the idea of 'outer space' emerges to distinguish it from the Earthly social realm (in this book, unless we are using this concept of 'outer space', we employ the terms 'cosmos' and 'universe' interchangeably).

This concept of the relationship between universe and society reflects the understanding of the relationship between nature and humanity prevailing in the Enlightenment era. It was a vision of nature instigated by Francis Bacon amongst others, one in which nature is seen instrumentally as a mere resource for human use and consumption (Merchant 1980). In regard to the universe specifically, Johannes Kepler can be cited as a man who, in the wake of Copernicus, initiated the transition between a view of the universe as a subject and that as an object. On the one hand, he was a Lutheran scholar, a Platonist and a renowned astrologer. On the other hand, he used Tycho Brahe's log books to chart the positions of the stars and deduce the elliptical motions of the planets. As scientist and space colonization activist Robert Zubrin says of him:

> Kepler did not describe a model of the Universe whose geometry was merely appealing – he was investigating a Universe whose causal relationships could be understood in terms of nature knowable to man. In so doing Kepler catapulted the status of humanity in the Universe. Though no longer residing at the center of the cosmos, humanity, Kepler showed, could comprehend it.

> Therefore . . . not only was the Universe within man's intellectual reach, it was, in principle, within physical reach as well.
>
> (Zubrin and Wagner 1996: 24)

From this point forward, the universe, like the rest of nature, became simply an object for humanity to work on. This paradigm of instrumental reason was attacked by critical theorists as a basis for our relationship with nature here on Earth and for conquering space. Peoples (2006) cites passages from Adorno and Marcuse in which they provide a critique of the American space programme as an extension of the rationality of the Nazi rocket programme. Wernher von Braun is an emblematic connection between the two; the rocket engineer who worked on the V2 for Hitler at Peenemunde (Figure 0.1) before being captured by the Americans and put to work on the Apollo missions and becoming great friends with Walt Disney.

The politics of space

It is here that we come into contact with another body of literature that has considered the relationship between society and cosmos, and that is the work, largely from within political science, aimed at exploring the politics of national space programmes, and in particular the relationship between the Cold War and the 'space race' (Cadbury 2006; Byrnes 1994; MacDougall 1985; Logsdon 1970 are particularly recommended). We concede that talk about Cold War politics seems a little dated now and we examine what has happened in the post-Cold War era of space exploration and development. Recent years have seen a number of countries beginning space programmes (in 2005 China became only the third country to send someone into space), or at least taking advantage of space technologies and products offered by other countries and corporations. But, just as significantly, it is a field in which, as in other areas of social life, we have witnessed a decline in centrality of the nation state and a rise to prominence of the private sector. The range of space products and services is growing exponentially and to the point at which they are essential to the operation of global society. The role of space technology, largely at this point meaning satellites, is fundamental to the 'network society' identified by Castells (2000a) and the 'surveillance society' identified by Lyon (2001), though rarely is this explicitly acknowledged or set in the context of a cosmic society.

When focussing on the social changes that have brought about the humanization of the universe, and the social processes that they in turn engender, we again retain the central focus on the role of power. Though not wishing to ignore past and present socialist space programmes, our preoccupation here is with capitalist space development, which seems especially pertinent given the ever-increasing infiltration of capital into what were once predominantly state programmes. Drawing naturally on Marx in the first instance, we explore the relationship between the humanization of outer space and the central dynamics of capitalism rooted in inequality and alienation. We believe that this historical

Figure 0.1 Wernher Von Braun (fourth from left) and officers at Peenemunde, 1942. Source: Smithsonian Institute Neg 87-5769.

and critical perspective offers the best means for understanding why and how the capitalist world system is expanding into the nearby cosmos as a result of Earthly crises, and the effects of it so doing.

Empirical sources for this book

The discussion of the first chapter of this book centres around historical sources. This necessarily relies largely on the ideas of key thinkers in the history of cosmology. There is less evidence (apart from where anthropological sources are involved) of how the lay person related to the universe. Fortunately, when discussing contemporary cosmology and attitudes towards the humanization of outer

space we have been able to base our conclusions on empirical evidence from the public. There is plenty of evidence to suggest that the general public, at least in the developed nations, has some kind of interest in outer space. Witness, for example, the continued success of science fiction films set in space – seven of the twenty highest-grossing films of all time have had a space theme (Mean and Wilsdon 2004) – and the widespread distribution of popular science magazines carrying lead stories about space. Six hundred million people watched the Moon landing, and the National Air and Space Museum in Washington DC is the world's most visited museum, averaging more than 9 million visitors a year. Estimates at the end of the 1970s suggested that 25 million Americans could 'be counted among the pro-space forces' enthusiastic about human activity in space (Bell 1981: 52).

At the extreme end of these 'pro-space forces' are the members of the pro-space movement. This is a movement aimed at promoting human activity in outer space. This includes exploration, commercial development and settlement. Space tourism has become a focus in recent years, leading some to identify a distinct space tourism movement (Bereinstein 2002). The twenty-first century has also seen the escalation of a trend towards supporting private rather than government space ventures, a development which insiders have called the 'alt.space' (short for 'alternative space') movement.

We have suggested, in parallel with insiders' accounts, that these developments represent a third era of the movement's history. The first era was marked by the European and American rocket clubs of the 1920s and 1930s (Winter 1983; Bainbridge 1976), though rocket and even space colonization plans were around before this. The scientists who formed these clubs were drawn into military service in the Second War World, most notoriously Wernher von Braun, who went on to found a forerunner of today's pro-space organizations, the National Space Institute. After the 'golden era' of science fiction in the 1940s and 1950s, a second incarnation of the movement crystallized around the space colonization enthusiast Gerard O'Neill and the astronomer Carl Sagan, who, in the 1970s and 1980s, inspired and founded the two largest pro-space organizations in existence today, the L-5 Society and the Planetary Society. The L-5 Society was so named because its members were dedicated to establishing a colony in Earth orbit at one of the Lagrange points (L-5) where the gravity of the Earth and the Moon balance each other. Members of the society suggested it be disbanded one day at a meeting onboard an L-5 colony.

The movement has never been particularly large in social movement terms, probably peaking in the 1990s. The last estimate based on survey evidence was 150,000–200,000 signed-up members (Bell 1985a: 82). Membership of the movement is largely formalized through membership of one or more pro-space organizations, all of which produce glossy magazines as part of the membership with technical and space policy updates and articles. The major organizations also lobby congress in the US (where most of our research has been conducted), support private research and development, educate the public and meet at conferences to discuss space issues amongst themselves.

Our previous research has examined these pro-space activists in an attempt to

understand their motives, ideology and organization (Ormrod 2006), and we use primary empirical evidence arising from this research to illustrate our discussion here. It is important to acknowledge that these are activists and in that sense their stories and beliefs do not reflect those of the general public. Yet, as we have argued, they are very much products of our society and therefore key social trends we highlight are in evidence in these extreme cases.

In philosophical opposition to the majority of pro-space activists (though they rarely clash in reality) are a growing number of social movement organizations and networks established to contest human activity in space, especially the military use of space and the use of nuclear power in space. Groups such as the Global Network Against Weapons and Nuclear Power in Space (GN) and the Institute for Cooperation in Space are at the centre of this movement, led by activists such as Bruce Gagnon, Loring Wirbel (2004) and Karl Grossman (1997, 2001). Gagnon's website also contains critical comments on the commercial development of outer space and the creation of space debris. The activities and arguments of these groups, to which we are by and large sympathetic, are used to demonstrate the ways in which our understanding and use of outer space is contested in pivotal times. Websites relevant to space-related social movements are listed in Appendix A.

The views of the cosmic elite – especially physicists, governments and the military – are very much circulating in the public domain. Those of social movements are somewhat more hidden, but we are also interested in the ideas of the general public, which are even more rarely voiced. How do they draw on and relate to different understandings of the universe? What do they know about what is happening in outer space and what are their opinions about it? We explored this further with the help of Sussex University's Mass Observation project. Mass Observation (MO) was initially conducted in 1937 with the aim of collecting material about everyday life in Britain. Since 1981 a self-selected panel of people from all walks of life have responded to the project's 'directives', which come out about three times a year. The directives contain open-ended questions that encourage the respondents to write about their experiences, observations and opinions concerning that particular theme.

We are indebted to the MO team for including in their summer 2005 directive a number of questions we supplied relating to their views about the universe (Appendix B). It must be remembered that the sample that responded to this directive was not representative in any way. In 2004, of the 400 people writing regularly, there were three times as many women as men and the distribution by age was skewed in favour of the more elderly (though the profile of MO writers has been addressed in the intervening time and is now much more representative). When we use MO data we do so to show how an idea is articulated, not to argue that this represents public opinion or a social trend. When we refer to specific respondents, the code used to identify them is given in square brackets. In dialectical terms, this body of empirical data helps show how the subjectivity of individuals may be affected by different visions of, and activities in, the cosmos.

The structure of this book

Chapter 1 raises some important issues not only for a sociology of the universe but for sociology as a whole. Its focus is on the ways in which the universe has been envisaged by different societies at different times, and how those societies have believed that knowledge of the universe can be arrived at. More importantly, it is about the relationship of these ideas to social processes and our understanding of society. There is also a discussion of the different forms of subjectivity engendered by these relationships. It argues that many of the concerns central to sociology (for example, the division of labour and the rise of individualism) can be better understood by a sociology that incorporates the cosmos.

Chapter 2 is a key chapter, introducing the main theoretical ideas informing our discussion of why and how the universe is now being humanized. On the one hand, we use the work of the Marxist geographer David Harvey. Building on earlier work by Lenin, Lefebvre and others, he shows how spatial expansion is linked to economic crisis. Capital is always attempting to find new sources of capital accumulation, privatizing and commodifying resources and investing in new 'spatial fixes' in which profits may be realized. We extend his work to argue that capital, mediated by banks and financial institutions, is now increasingly making 'outer spatial fixes' in the nearby cosmos. On the other hand, we use the notion of 'hegemony' as outlined by the Italian political scientist Antonio Gramsci. This refers to the ability of ruling elites to exercise ideological power, making dominant forms of 'common sense' that join the formal state apparatus in creating social order. But this 'common sense' is not imposed. It draws on existing forms of subjectivity. This includes the possessive individual, a personality type now being greatly enhanced by the humanization of outer space. Finally, note that the ideas of Gramsci and Harvey can be linked; economic and political crises tend to be resolved, if only temporarily, in the sphere of ideology.

Chapter 3 takes up the reins of the discussion of imperialism and spatial expansion in Chapter 2, to look at the central role that outer space technology plays in maintaining military dominance. Military expenditures have long been a way in which the revival of private sector profitability has been attempted, but this tendency is now rapidly developing, especially in the light of 'the war on terror'. Space technology has also redefined time and space in military operations, affording some people superhuman capabilities and leaving others with limited resources for combating Western territorial domination. Nevertheless, there is certainly no guarantee that the militarization and weaponization of outer space will succeed in pacifying subordinate social orders. This particular type of 'fix' may well be disastrous.

Chapter 4 examines the role of satellites in civil society. First, we take issue with arguments that we now live in an 'information' or 'network' society. Such arguments, we suggest, are in danger of diverting attention from power relations that are exercised via networks and information. Satellites certainly enable the development of the global economy. At the same time, they are central to the exercise of political, cultural and economic power. This includes surveillance:

the monitoring and regulation of 'deviant' populations, including even labour processes. They constitute an 'orbital panopticon' in which subjects felt to be in need of discipline and control are continually monitored by unseen and powerful observers. This links to the question of subjectivity. This chapter shows, for example, that subordinate groups often welcome the surveillance of what they see as threatening 'others'. Satellites are also central to the development of television communications, especially via the great media corporations. Satellites are therefore being used in the dissemination of the views and interests of those who own and operate such services. In other words, they are agents in the spread of hegemony through the global media. On the other hand, there are countertendencies. Satellite-based communication systems are also allowing the rise of resistances and alternative, counter-hegemonic, worldviews.

Chapter 5 examines the boom industry in space at the time of writing, and that is space tourism. Ever since the eighteenth century, elites have sought out exotic places as a means of encountering dangers and enhancing their social status and identity. But these destinations are later discovered by subordinate peoples and elites move on. Outer space is the one remaining undiscovered pure and exotic zone, and a trip there can be framed as having quasi-religious qualities. Meanwhile, the number of people able, at great cost, to visit outer space looks set to grow rapidly as suitable vehicles are tested and certificated, and with large and well-known investors behind them. We examine the appeal and effects of a trip to outer space and ask what the consequences are for this new relationship with the universe for those who do and do not make the trip.

Chapter 6 examines plans to exploit the resources of outer space to satisfy human needs. This includes both the use of space resources (minerals, fuel and energy) and living space (in the form of colonies and 'terraformed' planets on which the climate has been engineered to be more Earth-like). These may seem like distant possibilities, but large sums of money are already being spent in research and development. Yet, even were they never to occur, they serve to illustrate and extend some familiar observations about how different societies meet their needs over time. Marxists will note how the demand on space resources reflects the necessary expansion dynamic of late capitalism (and the narcissistic demands of its subjects) and how it is those already in control of Earthly means of production who are in the driving seat of outer space appropriation ventures. Green theorists will notice immediately the environmental consequences of plans to use space resources, both on how we use Earthly resources (which will clearly be affected if we believe space resources and living area exist for us in the event of environmental destruction on Earth) and on how we relate to outer space as a resource for human manipulation. And the rapid growth of 'space junk' is one factor creating 'a cosmic risk society', one endangering further humanization of the cosmos.

In the Conclusion, we return to our agenda for a cosmic sociology, summarizing what we feel is gained from broadening the sociological lens to consider the continuous dialectic between humanity and the cosmos. Especially important are the forms of domination built into understandings of society–cosmos relations over the past two thousand years. The Conclusion also explores the prospects for resisting

the contemporary humanization of the cosmos, at least in its present form. New social movements are countering the dominant hegemonic idea that outer space should be used to promote individualism, imperialism and capital accumulation. But this leaves the question of which alternatives for outer space should be fought for. Given the risks and resources involved, should all plans for the humanization of the cosmos be abandoned, with attention and resources switched to the solution of Earthly crises? Should outer space be left pure, untouched and explored only for scientific purposes? Or, as prefigured by Marx and as the Russian cosmists contemplated in the 1920s, should it be fully humanized by and for a future socialist society?

The subtitle of this book is '*towards* a sociology of the universe'. It does not claim to be an exhaustive account of humanity's relationship with the universe. It could hardly hope to be. In the first instance, the Anglo-American framing is apparent throughout. Our emphasis reflects the current dominance of the US and American capital in space. Non-Western religious relationships with the universe, especially Buddhist and Hindu cosmologies, do not receive the attention they deserve. Nor is enough time spent considering the rapidly developing space programmes of China, India, Japan and the European Union. Besides this, there are without doubt questions raised here that are not satisfactorily answered, and many other important and interesting questions are not raised at all. We can only hope that our omissions will be addressed by future theorists.

1 The cosmic order, the social order and the self

About this chapter

This chapter looks at humanity's imaginative relationship with the universe at different times and across different societies. At a philosophical level, we are concerned with different ontologies and epistemologies of the universe. In this context ontologies are theories about the kinds of things that exist in the universe. Epistemologies are theories about how we can gain knowledge of the universe. At the ontological level, sometimes the universe has been seen as the realm of spirits, gods and other unobservable entities and divine processes, at other times as consisting largely of material processes such as are observable on Earth. At an epistemological level, there has been a movement between accounts derived from abstract reasoning divorced from observation and theories derived from and checked against empirical evidence. On the basis of these different philosophies, which themselves have important social roots and implications, a number of different models of the universe have been produced. These theories themselves have a dialectical relationship with the society that produced them and with understandings of that society. A further dimension to these relationships is the self. 'The self' as both understood and experienced has historically varied as humanity's relationship to the universe has been envisaged in different ways.

In writing this chapter, we have been fortunate that there are available a number of scholarly and insightful accounts of the social roots and consequences of different historical cosmologies, and a few that trace some sort of social history of cosmology. Our aim has been to provide snapshots from these different (and often disconnected) accounts in constructing our own impression of what a historical sociology of the universe might look like. There are doubtless many accounts we have omitted, and certainly there are many places where we have made quite gross use of lengthy works. The original texts are highly recommended to the interested reader. As we approach the present era, we have not made any great attempt to situate our commentary within the established field of the sociology of science. Readers familiar with this field will recognize in our account an 'externalist' theory of science; one stressing the social conditions and power relations in which science is conducted. For those wishing to make these connections, David's (2005)

Science in Society is an excellent starting point. Too often the progress of scientific knowledge is presented as an 'internal monologue' in which old theories are simply steadily built on by new ones, with no reference to social factors. Stephen Hawking borrowed Newton's phrase 'standing on the shoulders of giants' as the title for his series of books about the great thinkers in physics and astronomy. We reject such a picture (as, for example, does Hoffman 1959). There is much that could be said on our subject from an 'internalist' position as well: one stressing the way in which science itself is done (an interesting relevant starting point is ethnomethodologist Harold Garfinkel *et al.*'s 1981 paper on the discovery of the pulsar) and battles within the scientific profession (see Mitton (2005) on the confrontation between Fred Hoyle and Martin Ryle). There are certainly many directions in which this summary account could be taken. As critical realists, however, we do not see science as merely a social construction.

Models of the social order and models of the cosmic order

Our understanding of the cosmos may have advanced a great deal since the supernatural understandings of Durkheim's 'primitive' Aboriginal tribes, but they still reflect and constitute the society that produced them. The best theories, however, are those that speak to the real empirical world and are not expressed through the language of social ideology, myth and misrepresentation. Unfortunately, too often our understanding of the cosmic order has reflected and been reflected in our understanding of the social order to the benefit of those in power at the time. The manner in which models of social order and social interactions themselves influence our understanding of the order of the natural world has become a well-established concern of sociologists of science. Darwin's theory of natural selection can be seen, for example, as mirroring Hobbes' political theory and developments in an increasingly competitive English capitalist society (Dickens 2000). These theories about the natural world in turn are used to give added legitimacy to the social order, to the extent that Western society lives by the myth that capitalism is the 'natural' order of things (Hughes 2005). For those who benefit from the established social order, cosmic parallels are likely to be highly attractive.

The primitive universe

The branch of the social sciences that has previously taken most interest in societies' relationships with the cosmos has been historical and contemporary anthropology. Anthropologists have read 'primitive' societies' supernatural beliefs about the cosmos as a way of understanding how the more general belief systems and social organization of the society were constructed.

Our sociological understanding of cosmology and religion in primitive societies stems largely from Durkheim. He noted that Australian tribal societies (the most primitive available to study) were divided into clans, and each clan had a totem or emblem; 'a species of material things' with which it has 'a special relationship'. The problem lay in explaining how this totem became sacred. His answer was

that, especially during times of communion, members of the clan felt the effects of the power that their social group influenced over them and their dependence on it, but that this power was 'too circuitous and obscure, and employs psychical mechanisms that are too complex to allow the ordinary observer to see whence it comes' (Durkheim 1915: 209). Unable to grasp the nature of this power, they attributed it to some external object – the totem that represents the clan.

It was in fact rare, says Durkheim, for a celestial body to be a totem. They were usually plants or animals. But the cosmos was later divided so that each thing belonged to a particular clan. Where two opposing phratries (each containing various clans) existed, opposing elements were divided between them – the Sun to one phratry, the Moon to the other, for example. The ordering of the cosmos therefore both reflected and helped to create the horizontal stratification of Aboriginal society. One of Durkheim's main concerns was with how the individual relates to the group. Individual and collective identities were, in his opinion, fused in traditional and tribal societies, this resulting from people's close relations with their universe.

The universe of primitive societies was experienced very much as one alive with powers and to which its members were related. Other authors have stressed the extent to which the universe was experienced as a subject dominating human affairs and something that evoked a great deal of fear.

> Given that it is a 'theory' resting on nothing but accidental relations, the intimate cosmology of the savage is a kind of spiritual terrorism. The savage is helpless in the face of nature. Divining relations within it, he represents these unsystematically as the controlling spiritual forces to which he also is subject . . . . The savage creates for himself an uncomfortable cosmos.
>
> (Ferguson 1990: 33)

Yet it is a cosmos to which these reverent 'savages' relate collectively. Rituals were directed at influencing the will of these cosmic entities (see Tylor (1994) or Holbrock (2006) on African tribes).

However, Durkheim does note that the degree of sacred force (*wakan* or *mana*) seen to be inhabiting each object and person is not the same. Women and young men not initiated into the religious order were profane, whereas older men, and priests in particular, were the most sacred. Women and the uninitiated were not allowed into certain sacred places, and, where the tribe acknowledged a god, they were not even allowed to know its name. Apart from this, there is limited discussion of social power and the division of labour in Durkheim's account of primitive religion and cosmology. This is perhaps because he believes central authority to be at best 'uncertain and unstable' in totemic societies (1915: 233).

Cosmological societies

It was with culturally more advanced 'archaic societies' that social divisions arose based on those who had privileged access to the heavens (Parsons 1966).

According to Parsons, these societies developed as particular lineages grew more powerful through marriage alliances. The result is a kingship lineage in which the king becomes the 'fountainhead of socio-cosmic order' (ibid.: 50), and in which 'a cosmological cultural system is generally interpreted for, and ritually mediated to, the society as a whole by specialized temple priesthoods' (ibid.: 52). These temples became central units of social and economic organization, and priests became powerful figures freed from manual labour to conduct rituals for the rest of the population. This is the emergence of what we call 'the cosmic elite'. The power of the elite was considerable in these societies in which the organization of space and time was oriented to the heavens, through architecture, ritual and the calendar.

In Egypt the king was considered to be divine – a god among men. Born of the gods, the pharaoh was the link between the divine, the human and the subhuman worlds:

> Only through the divinity of his kingship and its intimate associations could human beings relate themselves to the divine. Ordinary people could not participate in the sacred order, they could only be articulated with it.
>
> (Parsons 1966: 54)

In a highly stratified society, the pharaoh therefore stood quite apart from the rest of society, though he could delegate his charismatic powers to priests. Rituals conducted by the priests were seen as necessary to manage both social and natural processes. *Maat*, the cosmic order, had to be preserved through actions, an order which, as Parsons argues, was a projection of human interests. In Mesopotamia, the priests had a slightly different role in interpreting the universe to the people, especially through astrology and the search for omens in the heavens. Their kings were not considered divine in themselves, and thus the human population was subject to the will of the gods. This was also common in American civilizations such as the Aztecs, whose priestly interpretation of a comet led them to accept the Spanish invasion (Prescott 2002). North suggests that astrology first existed in Babylonia 1500–1250 BC. Originally, according to this belief system, celestial bodies were deities and their movements assumed to have Earthly effects 'in matters of love, war and so forth' (1994: 30). This belief itself largely disappeared, though astrology remains highly popular.

Priestly interpretations of the universe were taken on trust, and, despite making observations of the stars and planets, the Egyptians made no attempt to model the universe.

> Despite the great cultural wealth and length of time over which the heavens were scrutinized by the Egyptians, not to mention the respect in which they held many celestial objects, except in the case of the calendar it does not seem to have occurred to them to seek for any deeply systematic explanation of what they observed.
>
> (North 1994: 16)

One might expect what Parsons called 'advanced intermediate societies', which had abolished the notion of a divine king, to become more egalitarian. In fact, in some societies, Parsons argues, an even more marked dichotomy emerged, based on having 'the capacity and opportunity to act directly in terms of the new conception of the ultimate order' (1966: 70). Those without this capacity were excluded from the social order in a way that had not occurred in less advanced societies. In China, for example, the Emperor, not being divine himself, along with the mandarin class, had to impose 'a culturally-defined, ultimately grounded pattern on the society' (ibid.: 72). However, Davidson (1985: 24) talks about a time when the Emperor would meet people whilst facing south beneath Shang-ti, the god of the pole star; thus, his audience would face 'both the Earthly throne and the God of the pole above'.

In the Chinese case, this meant a dialectic developed between the dichotomous cosmic order of yang and yin and the social order of binary opposites and superior–inferior relationships, including male–female and upper status–lower status (Parsons 1966: 73). The founder of structural anthropology, Lévi-Strauss, noted a similar opposition between primitive societies' construction of the Sun and Moon. He identifies two ways in which the opposition of Moon and Sun marks important social and cultural distinctions. In these cases, 'the Sun and the Moon are commutative in function of more fundamental oppositions which they make it possible to express' (1968: 216). The first is that they may mark the physical order, by being ascribed particular genders and by describing a (sexual) relationship between them. The second is that they may mark the moral order, as each is characterized by a distinct set of attributes. For example, 'the Sun is thoughtful, careful, efficacious. His brother Moon acts without due consideration and makes all sorts of blunders, often fatal, which his elder brother must then repair' (ibid.: 217). The gender order is here made through a fundamental division of the universe. Furthermore, it is not simply a benign division as in Durkheim's account, but a division capable of expressing qualitative differences also found on Earth. This gendered division of the universe appears to have been common amongst early societies, and can be combined with a concept of patrilinear hierarchy that bridges the sacred and profane worlds as in Parsons (1966). In Andean cosmology, for example, Illapa was the male god of thunder and lightening from whom powerful groups could supposedly trace their descent, whereas Pachamama was the female god of Earth and generative forces.

> Thunder was also a conqueror. And as the emblem of powers that allowed one portion of humankind to control others, Illapa was set off against forces of natural fertility and bounty. Many Andean people conceived of Illapa as the ancestor-father of heroic founders of descent groups whom myth had proclaimed as the conquerors of other native kindreds. These mythic victories made sense of the internal ranking of descent groups which together formed an ayllu, or community. They also help explain why this divinity, as well as the descent groups claiming his direct ancestry, could stand for all the social descent groups which formed a political unit.
>
> (Silverblatt 1987: 22)

The equation of women with the Earth and men with the higher realm of godliness, culture and transcendence is a common theme in anthropology (Ortner 1974). In the Andes this stratification was given a very literal physical translation, as the male heads of household would visit shrines high in the mountains to be closer to God, whilst women were forced to remain in the valleys.

In the case of the Islamic and Roman empires, the failure to unite the cosmic and social (politico-legal) orders is cited by Parsons as a major reason for their fragmentation. Late attempts to deify the Roman emperor to achieve this were laughed at by intellectuals (1966: 92). The account of social power diminishes in Parsons' writing as the societies he is discussing become more advanced. In our view, the nature of the cosmic elite may change over time, but its power does not necessarily recede.

The Greeks and the growth of abstract knowledge

The search for an Earthly order that replicated the perfect order of the cosmos was a theme further developed later in Ancient Greece. The Ancient Greek philosophers such as Pythagoras (582–507 BC), Plato (427–348 BC) and Aristotle (384–322 BC) were searching for the universal and the harmonious, and the universe was seen as exemplifying just these qualities. The Platonic tradition held that certain geometric shapes (most notably the sphere and the 'Platonic solids') had particular aesthetic qualities, and these shapes could be superimposed upon the universe in theory to explain the movements of the stars and planets. The supposedly pure cosmos was made the subject of poetry and aesthetic contemplation, at least by the slaveholders and other dominant classes such as the philosophers. It was a circular explanation without empirical testing. It was assumed that the universe could only have been constructed on the basis of perfect geometry and aesthetic values, and it was up to the cosmic elite to find these perfections in the heavens, which were in turn used as proof of the correctness of the Platonic worldview.

The word 'cosmos' is Greek and refers to the world as a whole ordered system. Its opposite is 'chaos'. The cosmos could, according to the Ancient Greeks, be understood by using logic, reason and reflection. Plato was amongst the first to argue that, whereas the physical world is subject to constant change, the world of ideas is constant and immutable. His pupil Aristotle offered a related picture of the universe, one in which the movements of stars and planets revolve in circular fashion around the Earth. Such geometry was seen as pure and 'divine'. It contrasted with the sphere of the universe between the Earth and the Moon, which remained chaotic, imperfect and impure. Aristotle recognized and used astronomical observations, including those made by the Ancient Babylonians and Egyptians, but nevertheless insisted on the central importance of pure thought and pure geometry in defining the form of the universe.

The philosopher and mathematician Pythagoras was amongst the first to eulogize on the subject of the beauty and harmony of a mathematically describable, ordered cosmos. Plato, following Pythagoras, created a series of geometric models

of the universe, a set of interlocking spheres representing a geocentric arrangement of stars and planets. Aristotle, one of Plato's pupils, further developed the notion of a geocentric universe. It took the form of a hierarchical order, each celestial body associated with a spherical layer which contained (and was contained by) another layer (Figure 1.1). The cosmos, according to Aristotle, is divided into the sublunary realm (where all matter is composed of the four elements earth, air, fire and water) and the celestial realms where an element not found on Earth dominates. That element is ether. The heavens are the zone of purity and regular motion. The Earth is the zone of irregular and intermittent motion. The connection between heaven and perfection is further enhanced by its connection

Figure 1.1 Aristotle's hierarchical cosmos. Source: BPK/Kunstbibliothek, Staatliche Museen zu Berlin.

with the *primum mobile*, or prime mover. It operates in the outermost spheres, but with each inner sphere 'geared' to its neighbour. The unmoved and eternal prime mover was made the subject of theological speculation and Aristotle's scheme was adopted by Christianity for more than a thousand years.

Aristotle and feudal hierarchy

Aristotle's construction of the universe reflected and justified the dominant hierarchical construction of society, and vice versa. The universe as a whole was conceived as a 'finite, closed and hierarchically ordered whole' (Koyre 1957: 2), one mirroring and justifying feudal nobility's domination over the peasants, artisans and merchants. The Earth and the layers closest to the Earth were again envisaged as imperfect. But the layers furthest away were closest to perfection and corresponded to the religious and intellectual domains within humanity (Lachiez-Rey and Lumiet 2001: 29). These outer layers were assumed to have been designed by 'divine craftsmen' (Brague 2003: 33). Human beings must strive to emulate them if their souls were to achieve perfection. At the same time, rising above one's estate was frowned upon. In feudal society people were supposed to be reverent to those higher up the social order without aspiring to actually move up the god-given order of things. Aristotle's universe consisted of concentric 'crystalline' spheres, movement between which was impossible.

For Aristotle and Plato, order and perfection was to be found by copying a permanent, geometrically defined, god-given cosmos. Above was a God and below was an inevitable, permanent, divinely given sovereignty. Above was a heavenly father, below was paternal authority. Aristotle's hierarchical cosmos was also translated into a hierarchical model of the sexes (Laqueur 1990). Human society was seen as given and 'commonly apprehended as virtually equivalent to the physical universe in its objective presence' (Berger 1969: 20).

The kind of mathematical and aesthetic proof prized by the Platonists persisted until Ptolemy (a Roman citizen with Greek ancestry living in the first and second centuries AD) compiled and extended theories stemming from the Ancient Greek and Babylonian worlds. It was he who tried to combine the kind of aesthetic judgement exercised by the early Greek philosophers with observations of the stars. In 70 BC the Pythagorean philosopher Geminus had asserted that the behaviour of certain 'wandering stars' was preposterous, despite the fact that were divinely created. They were erratic and 'incompatible with the behaviour of a gentleman'. Indeed, their behaviour conformed more to that of servants and slaves and, given that the heavens are perfect, intellectual effort was needed to explain them. Ptolemy's solutions were extraordinarily elaborate. He retained a commitment to heavenly bodies moving in circles around the Earth. But these did not fit with the detailed empirical observations. Planets did not move in smooth and consistent arcs around the Earth, but at some points even seemed to double back on themselves, a phenomenon dubbed 'retrograde motion'. So Ptolemy envisaged planets rotating in circles, which were themselves revolving round larger circles (Figure 1.2). The Aristotelian and Platonic harmonic principles were retained, but made to fit the evidence.

Figure 1.2 (a) An example of the 'epicycles' on which Ptolemy assumed the planets were located. (b) The visible path created by such motion.

Ancient Greek philosophy, particularly that represented by Plato and Aristotle, placed a special premium on abstract, detached reasoning. Actual practical work and observation was denigrated. It was the kind of activity in which only slaves should engage. Here we start encountering a new form of the critical division of labour over knowledge of the universe. On the one hand, we have cosmic elites with specialized, often mathematical, knowledge. On the other hand, we have the great mass of people whose knowledge is based on practical experience. This division of labour is orchestrated, a basis for class and other social divisions. The division meant that mental labour (and mental workers) were considered nearer to God because of their connection to the heavens, whereas manual labourers and manual work were despised. Mental labourers were also deemed to be happier thanks to their proximity to God (Farrington 1947).

Eric Lerner (1991) develops a thorough critique of this tradition of abstract thinking about the universe. The theories he sets out to criticize (all of which suggest that the universe is finite) are represented in Plato, Aristotle and Ptolemy as well as recent theorists such as Einstein and Hawking. They are based, he suggests, on deductive speculation, a commitment to a mathematically 'perfect' universe, a faith in reason above observation, and are ultimately characterized by Lerner as mythical. He associates these forms of knowledge with slave-holding and feudal societies in which a cosmological elite of priests, pharaohs, shamans, astrologers and mathematicians holds knowledge of the heavens which is divorced from the kind of empirical knowledge held by slaves and peasants. He argues that changing social relations allowed an empirical cosmology to emerge. In Athens in particular, the transition to an Ionian order based on peasant and craftsman knowledge led to greater freedom, equality and a higher valuation of knowledge based on experience and observation. This attention to the empirical world had practical consequences for navigation and free trade. The utility of the empirical worldview (one also fundamental to the development of weapons of warfare and techniques of trade) allowed the Ionian worldview to defeat the older forms of deductive epistemology. It decreased the power of a cosmological elite whose abstract knowledge

was divorced from the real world. The infinite universe theories associated with Copernicus, Kepler, Galileo and now the physicist Hannes Alfven are based on inductive empiricism – a rejection of mythology and the theorizing of anything unobserved or unobservable (see Alfven 1983, 1988). The latter now includes, for example, so-called dark matter. Recognizing empirical knowledge values the knowledge of the craftsmen and other subordinated classes. It is also a knowledge relevant to these people. The historical swing between these two camps has been described by Alfven as the 'cosmological pendulum'. Lerner is critical of the abstract knowledge that he sees as having again come to dominate in the form of Big Bang theory. We return to this later.

The Great Chain

However, the relationship between cosmic and social hierarchy continued to be developed for some considerable time after the Ancient Greeks. Society and the cosmos in the mediaeval era were coded into the 'Great Chain of Being', a ranking of beings in the universe from God at the top, through the angels to kings, bishops, nobility, peasants, animals, plants and rocks (Lovejoy 1960). The position of priests and kings was much closer to that of angels than the common man. Much of Western history has been based on this view of the cosmos. Gods, royalty, priests, business people, servants, animals and rocks are laid out in a hierarchical way, one which is predetermined and permanent. The Great Chain was therefore a powerful demonstration of how the social order was embedded in the cosmic order.

This cosmology, one naturalizing power relations, had its origins in Ancient Greek philosophy and it continued to dominate societies in the Middle Ages, at least in 'Western' societies. A version of it continued into the Italian Renaissance, when the hierarchy was seen as determined by the relevant amounts of 'spirit' and 'matter' contained within each object. The less 'spirit' and the more 'matter' contained by an object, the lower it was placed in the hierarchy. There have been a number of variations to the Great Chain theme. Figure 1.3 shows an English sixteenth-century version. The Queen was the highest point in the Chain. Actors are located between beggars and pirates (this was before the days of celebrity culture). Women are included only so long as they are attached to the monarchy or court.

Unsurprisingly, the socially powerful found the idea of a god-given cosmic hierarchy highly attractive. Their place had, it seemed, been preordained by a wise Creator. As Bynum puts it 'The hierarchical *scala naturae* would have an inherent sympathetic appeal to men (sic) who were used to thinking about their own social relationships in hierarchical terms' (1975: 6). Similarly, those towards the bottom of the Chain were expected to defer to those higher in the social order and consider their often unpleasant experiences as the inevitable result of their god-given position.

On the other hand, the Chain contained a number of assumptions. And, particularly from the seventeenth century onwards, ideas which had been made

The Great Chain of Being

'The Courtier disdaineth the citizen;
The citizen the countryman;
the shoemaker the cobbler.
But unfortunate is the man who does not
have anyone he can look down upon.'
~ Tomas Nash, 1593

God
Angels
Kings/Queens
Archbishops
Dukes/Duchesses
Bishops
Marquises/Marchionesses
Earls/Countesses
Viscounts/Viscountesses
Barons/Baronesses
Abbots/Deacons
Knights/Local Officials
Ladies-in-Waiting
Priests/Monks
Squires
Pages
Messengers
Merchants/Shopkeepers
Tradesmen
Yeomen Farmers
Soldiers/Town Watch
Household Servants
Tennant Farmers
Shephards/Herders
Beggars
Actors
Thieves/Pirates
Gypsies
Animals
Birds
Worms
Plants
Rocks

Figure 1.3 The Great Chain of Being in sixteenth-century England.

hegemonic since the days of Ancient Greece came under severe challenge. Galileo's observations of the universe of the stars and the planets were suggesting that no plausible distinction could be made between the 'celestial' and 'sublunary' realms. Neither was superior. They were both subject to the same laws. New species were being unearthed and it was not clear how or whether these discoveries could be fitted into a Chain which supposedly incorporated not only the whole of creation but the whole of everything that *could* be discovered. Meanwhile, new (mainly non-white) people were being 'discovered' as a result of their exploitation. These could be, and indeed were, located on the Chain a little lower than white people. But that seemed to deny the possibility that these people could be in any way reformed or 'civilized'. It also led to increasing difficulties in categorizing people within a single linear scale. Was Newton, like all humans, near to the apes and the recently discovered Hottentots? Or was he much nearer the angels (Bynum 1975)? Meanwhile, biology was beginning to emphasize change and the transformation of species. This too seemed to undermine the Chain's assertion of a fixed social and natural order. In this context, the Chain was reinterpreted as describing a *process* not a static hierarchy. The 'lower' forms of entity could be envisaged as possibly adapting into 'higher' forms over time (Lovejoy 1960). But in the end the model broke down in the context of profound social, political and intellectual change.

Breaking the Chain: the emergence of individualism

So far the dominant forms of subjectivity as experienced in relation to the universe have only made sense when the self is understood as being locked into a social order. From Aboriginal tribes to the Great Chain of Being, human subjects, or certainly the vast majority of them, have experienced themselves not as individuals, but as part of the cosmic whole. At the same time there is deference to those with a closer relationship to the universe that exists outside of humanity. It was a relationship that lay people could never hope to obtain, at least during their lives on Earth. The universe itself remains a powerful entity influencing human affairs through its intermediaries on Earth. But, as suggested above, these kinds of relationships with the universe became increasingly untenable. A new concept of the self as an autarchic individual emerged alongside a new understanding of man's relationship with the universe.

Anthropological work suggests that the creation of individualized human selves, and indeed the fragmentation between these selves and external nature, is very much a product of modern Western society. Geertz, for example, writes:

> The Western conception of the person as a grounded, unique, more or less integrated motivational and cognitive universe, a dynamic centre of awareness, emotion, judgement and action organized into a distinctive whole and set contrastively against other such wholes and against its social and natural background is, however incorrigible it may seem to us, a rather peculiar idea within the context of the world's cultures.
>
> (Geertz 1974: 31)

One of the central themes of classical sociology is the transition from a homogeneous community life based on tradition, religion, family and a relatively uncomplicated division of labour to a modern society based on individualism, property and an advanced division of labour. Durkheim's description of the transition from what he called 'mechanical' to 'organic' solidarity is perhaps the best known account of this process (1933), although there are many others, including that of Ferdinand Toennies (1955), who made the famous distinction between *Gemeinschaft* (a social order built on family, land, generations and neighbourhoods) and *Gesellschaft* (a society composed of individualism, competition and impersonality).

The opening of the universe and the opening of the self

We now turn to capitalism to understand the rise of individualist consciousness and subjectivity. A number of writers have argued that the origins of contemporary capitalism and individualism can be traced back to the Renaissance (Cassirer 1963; Poppi 1987; DeGrazia *et al*. 1996). Jardine, for example, traces today's 'ruthless competitiveness', 'fierce consumerism' and 'restless desire for new horizons' to this period (1996: 436). A new subjectivity stemming from early capitalism was celebrated at this time by the ideology of the 'universal man' (Burckhardt 1878; for a critique see Martin 2004). It was a concept introduced by elite intellectuals, priests, merchant bankers and others in northern Italy in the fourteenth and fifteenth centuries. This was a highly versatile individual, one making himself (sic) into a fully developed personality through engagement with all forms of knowledge and human endeavour. These included mathematics as well as aesthetics, reason as well as emotion, theory as well as practice. It also included the increasingly empirical study of the universe, with practical implications for trade and colonial expansion. The whole of the universe was represented within the individual and he could make himself a part of the universe through embracing all kinds of wisdom. As Leonardo da Vinci put it, 'Man can do all things if they [sic] will' (Burckhardt 1878: 87). Here, then, was a new kind of open, self-expanding 'man', equivalent to the new image of an open universe and the capitalist society expanding around the globe. Though it did not disappear totally, the idea of a hierarchically ordered universe reflecting feudal subjectivities – the universe of Plato and Aristotle – was being replaced by the all-conquering individual of early capitalism.

From the late fifteenth century onwards astronomers developed the idea of a cosmos which, unlike the closed cosmos posed by Aristotle and the mediaeval astronomers, is essentially open, even infinite, and made of the same stuff as the Earth. It was a vision of the stars which no longer linked human behaviour to forces beyond human control. Copernicus himself was amongst those who developed this line of argument (Koyre 1957), though it was an idea which had been suggested a century before by Nicholas de Cusa with his notion that the universe is 'an infinite sphere' (Kuhn 1957). Followers of Copernicus, such as Bruno, Digges and Newton in the late seventeenth century, asserted with increasing confidence the notion of an infinite universe. The movement away from the Platonic sphere as a model of the universe was the cause of some depression for Pascal, who referred to the

infinite universe as *effroyable*. It was 'a fearful sphere whose centre is everywhere and whose circumference is nowhere' (in Borges 1970: 227). The old order had been dissolved.

The key point here, however, is that, while these discoveries and assertions were being made, a new kind of ideal, infinite, 'self' was *also* being actively proposed and elucidated. Thus, paralleling the discovery of a new open cosmos was a discovery that the self was also open and infinite in its capacities. No longer was the individual seen as locked into a rigidly defined Chain of Being as proposed by the Ancient Greeks and the mediaeval cosmologists. Rather, the Renaissance humanist philosophers were outlining a new kind of self-propelled self, a proactive, rational individual, fully capable of exercising free will and with infinite capacities for self-improvement. Charting the seas and the heavens and travelling round the Earth were a rational means of escaping what DeOliva, a major sixteenth-century Spanish philosopher, called 'the dregs of the Earth'. God and the heavens, 'the dwelling place of happy people', were to be accessed in this way (1977: 38). This self-improving rational person is a close cousin of Max Weber's hard-working Calvinist. Pico della Mirandola was a central figure in making this transformation (Poppi 1987; Tarnas 2006). Tarnas says of this era:

> It was of course no accident that the birth of the modern self and the birth of the modern cosmos took place at the same historical moment. The Sun, trailing clouds of glory, rose for both, in one great encompassing dawn.
>
> (Tarnas 2006: 4)

In short, the confident, self-expanding, potentially infinite individual (prefiguring the 'have it all' narcissistic individual that characterizes contemporary capitalist subjectivity) was a product of the discovery of a cosmos and a society that was itself seen as open and infinite. By the same token, this notion of a potentially self-creating self further enhanced and supported observation and yet further exploration of an infinite world and heavens.

The universal man would be able to engage in political and civic debate, dreaming up new concepts but also planning for their realization. His mission was to understand the whole of the Earth and to regulate it, making all organic and inorganic nature in God's image. It is of course important not to get carried away by the ideal and practice of 'universal man'. Not only are females largely excluded from this picture but, as has been well documented by Wallerstein (1974) and others, many people in Europe and the newly opened-up peripheral societies were made still more alienated and '*un*free' at this time. 'Universal man' may have been the characteristic celebrated by social elites in northern Italy, but most of humanity then, as now, were in practice subject to all kinds of control. The peripheries of the world economy in particular were subjected to many kinds of limitation and oppression, including slavery, cash-crop and share-crop labour. Control of these labourers depended on legal and other coercion and, if all else failed, continuing threats by their social betters of a descent to Hell. They would have known little of what 'universal man' was all about and they stood little chance of making

themselves into one of these self-developing, all-encompassing, individuals. In Chapter 2, we pick up on some indications of the latest formulation of this relationship between universe and self in the form of cosmic narcissism.

New scientific observations of the universe

Even in Greece, the extension of citizenship and democracy led to a popular optimism and confidence about the value of observation and experience. The universe, it was argued by some, could be seen as an extension of the materials and processes experienced and worked with on Earth. Observation and practice were preferable to pure, detached, thought. This empiricism at the epistemological level was coupled with the beginnings of a new understanding of the cosmos at the ontological level that emphasized its material rather than spiritual qualities. Such a view had been developed by Thales around 600 BC. It was also shared by Anaxagoras, who asserted around 400 BC that stars were merely massive rocks that were bigger than Greece and had been flung off an early Earth. They were glowing because they had been heated by friction. This materialist view, however, was not to prevail. It took social revolutions in the eighteenth century and the development of Enlightenment science to reassert the notion that the universe is infinite and is made of the same stuff as the Earth.

The beginnings of what are now seen as the scientific method were developed at the time of the Islamic Conquest from the seventh century AD onwards. Ibn al-Haytham and others built on the learning of the Greeks, arguing that the world and the universe could be known through reason and scientific authority. But the Islamic Revolution also created what we now see as the scientific method, one that rejected any notion that a mathematically defined universe was necessarily *the* reality. Instead, observations of the heavens were made in newly constructed observatories in cities such as Baghdad. Observations were tested against mathematically defined hypotheses and the hypotheses modified accordingly. The Muslim calendar is based on the Moon, for example, and this meant that it was important to see and predict the arrival of the new Moon. This was especially important for the month of Ramadan when fasting is demanded for the day. Similarly, the annual pilgrimage to Mecca meant determining the exact date of the Haj. Praying itself needs Muslims to face Mecca, and astronomy meant that the coordinates of the stars could be mapped and the direction of Mecca determined from any location.

The Muslim scientific renaissance faded, however, around AD 1100. It did not flower and develop at the time, remaining inhibited by social and religious convention centralized in the powerful caliphs. One key result was that the contrast between Heaven and Earth as maintained in the Islamic East and the Christian West was not challenged. Finally, the Turkish invasion displaced the caliphs. The Turkish invasion led to the dismantling of the budding Islamic economy and the Islamic scientists were dismissed as irreligious and heretical. Once again, the science of the universe is immediately implicated in social change and upheaval. Its development is a product of society and its arrest is also a product of social change.

The Copernican revolution

The assertion of a Sun-centred universe in Western astronomy was itself the product of an elite group of humanist intellectuals, artists, scientists and philosophers. They had been developing the idea of perspective: a solution to the representation of space. This representation was used by Copernicus. Such knowledge was mathematically defined and this inevitably made it available to only a select few people with the necessary knowledge. As Copernicus put it, 'mathematics is for mathematicians' (Kuhn 1957: 143). This was the language of God, the creator of the universe, and not something in which the lay person was expected to be fluent. Nevertheless, since it was divinely made, the mathematical understanding was one that had to be respected by society at large.

There was therefore clearly some continuation of the Greek influence in Copernican and post-Copernican thought. But Copernicus also contributed to a considerable shift in the way in which we gain knowledge of the universe. Lerner sees Copernicus as one of the empiricist cosmologists whose epistemology helped to undermine the power of the cosmic elite. This empiricism could be seen as liberatory in so far as it encouraged radical forms of politics and religion in Europe from the fourteenth century onwards while at the same time promoting the beginnings of a scientific worldview. Catholics, especially those in Italy, had espoused Aristotle's vision of the universe since the Middle Ages. This of course led them to resist new models such as the Sun-centred universe presented by Galileo. And the Inquisition in Italy of the early seventeenth century imprisoned, tortured and even killed those promoting such an atomistic view of the universe. As the prosecutor at one of the trials of the Inquisition in Venice explained: '[I]f the first man was composed of atoms like all other animals, everything resides in nature, God does not exist and neither does hell, purgatory or heaven, and the soul is mortal' (cited in Jacob and Stewart 2004: 2). However, there was no simple conflict between religion and science as is often believed. Copernicus dedicated his *De Revolutionibus* to the Pope, even though the Catholic Church later turned against him. The Protestant church, meanwhile, embraced him from the start.

Copernicus offers an important example of how social relations and social change are constantly intertwined with the development of new knowledge of the universe. On the one hand, as suggested earlier, it was a period of voyages and explorations, stimulated by a combination of intellectual curiosity and demand for greater wealth. Voyages needed accurate maps and navigational techniques, all of which needed better astronomy and knowledge of the heavens. On the other hand, the new Sun-centred cosmology shook the heart of religious belief. Asserting that the Sun, not the Earth, is at the centre of the universe represented an attack on Christianity itself. Although the Earth was still seen as divinely made, the Earth was de-centred by the new theory as the birthplace of Christ and the site of human redemption. Note that, although Copernicus died in 1543, the Catholic Church continued to resist his cosmology for over a hundred years. The Copernican cosmology won out, as did the Ionian worldview and capitalist empire, but because of its social implications it was heavily resisted. It should be noted that Copernicus

was not the first to suggest a Sun-centred universe. Nicholas of Cusa (1401–64) even postulated an infinite universe without a centre but this cosmology gained little recognition at this stage.

Copernicus and a paradigm shift

Even if the liberatory potential of Copernicus' empiricism is somewhat contentious, it is hard to argue that the eventual acceptance of his model of a heliocentric universe itself was anything other than revolutionary. Thomas Kuhn's well-known *The Structure of Scientific Revolutions* (1964) was founded on historical research he conducted on the revolution in scientific thought brought about by Copernicus (Kuhn 1957) (going on to look at the shift from Newtonian to Einsteinian physics). In his later work he fully developed his theory that science proceeded on the basis of cataclysmic ruptures between different paradigms on which scientific knowledge was founded. He suggests that science, especially the science of the universe, is typically confronted by an array of competing perspectives. One of these is eventually accepted by the scientific community and is widely adopted as the dominant 'paradigm'. Research, in the form of what Kuhn calls 'routine puzzle solving', takes place within this paradigm. Failures to prove the dominant hypothesis within this paradigm are mainly seen as 'local difficulties'. They are envisaged as problems associated with, for example, incorrect research procedures. Or they might be a result of unreliable evidence. Coping with such difficulties is 'normal science' (Kuhn 1964).

During periods of 'normal science', research was conducted on the basis of a particular paradigm or set of assumptions (for example, assuming that the Earth was the centre of the cosmos). These assumptions direct the scientist to attend to particular relevant qualities. Quite contrary to the picture of a neutral scientific enquiry, this perspective asserts, as David argues, that 'what you see is dependent upon the theory you already hold' (2005: 13). However, over time as more evidence is collected the prevailing paradigm becomes untenable and other paradigms emerge.

Such fundamental crises can only be resolved, according to Kuhn, by the widespread adopting of another paradigm, one that eventually captures the widespread support of the scientific community. The best example is Copernicus breaking free from mainstream thinking in the early sixteenth century by making the Sun the centre of the universe. Copernicus knew straight away that he was in trouble. In writing to introduce his theory to Pope Paul III, he recognized he was flying in the face of almost all contemporary opinion. He was likely, in his words, to be 'hissed off the stage'. But the assertions of the mathematicians working in the previous era had, he argued, become so obscure that they could not predict even the most basic events relating to Earthly life. As Copernicus put it, 'the mathematicians are so unsure of the movements of the Sun and Moon that they cannot even explain or observe the constant length of the seasonal year' (Kuhn 1957: 138). His careful observations of the stars and planets meant that an idea previously considered impossible had to be taken seriously.

Kepler: 'the first modern scientist'

In the wake of Copernicus, Johannes Kepler is often said to be the first modern scientist of the universe. Yet he remained steeped in the tradition of the Ancient Greeks insofar as he again saw the forms of the universe as part of a pure, divine harmony. His initial models of the universe were based on the Platonic solids. The orbits of the planets (shown as cut-away spheres) were envisaged as a series of Russian dolls each nested inside one of the Platonic solids, which in turn was inside the orbital sphere of the next planet (see Figure 1.4). The shapes were not believed to be real, as were Aristotle's crystalline spheres. But they served to illustrate the principle of ratio of orbits God had used to design the universe. This system emerged almost solely from abstract aesthetic reasoning and was not based on systematic observation. However, Kepler sought to deductively test his theory using Tycho Brahe's data derived from years of observing the sky. Kepler allegedly killed Brahe to get hold of his log books (Gilder and Gilder 2004). This empirical data actually caused him to abandon his theory based on the Platonic solids, and to discover that, contrary to Platonic principles, the orbits of the planets were elliptical, not circular. However, even after he had developed the laws of planetary motion and been made the Imperial Mathematician to Rudolf II, Kepler retreated back into the world of abstract metaphysics. He next made a revised model based on the intervals of the musical scale, a common theme amongst Platonists. The empirical observation of the universe was left to others like Galileo to develop.

Figure 1.4 (a) The Platonic solids in order – cube, tetrahedron, dodecahedron, icosahedron and octahedron. (b) Kepler's model, which shows the spherical orbits of the planets as each nested between two of the solids. Within Saturn's sphere is a cube, within which is Jupiter's sphere, within which is a tetrahedron and so on. *Original Cosmographic Mysteries* (1609).

Science and the division of labour: alienation or emancipation?

It should be noted that, contrary to Lerner's (1991) argument, Alfred Sohn-Rethel (1975) and Frankel (2003) have argued that this more scientific mode of relating to the universe merely intensified rather than alleviated the alienation of the masses from the universe. Sohn-Rethel's argument is that 'abstract', one might say 'objective', knowledge first arose as part of the exchange relationship in what he calls 'societies of appropriation' or capitalist societies based on a high division of labour. The person producing a commodity is, as Marx described, alienated from the exchange process, in which s/he comes to see his/her product in terms of an abstract exchange value, which operates independently of the needs and uses which the seller or buyer has in mind. This purely abstract system of thought represented in the form of money ('a crude approximation of the underlying principle') leads to abstract, scientific, thought. Postone (1996) has argued similarly that 'abstraction' in general is central to capitalist societies.

The development of capital in two distinct epochs has led to corresponding developments in epistemology, according to Sohn-Rethel. First, the introduction of coinage in Ancient Greece led to Greek philosophy and mathematics. Second, the development of modern capitalism led to the sixteenth- and seventeenth-century scientific revolutions. He goes on to argue, and this forms a major focus of his and Lerner's thesis, that the abstract form of scientific knowledge was instrumental in legitimizing the division of mental and manual labour in modern capitalism. The argument is that the existence of this abstract system justifies the existence of an elite of scientists capable of studying the system untainted by the practical knowledge of the worker. Davidson (1985) is also extremely critical of the development of objective scientific approaches to the universe that distance knowledge from people's everyday experience of the universe. The latter, Davidson argues, remains Earth-centred (as in Tycho Brahe's model). The result of de-centring Earth through science, for Davidson, is the creation of 'a cold mechanical world' (ibid.: 4).

There are important differences between Sohn-Rethel's account and Lerner's. For Lerner, Galileo, like the empiricists Copernicus and Brahe before him, represents a break from the truly abstract philosophy of Plato. It is a break alleviating a lot of the problems of the division of labour by relying on artisan and serf knowledge available to all. However, Sohn-Rethel sees Galileo as representing a distinct break from his predecessors in instituting a new form of *abstracted* knowledge that severely heightens the mental/manual division of labour. He points to parallels between Galileo's law of inertial motion and the abstraction of the commodity exchange. Lerner does not draw out a full criticism of the relationship between capital and cosmology that replaced it. Contrary to what Lerner implies during most of the book, colonial capitalism based initially on practical knowledge of navigation (now satellites, and possibly future capitalist exploitation of space resources) has not been an age of equality or celebration of the knowledge of the manual worker. This epoch has had its own cosmic elite of not only scientists but also engineers, and the military and the governments and corporations

that control them. The scientific cosmological elite of today is still maintained by others' labour. They are given 'the freedom to abandon the constraints of the "ordinary" world' (Ferguson 1990: 1).

Enlightenment materialism

Materialism takes a number of forms, but basically it is the assertion that everything, the Earth and the universe as a whole, is made only of matter or is ultimately dependent on matter for its existence and nature (Lange 1925). In the wake of Kepler and Galileo, during the European Enlightenment (dating roughly between the 1680s and the 1780s) a number of thinkers contributed to a resurgence in materialist thinking. But it should be recognized that materialism has a long history. It even goes back to the Ancient Greeks, with Anaxagoras (*c.* 500–428 BC) and Democritus (*c.* 460–370 BC). The development of materialism had important social implications. In the first instance it further undermined the role of a cosmic elite whose knowledge was based on proximity to the heavens. It also contradicted the idea that the universe was closed and the social order fixed.

One of the best-known Ancient Greek materialists was Epicurus (*c.* 341–271 BC), whom many now see as an early progenitor of what would now be termed an 'Enlightenment' view of science and nature. His views were especially influential on the young Karl Marx (Foster 2000). This is because Epicurus resisted teleology, the idea that society or nature is working towards some predestined end, one perhaps determined by God. Attacking teleology in this way was later important for Marx since it implied that human beings had their own futures in their own hands. There was no essence to nature and the universe. There is no Guiding Spirit determining human affairs after all.

After the Middle Ages, materialism was again to flourish with the work and insights of Enlightenment philosophers and their forerunners, including Thomas Hobbes (1588–1679) and Holbach (1723–1789). Religious and aristocratic authority was being overturned. The cosmos was now one in which independent entities such as the planets were seen as obeying the same laws. Similarly, there was no reason to suppose that some people were inherently superior or inferior or that social laws should apply only to some people and not others. Like the planets and the comets, they too were made of the same stuff and therefore deserved to be treated in an equal way. Furthermore, the cosmos was no longer seen as fixed and enclosed but was viewed as infinite and even expanding. The end of mediaeval social relations and the spreading of a Western society in the form of voyages on a global scale both matched and mirrored the new view of the universe as itself open and expanding.

Indeed, astronomy was further developed towards a very specific end, that of colonizing the globe. In the late seventeenth century, for example, sailing ships were having enormous problems orienting themselves. It was the problem of establishing longitude – one's exact position East and West – whilst at sea. In March 1675, King Charles II appointed John Flamsteed, a 28-year-old clergyman and mathematician, as his first Astronomer Royal to try to crack this problem,

although accurate clocks eventually supplied the solution (Sobel 1998; Forbes 1975).

Best and Kellner echo Tarnas (2006) in noting that this new materialistic view of the universe reflected an ontological break with pre-modern cosmology. 'The goal of knowledge shifted from contemplating a divinely organized, living universe to conquering and mastering dead nature, a universe reduced to mere matter-in-motion, a storehouse of raw materials for human use' (Best and Kellner 2001: 109). This clearly mirrors the view Francis Bacon developed of nature. Bacon rejected the understandings inherited from antiquity and proposed a new scientific attitude towards nature. The proper place of mankind according to this view was as the master or manager of nature. Nature was largely seen as designed for human purposes, though it was to be cultivated in the context of a cooperative relationship (Dickens 2004: 2). Tarnas (2006: 41) suggests that the demystifying of nature and of the universe unconsciously served the purpose of human self-aggrandizement and further justified exploitation of the world.

Despite a different philosophical starting point, Descartes (1596–1650) also acknowledged the material nature of the universe. He believed that the Earth was made up of 'coarse' opaque elements, whereas the Sun and the stars were made of luminous elements supposedly capable of penetrating terrestrial matter, and a 'transparent' element filled the spaces between these different sorts of bodies. The universe was composed of collisions between these physical elements. His atomistic 'mechanical philosophy' heralded the scientific revolution. An organic cosmos had given way to a 'mechanistic worldview' (Merchant 1980).

A Newtonian age of physics

Nevertheless, it is Newton who is usually seen as the epitome of the modern, scientific, rational, view of the universe. His monumental text, *Principia*, showed that the elliptical motions devised by Kepler were the natural product of a universal law of gravitation. His importance lay in the fact that he developed an understanding of the causal mechanisms underlying the observations made earlier and by contemporary astronomers at the Royal Observatory at Kew. This even became the site of an anarchist 'terrorist attack' as long ago as 1894 because it was a symbol of 'progressive' British scientific colonialism. The development of instrumentation, most importantly Galileo's telescope, had enabled detailed observations of the universe that could be used to test and develop models of the universe.

Newton's theories can be seen as a very direct product of the social conditions in which they emerged. A fundamental understanding of how the physical world works was needed, for example, to enable large ships to cross the water, to enable extensive mining to take place and to improve the ballistics needed by a modern military force. The physics developed by Newton were, then, directly involved in the making of the earliest stage of industrial capitalism, especially in Britain (Hessen 1971). Newton's physics indeed eventually found direct application to these areas of social and political change, but intermediate organizations and institutions and political processes enabled such development to take place.

For example, lectures were given in London from the early eighteenth century onwards by promoters of Newton's new knowledge. Artisans and others were actively taught in public institutes to make and use machines based on the principles of attraction, repulsion, inertia, momentum, action and reaction. Such active promotion of Newton's ideas was later to take place in Edinburgh, Belgium, France and elsewhere. Newton's theories needed social, political and religious allies to develop and achieve prominence and application. Also note that Newton actually had little idea how his ideas were to find practical application. Industrial capitalism can be seen as the unintended consequence of Newton's theories. When sailors started to be introduced to the basics of physics Newton actually argued against such an innovation, suggesting that what seamen really needed was a good grounding in astronomy (Jacob and Stewart 2004).

The Newtonian universe and system of government

Although the new empirical approach to the material realities of the universe proved of instrumental value, a deity nevertheless remained firmly in charge of Newton's universe. The regular motions of the universe were to be seen as the product of an all-seeing, all-guiding God. Newton believed that the universe was so orderly that the universe could only have been created by God, and that under the pressure of gravity the universe would collapse 'without a divine power to support it' (Koestler 1989: 536). There remained strong elements of classical thinking in Newton. The universe as a whole was once more something pure, permanent and unshifting.

It was out of a meeting of idealism and materialism that Newton's idea of universal gravity emerged. The atoms were held together by something invisible and yet divine. Newton therefore developed a model of the universe that espoused both science and religion. Furthermore, and this is most important for our argument, it was made a model for society as a whole.

> The ordered, providentially guided, mathematically regulated universe of Newton gave a model for a stable and prosperous polity, ruled by the self-interest of men. That was what Newton's universe meant to his friends and popularizers: it allowed them to imagine that nature was on their side; they could have laws of motion and keep God; spiritual forces could work in the universe; matter could be controlled and dominated by God and by men.
>
> (Jacob 1976: 18)

As this quote suggests, the Newtonian model of the universe also provided a model for a society which was becoming increasingly infiltrated by the market and private property ownership (see Mirowski and Goodwin (1991) for a history of the metaphoric relationship between economics and physics). The 'stable and prosperous polity, ruled by the self interest of men' was nothing less than Britain's very early industrial capitalism. As Frankel (2003: 78) puts it, 'provided individuals pursued their paths "freely", the whole world would, like a machine, continue

its uninterrupted progress, brought together by some mysterious providential mechanism'. Best and Kellner (2001: 136) similarly argue that 'the homologies between Isaac Newton and Adam Smith stemmed from each voicing a different application of the same mechanistic paradigm of modernity'.

The new astronomy and cosmology developed in the Enlightenment era was made a battle-ground, reflecting opposing social and religious alliances, with the Protestants using modern science and Newtonism as proof of God's works and the Roman Catholics seeing them as precisely the opposite: the work of the Devil. It was as much the social and political alliances either attacking or supporting science and Newtonian thought which led to its success as the science itself. As Jacob and Stewart put it:

> More than any other single factor in the rise to prominence of Newton's science, the postrevolutionary politics of the 1690s set the stage for its acceptance. Newton's science did ideological work in shoring up belief in a broad, liberal Christianity and in the providential order of a state sanctioned not by the divine right of kings but a vote in parliament.
>
> (Jacob and Stewart 2004: 19)

Note that Jean Desaguliers, a leading Newtonian in the 1720s and 1730s, spoke of 'The Newtonian System of Government' (Jacob and Stewart 2004: 21). The parliamentary system was envisaged as god-given in the same way as was Newton's universe. Politics had been made 'scientific', obeying the laws of nature.

But this model of society was in turn projected back on the universe as a new science, and one that provided what many (most?) people now argue to be a greatly improved picture of the universe as an objective reality. Value concepts such as perfection and harmony were giving way to a universe governed by underlying laws and mechanisms. Like earlier visions of the cosmos, Newton's model of an infinite universe was a product of the society and social changes of his time. And it equated well with the progressive mentality of the times.

> The revolutionary concept that society is not a fixed entity, that it continuously evolves through effort and struggle, through science and technology, toward higher forms of organization and material well-being was swiftly taken up in the field of science.
>
> (Lerner 1991: 110)

Newton's view of the universe therefore influenced social and political relations on Earth while also being a product of society itself. As Freudenthal (1986) points out, Newton had an atomized vision of the universe, one composed of separate entities with internal properties. These include gravity holding the system together. Yet it was a view that was analogous or homologous to a dominant view of the social order, one that sees society as itself composed solely of individuals with their own, internal properties. Some Ancient Greek philosophers, known as the atomists, had advanced the theory that the material world was made of atoms.

Atomos, in Greek, means indivisible. It is, the atomists believed, the indivisible material unit which constitutes the whole universe. The individual became the atom of society (Kuhn 1957). But although 'socially constructed', it also brought an immense step forward in terms of understanding the causal mechanisms underpinning the relations and movements of the universe.

Newton's deterministic theories of a universe composed of elements predictably moving around the Sun were created in a society widely envisaged as a set of autonomous, property-owning, individuals moving in stable and predictable fashion. However, once constructed, Newton's vision in turn affected dominant elite views of how society should be made. The job of politics was then envisaged as making society also smoothly ordered, a legitimate part of the universe. The Newtonian revolution had an immediate effect on Locke in particular. But atomized individualism is a misleading and dangerous analogy to apply to society (Collier 1994). Such an equation between the universe and contemporary politics serves a key ideological purpose, a point not lost on the young Marx when he describes the transition to modern democracy: 'Just as the Christians are equal in heaven though unequal on Earth, the individual members of the people became equal in the heaven of their political world, though unequal in their Earthly existence in society' (1975b: 146). The inequalities and injustices of Earthly existence were left intact.

Contemporary mysticism and abstraction

There are an increasing number of people now arguing that contemporary cosmology, including even the 'Big Bang' theory on which much of cosmology is now based, is simply social constructions remote from empirical observation (see, for example, Frankel 2003; Lerner 1991; Woods and Grant 1995). These kinds of theories have been referred to as 'metacosmology' (Coles 2001). Modern physics is struggling with chaos theory, complexity theory, 'Big Bang–Big Crunch' models, an 'inflating' universe and even ideas of multiple universes. It is argued that all these are again highly speculative, the result being a major crisis in physics over at least the past six decades (Norris 2000). Contemporary scientific views of the universe often seem content to return to a level akin to that attained by the Ancient Greeks, with the beauty of the theory being on its own sufficient reason for its adoption. One contemporary commentator suggests that modern astronomers and cosmologists have not even attained Ancient Greek levels of understanding. They are back in the mythological realm, particularly as some of them attach religious significance to their models of the universe's origins and collapse. 'Much of what astronomers claim to know about the history of the universe is speculative and, according to some critics, no closer to reality than the epics of early Hindu poet priests' (Cornell 1989).

Einstein and the flight from reality

Einstein's theories were derived from experiments and given practical applications. These led to empirical confirmation of their correctness. He predicted, for

example, that a gravitational field would bend light rays: specifically that a light ray passing close to the surface of the Sun would be bent out of a straight line by an exact amount: 1.75 seconds of an arc (Woods and Grant 1995: 154). In 1919 an astronomic observation of an eclipse of the Sun confirmed this prediction. Towards the end of his scientific career Einstein fought against abstract idealism, particularly of the kind offered by Heisenberg and Bohr (Norris 2000). The main point of debate between Einstein and the Danish physicist Niels Bohr, for example, concerned whether and how it is indeed possible to 'get behind' surface appearances. Einstein claimed to be a realist and did not like what he saw as Bohr's 'unthinkable phenomena' and his apparent lack of interest in verifiable underlying causal mechanisms. One of Bohr's concepts, 'spooky action-at-a-distance', apparently made Einstein particularly angry. But even Einstein oscillated between a notion of truth as based on underlying causal mechanisms which were not necessarily observable and a notion of truth based on verification through observation (Norris 2000). Frankel even goes so far as to suggest that Einstein's Special Theory of Relativity was 'equivalent to solipsism, or the view that each individual can only be certain of his/her own sense data' (2003: 39). Making a firm connection between Einsteinian physics and currents in relativist philosophy is a little dubious. Even his General Theory, however, is a 'ghost-like' picture existing only in the mind as far as Frankel is concerned.

But, whereas Einstein's theories were rooted in the real material world, later intellectual adventures left the real universe behind. Frankel has described Einstein's theories as 'the first major step in the twentieth century in the scientific-philosophical flight from reality' (Frankel 2003). By this is meant that from Einstein onwards scientific endeavour has tended to diverge from the kind of scientific strategy developed by Newton and his forebears. The attempt is no longer to establish causal mechanisms that underlie the complexity of the universe, mechanisms that are testable and revisable. Metacosmology has now been extended into the realms of fantastic speculation. One innovation, for example, is Stephen Hawking's 'baby universes'. Here, space is envisaged as 'a sort of quantum foam, randomly shaping and unshaping itself' (Kern 2003: 161). From this substance a number of tiny space–time bubbles apparently emerge, said to be connected by 'wormholes'. These latter form and experience their *own* Big Bangs and creation of their *own* complete universes. The picture is one of rapidly breeding universes, with every centimetre of our universe generating 10^{143} universes every second, with each connected to our own universe by tiny wormholes while also giving birth to further multiple universes. Cosmology, in short, is becoming increasingly fanciful.

Physicists working from empirical evidence in the first instance (the 'bottom-up' approach; Best and Kellner 2001: 112), such as Richard Feynman and Sheldon Glashow, have derided this idealistic 'top-down' science as 'theatrical physics' or 'recreational mathematics'.

> With relativity theory, quantum mechanics, chaos and complexity theory, and superstring theory, science abandons the *terra firma* of Cartesian clarity for

> a Wonderland of intricate relations, along with perplexing thought experiments, riddles, paradoxes, and counter intuitive phenomena.
>
> (Best and Kellner 2001: 110)

This 'Wonderland' becomes problematic if it simply reflects the imaginings of a cosmic elite, and is not anchored in everyday reality. Lerner (1991: 166) suggests that the status of this elite appeared legitimate because such abstract speculation mirrored the wealth created in 1980s Wall Street speculation 'by mere manipulation of numbers, without building a single factory or mill'.

The Platonic influence can still be seen in some contemporary theories. Michio Kaku, a leading theoretical physicist and proponent of string theory, is wholly reflexive about the continued importance of aesthetic beauty in contemporary metacosmology:

> Should beauty alone be a criterion for a physical theory? Should physicists try to replace a theory, like the standard model, just because it is ugly? I think so. [. . .] What appeals to me about string theory is that it is gorgeous.
>
> (Kaku 2005: 48)

Kaku believes that good theories of the universe speak in terms that are simple, symmetrical, beautiful and harmonious. Like Kepler in his later work, he uses musical harmony as an analogy for the construction of the universe. He also argues that great physicists like Einstein, in common with the great composers like Mozart or Beethoven, came up with their ideas whilst staring out of the window, rather than whilst examining empirical evidence. He agrees that Newton and Faraday made great advances over mysticism and black magic, which they undoubtedly did, but he has taken their abstract entities, the effects of which are observable (gravity and fields respectively) and run away with them. Like many Big Bang theorists, Kaku has hope that in artificial laboratory settings his theories will one day find proof (so-called atom-smashers and the like aim to recreate Big Bang conditions), but for the moment the theory is being developed without such supporting evidence.

Big Bang, Big Crunch and the end of the world

But we should now consider the social context in which such abstract representations of the universe are formed. One example is Big Crunch theory. The prediction of a collapsing world and universe in the classical Greek, Roman and mediaeval eras reflected 'the fact that a particular system of society had become exhausted and was on the point of extinction. What was imminent was not the end of the world, but the collapse of slavery and feudalism' (Woods and Grant 1995: 199). The early Christians suffering from persecution by the Romans developed the first version of 'Big Crunch' thinking. This also entailed a retreat from reality and an engagement with ideas detached from observation. A new, pessimistic, philosophy took charge. By AD 400 Augustine had developed a cosmology in which a wholly

pure universe had been created in an instant out of nothing. But it was now 'decaying from a perfect origin toward an ignominious end, populated by strange and miraculous creatures, and knowable only by the mind, not the senses' (Lerner 1991: 82). Current Big Crunch thinking holds that the universe was created from a singular point of infinite density in a Big Bang (a view normally credited first to the Belgian priest Georges Lemaître) and will eventually collapse back in on itself.

Though Big Bang theory does not necessarily imply a Big Crunch to come (for reasons we will not go into here), the connection between the two has appeared to make Big Bang theory popular at times of economic and social crisis and fear of collapse. As Kaye argues:

> It is certainly no coincidence that the period during which the Big Bang was in eclipse, from around 1957 to 1964, corresponds to the time of the most vigorous expansion of postwar recovery and a resurgence of confidence in progress. The Big Bang's golden age in the seventies, on the other hand, corresponds to the end of the postwar boom and a new decade of growing pessimism. In fact, the links between cosmological and social ideas were made explicit by both cosmologists and political writers of the period.
>
> (Kaye 1992: 163)

The Big Bang/Big Crunch scenario can therefore be seen as a metaphor for substantial change in society and politics. Just as the universe was faltering, so too were capitalist economies. A collapsing cosmos can therefore be interpreted as reflecting an apparently collapsing society. In Lerner's words, 'once again cosmology justified the course of events on Earth' (1991: 165).

Cosmology, Lerner argues, continued to reflect some of the most important social and economic events on Earth. The Higgs Field, a hypothetical force supposedly permeating the entire universe, was originally postulated in 1964 by the British physicist Peter Higgs. In the 1980s Alan Guth argued that the Higgs Field would have generated all the energy needed to drive the Big Bang. And this was done out of a vacuum, out of absolutely nothing. In this sense it was a 'free lunch' explaining the origins of the Big Bang and an expanding universe out of nothing whatsoever. And it was achieved by a single, completely theoretical, device. Lerner's point is that these wholly theoretical explanations of the origins of the universe were advanced at just the same time as Western society was experiencing intense financial speculation, rampant inflation and the amassing of capital by financial and other elites. The cosmic 'free lunch' hypothesis was advanced 'just as the American economy began its own gigantic free lunch – a period of speculation which rewarded its wealthy participants while actual production stagnated' (1991: 165).

These brief suggestions of the relationship between Big Bang/Big Crunch thinking and social conditions are by no means exhaustive of what could be said about the dialectics at work in contemporary cosmology. Black holes, multiple universes, wormholes and superstrings are beginning to generate their own speculative

sociological interpretations. Here we mention just one more idea central to recent understandings of the universe.

Society, cosmos and complexity

Another good example of the continued dialectic between understandings of the cosmos and the social and political worlds comes in the form of chaos and complexity theory. According to physicists like Prigogine (1996), postmodern forms of science offer a new conception of what reality is like. It is argued that the indeterminacy witnessed when studying the universe is not the fault of our models of reality or our ability to know reality, but is actually inherent in the nature of things (Best and Kellner 2001). Chaos theory concerns systems that appear to generate random patterns of effects, whereas actually they are the product of complex interacting parameters. In the words of Ian Stewart (1997: 17), chaos is 'lawless behaviour governed entirely by law'. Such systems are extremely sensitive to their starting conditions, a tiny change having an ultimately huge effect. Thus, the flap of a butterfly's wings in Brazil can generate a storm in Africa. There are no consistent cause and effect relationships in complex systems but they are seen as having distinct, regular qualities and behaviours. In particular, they are seen as capable of *self*-organization, predictable patterns and orders spontaneously emerging out of the chaos only to dissolve and *re*-form. Thus, what looks chaotic and unpredictable can be seen as consistent and predictable, albeit with the aid of the conceptual framework of 'chaos theory', combined with some complex mathematics.

These theories of the universe are also products of their era. They reflect, in Frankel's words, 'an altogether different state of society, marked by economic, social and political instability' (2003: 232). These concepts started to be fully developed in the 1970s, a time of considerable social, political and environmental 'chaos'. The chaos of the social world is projected back on to the physical universe. But this chaos is seen, like Adam Smith's 'invisible hand' of the market, as *self*-organizing. There is order within apparent disorder. And this brings us to the reverse movement from cosmos and society. Complexity theory is now being used to understand human social systems as well. As one leading sociologist has recently put it:

> Most significant phenomena that the so-called social sciences now deal with are in fact hybrids of physical and social relations, with no purified sets of the physical or the social. Such hybrids include health, technologies, the environment, the Internet, road traffic, extreme weather and so on. These hybrids, most of which are central in any analysis of global relations, are best examined through developing complexity analyses of the interdependent material-social, or 'inhuman' worlds.
>
> (Urry 2003: 17–18)

Acknowledging the many complex and interrelated processes at work in the universe and the difficulties faced when trying to identify them is not necessarily a bad thing. Frankel (2003), whose commentary has been used throughout this chapter, is quite positive about this direction in which science is going, believing it reflects the themes of motion, change, separation and recombination present in Engels' (1959) *Dialectics of Nature*. It needs to be recognized, however, that, whereas society is clearly part of the universe, it is composed of social and power relations which require a different type of explanation from physical processes. Dialectics certainly should not deny the qualitative differences between phenomena, nor their historicity. Furthermore, there are potential political problems with the implication that society, like the cosmos, might somehow be 'self-organizing'. As Best and Kellner (2001: 123) acknowledge when discussing self-organization theories, 'these biological metaphors are also highly risky and subject to abuse, for one can easily lose sight of the crucial differences between biological and social systems, thereby reifying the social world as immutable even as one anthropomorphizes the natural world'. They recognize that the self-organization metaphor can be read in an anti-capitalist light, but that neo-liberalism is now making good use of it.

Avoiding physical or social reductionism

The physical and natural sciences have often historically denied that their attempts to know the realities with which they are concerned are in any way dependent on the social world. The ideal of science is of an objective discipline that is value-free and guided by its own criteria of progress. The social influences on the theories and methods of science are therefore ignored. Likewise, in the social sciences in the last few decades there has often been a suggestion that our understandings of the physical and natural worlds are mere social constructions, a product of the society in which they were created, thus privileging the kind of knowledge held by the social sciences over that of other disciplines. But as Bruno Latour says, whilst explaining the importance of material reality, 'it is hard to reduce the entire cosmos to a grand narrative, the physics of subatomic particles to a text, subway systems to rhetorical devices, all social structures to discourse' (Latour 1993: 64).

We maintain that, in order to understand the dialectic between social and physical worlds, an ontology is necessary that explains how insights from both the social and physical sciences can be combined. We recognize that causal mechanisms operate on a number of different levels within the universe, and argue that the job of the social scientist is to work with the knowledge produced by physicists and the like, combining that with sociological understanding. The result of this should be a theory that reduces the universe to neither the merely physical nor the purely social. These points are related to the fundamental tenets of critical realism as outlined by Roy Bhaskar and others (Bhaskar 1986, 1997, 1998; Archer *et al.* 1998) (see Box 1.1). Unfortunately, the ongoing attempt by scientists to construct a theory of everything runs counter to this kind of ontology.

Box 1.1 The key elements of critical realism. After Bhaskar (1986, 1997, 1998)

1 Knowledge is a product of society, but knowledge is not only a product of society. It can refer to real processes and causal mechanisms in the world.
2 Science is about establishing the causes underlying phenomena of interest. Real, relatively enduring structures and causal mechanisms in the universe, and in the biological and social spheres, underlie what we can observe and experience. They do so in combination with one another and often in combination with contingent circumstances. 'Closed systems' are created artificially to develop understandings of causal mechanisms, but they are rare in society and nature.
3 The universe, and our world within it, is envisaged as hierarchically stratified. At the most general level are the physical mechanisms which are the particular concern of physicists. An example is gravity. At a 'higher' level are chemical structures and mechanisms. Higher still are biological mechanisms (for example those generating an organism's growth). Finally, there are psychological and social mechanisms. Mechanisms or causal powers operating at each level of reality are rooted in – but, very importantly, not reducible to – those operating at other levels.
4 The nature of these structures is and should be subject to constant critique and scientific development. This critique and development can also stem from practical, everyday experience. Critical realism is also 'critical' is the sense that it mounts a continuing critique of the ways in which knowledge is being formed and used.

The theory of everything?

It seems to be an exciting time to be involved with humanity's attempts to understand the universe. In contemporary science there is an ongoing quest for a 'theory of everything' (or TOE); one theory capable of explaining the totality of the cosmos. Reference has also been made to an 'ultimate explanation' (Barrow 1991) or a 'final theory' (Weinberg 1994). A state of omniscience is believed to be on the horizon. In theoretical physics, this now means a theory that unites all the forces science has identified – electro-magnetism, gravity and the weak and strong nuclear forces causing atoms to respectively decay or hold together. It is believed that such a theory will be able to explain everything from the micro level of the subatomic particle to the formation of galaxies and even universes. Some believe this theory will be expressible in such a simple mathematical formula that it can be written on the back of a T-shirt (Falk 2002). This quest has not been abandoned, even though 'the hunt for the Theory of Everything', as Battersby (2005) puts it, 'is turning into a road trip from hell'. String theory, which reduces everything to elements of particles which are just 10^{-33} metres long and capable of vibrating at

different frequencies, is one such abstract attempt at a theory of everything. A similarly imaginative answer is provided by Blaha (2002), who, following linguistic turns in the social sciences, suggests that electrons, quarks and superstrings can be understood as the 'letters' in a cosmic language, the universe itself being a word.

Some social and natural scientists have gone as far as to suggest that a grand theory of the universe could account for all levels of social reality, extending the physical laws so that they explain the development of biological evolution, human consciousness and social structures as well as how galaxies etc. are formed. A very good example of this occurred very early in the history of sociology with the evolutionary theory of Herbert Spencer. Spencer embarked on a quest to develop a 'synthetic philosophy', a project he would never complete. This philosophy would use a singular theory of progress and evolution to account for all physical, natural and social phenomena. Though it is rarely noted, Spencer (1971) began his philosophy in *First Principles* with an account of what he called 'astronomic evolution'. He claimed that the universe was undergoing constant progressive movements towards concentration and integration on both a universal and local level. These processes are carried 'without break' into his discussion of geological evolution, and thence to organic evolution and social evolution. Present-day theories that talk about an organic, evolving universe are often referred to as wholly new, but in fact bear a remarkable resemblance to Spencer's work 150 years ago. Lerner (1991) develops a similar theory, seeing evolution towards efficiency as underlying every observable natural and social process. Avoiding such an overarching theory, in the chapters that follow, we attempt to outline some of the causal mechanisms at work at a sociological level in regard to the humanization of the universe.

Re-enchanting the universe

Contemporary metacosmology is not the only way in which the cosmos has again become a mysterious subject outside the realm of human affairs. If previous theories like Newton's had, in Weberian terms, 'disenchanted' the universe, then there have been a number of moves towards 're-enchanting' it.

Stretching back to the end of the nineteenth century, the Russian cosmists attempted, as many others have from Kepler onwards, to combine scientific and religious understandings of the universe. Tsiolkovsky and others believed that space exploration would lead to the creation of utopian societies in outer space. A new form of cosmic consciousness was even a means of achieving eternal life (Wiles 1965). Penetrating the universe would allow humans to discover and disinter their ancestors and, with the help of modern science, bring them back to life. As Hagemeister (1997) says, 'now that the social revolution had been accomplished, it was time to put the abolition of death, the colonization of the universe and the resurrection of the dead on the agenda'. Russian cosmism has inspired a number of contemporary cosmologists who see humanity's destiny as being in space, including Zey (2000) and Wolfe (2004). Wolfe's attempt to understand his own drive to go into space hinges on a concept of human nature that is essentially spiritual rather than scientific in its ontology, but which, like many New Age 'religions', is

constructed from a bricolage of ideas drawn from very different traditions, including Eastern religion ('the void', yin and yang), Big Bang theory, Darwinian evolution, an evolutionary model of society similar to Spencer's, a Kantian notion of the progress of human consciousness, predestination, Lovelock's Gaia hypothesis, complexity theory and a pseudo-Jungian model of personality types.

There is a wealth of literature on the social and psychological significance of unidentified flying objects (UFOs) and the Search for Extraterrestrial Intelligence (SETI), which we do not have space to discuss in full here. Suffice to say that most commentaries explain these social phenomena as pointing to the universe still being seen by many as a source of the irrational and uncanny. One interpretation of UFOs is that they represent the exact opposite of rationality. They speak, in one author's words, 'the language of beauty, mystery, longing, fear, awe, power and interaction with a sentient other' (Mullard 2000: 145). For Michaud (2007), a concern about extraterrestrial intelligence comes from people who want a more mystical universe than science has previously revealed to us. Davidson (1985: 196) argues that the idea of extraterrestrial civilization has replaced God in the heavens. For Michaud, our hopes and fears as human beings are projected onto space in the form of alien life. A similar point forms the basis for Jung's (1959) analysis of UFOs. Other attempts have been made, rightly or wrongly, to remystify the universe in Jung's name. Both Tarnas (2006) and Pearson (2006) believe Jung held a vision of a cosmos more alive with meaning than most mechanistic modern accounts, and use this as the basis for new cosmologies in which the universe is no longer 'soulless'.

As we will shortly see, astrology too remains popular, even in a supposedly scientific age. As North (1994) explains, fairly early on in history, once the movements of the planets and stars could be predicted, the idea that these celestial bodies were actually gods wandering the skies disappeared. But prediction of Earthly events based upon these repetitive patterns continued. If looked for, historical cycles could easily be found that mapped in some way onto the stars. The same is now true of personal horoscopes. Adorno addressed the dangers of astrology as an irrationality that promoted fatalistic passivity and the personal bearing of failure, but yet was embraced as an attempt to 'satisfy the longings of people who are thoroughly convinced that others (or some unknown agency) ought to know more about themselves and what they should do than they can decide for themselves' (1974: 16–17). Astrology, for Adorno, exists to satisfy unconscious longings, but in a manner which does no service to the individual. It is, in his words, an 'ideology for dependence'.

Continuing materialism and empiricism

We have just been outlining some of the ways in which contemporary metacosmology and other understandings of the universe have served to remystify it and to again constitute it as a subject dominating human affairs. Such understandings are often formed without appeal to empirical evidence, but are taken on trust from those in authority, whether they are physicists like Stephen Hawking or astrologers like Russell Grant. However, there are movements back towards a more materialist

conception of the universe, which argues that the processes occurring in space are not dissimilar to those observable on Earth. Such theories are therefore, at least in theory, more amenable to empirical verification. One example is the plasma theory of Hannes Alfven.

Plasma theory is again based on understandings of *known* physical processes. Hannes Alfven's view is of a universe alive with networks of electrical currents and magnetic fields filled with plasma filaments. Alfven's approach returned to Galileo and Newton in that he continually emphasized the two-way links between theory and observation. This represents another swing of the cosmological pendulum. He believed that an understanding of the universe should extrapolate from known processes on Earth, that it should be based on laws discovered by theoretical analyses of observations made in the laboratory (Alfven 1966, 1977). In his words, 'we must begin from the present universe and work our way backward to progressively more remote and uncertain epochs' (cited in Woods and Grant 1995: 8). Woods and Grant point to the parallels between plasma theory and Engels' dialectical view of the universe. Furthermore laboratory simulations using powerful electrical currents have created plasmas that are very similar to the spiral galaxies observed in space (Lerner 1991: 46). Alfven is not alone. Halton Arp's (1988, 1998) universe is a steady-state universe (as, famously, was that of Fred Hoyle) which also provides an alternative to the Big Bang. He dismisses all the evidence for the Big Bang.

The public universe

We have argued throughout that a cosmology that distances the general public from the universe is a bad thing. But how do lay people now relate to the universe? Here we summarize some of our findings from the Mass Observation project.

Despite what seems a widespread continuation of some sort of belief in the legitimacy of science amongst the general public, the relationship people have with the science of the universe seems to be increasingly problematic. The general effect of the continued privileging of 'scientific' knowledge of the universe, and yet its increasing abstraction and mysticism, is confusion and estrangement of people from the universe and our accumulated knowledge about it. This is particularly marked in those without a great deal of social or cultural capital, thus further undermining them. Much of the MO data came from one of the demographics that this most applies to: older women who are often retired. The first comment they make is that, although they are aware that great studies into the nature of the universe are being undertaken, the results are not made available to them, but remain the thing of a scientific and cultural elite: 'Undoubtedly there must have been much research and much learned over the years, but it doesn't reach me. Also it seems a political activity by the few, rather than something in which the whole world can share' [C2654].

Amongst others with a peripheral awareness of scientific research into the nature of the universe, there is a widespread feeling that the pace of change in such research is so fast that it would be impossible for them to keep track of it. There is certainly some truth in this. The ease with which the scientific elite are

able to about-turn contributes to the sense that to be informed about the latest thinking about the universe is the privilege only of professional scientists: 'All scientific theories of the universe are interesting, though sometimes a bit ridiculous. Scientists often change their minds too, including Professor Hawking, so what are we ordinary mortals to believe?' [B89]. Stephen Hawking, it appears, has a lot to answer for in this respect. The continuous emergence of new speculative theories contributes to the relativism this group of MO respondents employs when judging scientific theory:

> It is hard for me to come to any conclusions about theories on the origins of the universe. I cannot say yea or nay as to whether the Big Bang theory is correct. It seems as good an idea as any other.
>
> [B1475]

The mathematics involved in Copernicus' theory were so impenetrable that the general public were never intended to understand them, and this public incomprehension of the mathematics involved in contemporary theory continues this trend, only now it is coupled with the sense that they will never be translated to a theory the public can grasp and that therefore they will never be in a position to accept or reject scientific theory: 'They don't have all the answers and how do we know whether to believe them? . . . The Big Bang theory cannot be proved, and the statistics involved are so mind-boggling that most non-scientists cannot grasp them' [B2605].

Even when the public seek to engage with contemporary scientific abstraction, the more they read the more confused they seem to get. Whereas more men report understanding what they read, older women are generally open about the fact that they do not really understand what they read:

> Well what is a universe and what is space? I may read more about it, but my understanding of it doesn't increase – it's all just too immense. When I look at the Milky Way and understand what it means and then relate it to infinity, my mind just shrivels and my brain gets tangled.
>
> [A1706]

Others had read Bill Bryson's (2004) supposedly basic *A Short History of Nearly Everything* or books about string theory and quantum physics, without claiming to have understood anything from them (though a few still reported that they enjoyed the attempt). The result in some cases amongst this demographic is complete confusion about what different theories exist and who believes in them. When discussing *scientific* theories, one writer reported that: 'Of course some persons think the Earth is flat and it is all a NASA con and others think the Earth is a big hollow ball with the Sun inside it, all revolving' [A1292]. This woman seemed to surrender to what she saw as the mysticism of contemporary physicists, citing Stephen Hawking's belief in 'spacemen' and atheist philosopher Anthony

Flew's conversion to belief in God, in her words 'because the universe is getting so complex'.

The retreat into mysticism is therefore one response to the crisis in empirical astrophysics, but a more common one seems to be the distancing of the public from scientific knowledge and thus a distance emerges from the universe itself. This can have a crippling effect on the public's esteem of their own knowledge base. One woman believed it was a failing in *her* that she wasn't more engaged with scientific theories of the universe. She said, humbly, 'I know all these scientists know this [problems with gravity] and what I know wouldn't cover a pin head' [D156]. The universe is considered a realm only scientists can relate to, whereas the lay woman is comfortable only with the circumstances of her daily life. As one woman put it, 'I don't have a scientific bent at all, so I would rather be in a landscape I can relate to' [C2654]. Another woman explained that 'The only effect that these mind-blowing figures have on me is to make us feel no more important than a grain of sand' [B2605].

Occasionally, science itself was questioned. As scientific theory of the universe has become more and more abstract and removed from everyday experience, its status as a privileged form of knowing does seem to have been eroded for some sectors of the population. The postmodern position on the relative nature of scientific discourse could hardly be more clearly stated than it is by these MO writers:

> I don't think that science gives us all of the answers to understanding the universe, mostly because even formulating the questions to be asked are shaped by cultural world views. Different cultures provide different schemas for what constitutes science and what constitutes a reasonable line of scientific enquiry.
>
> [F3137]

> Science is, after all, not some all-powerful constant edifice to which we can turn for reassurance and truth. It's simply an *approach* to the 'truth' and is constantly changing as we make new discoveries.
>
> [H1745]

But of course, as we argued above, it is not just scientific metacosmology that constructs the universe as a mysterious subject. Astrology has very much the same effect. Illustrating precisely Adorno's concerns over the effects of astrology on the self, one woman provided the following account of her experience:

> It has taught me a lot about myself. I am a shy person, very meek and mild, easy prey to those who would take advantage of me. . . . Now for years people had told me I was too soft, too soppy, I must learn to stand up for myself, be hard. I guessed they were right, after all they were like that and they got on in life better than I. But try as I may I couldn't bring myself to behave like them. Then I went to astrology classes and I calculated my own birth chart,

> and there it was . . . me . . . in a nut shell. I am meant to be like this, I can't be something else.
>
> [D156]

In contrast to some of the grandiose and narcissistic overestimations of the self we will encounter later, particularly in pro-space activists, these more humble sentiments may not seem like such a bad thing, but if they result in an emaciation of the self and the conceding of power to a cosmic elite better able to grasp the immensity of the universe, then the consequences are potentially destructive.

Summary

The critical realist philosophy that underpins this study leads us to argue that, although the causal mechanisms at work in the universe can be uncovered by science, a close eye should be kept on how theories are used in society. Abstract cosmologies that privilege a cosmic elite and estrange a population from the universe are undesirable, especially when they offer a knowledge that is difficult to test, particularly by lay people. As many scientists would concede, religious questions may still remain about the universe once its underlying causal mechanisms are established, but these mechanisms themselves must be uncovered by an empirical cosmology. Yet, in unequal societies, ability to take advantage even of this form of knowledge has accrued to those in positions of economic and social power. A scientific and materialist understanding of the universe is therefore a promising starting point for understanding relations between society and the cosmos, but it must be combined with an understanding of how human social organization works and human identity is made.

Furthermore, this chapter has shown that our understanding of the universe has been conditioned by society's understanding of itself. At the same time, society's understanding of itself has been conditioned by its understanding of the universe. The two are locked into a permanent, dialectical relation. The dialectic continues in the present day, with contemporary theories of the universe both reflecting and influencing understandings of society. And, although metaphors may be useful in communicating a concept or a model, metaphors relevant to one level of reality cannot be translated straightforwardly onto another. If such conflations are to be avoided, then constant critical attention must be paid to the ways in which we understand both the cosmic and social order. Such checks also ensure that the forms of self created in our engagement with the universe are as full as they possibly can be.

2 The outer spatial fix

About this chapter

Society's relations with the cosmos are currently undergoing massive changes. Nearby zones of the universe previously considered to be occupied only by gods and inanimate matter are being used as a means of exercising social, military and cultural power. Over 25,000 payloads have now been launched into space. Man-made satellites are now a central feature of our global society. Space law is being forged, allowing the future ownership and economic exploitation of nearby parts of outer space. A number of different groups of people are imagining and planning towards the making of a spacefaring civilization in which tourist trips to space are commonplace; scientific and medical experiments are routinely conducted in orbit along with zero-gravity manufacturing projects; the Moon, Mars and asteroids are mined for their resources; and the human exploration and settlement of space continues apace. Whereas the last chapter examined the relationship with the universe that humanity imagines for itself, the remaining chapters are primarily devoted to explaining and understanding the material processes involved in our new form of cosmic society. Crucially, however, they do not neglect the dialectic relationships between material processes, ideas and the self. In attempting to understand all these processes, we do not argue for a radically new form of sociological theory, but make the case that existing ideas about the dynamics of the contemporary global capitalist society need to be extended to cover capital's humanization of the universe. In doing so, we draw particularly on the work of David Harvey, who has explained historical and contemporary imperial projects, and especially those involving a reconfiguration of time and space, as attempts to resolve or fix crises that are inherent to the capitalist economy. We believe that the concept of an 'outer spatial fix' for capitalism should be added to his notion of a 'spatial fix'. We also introduce the work of Antonio Gramsci to explain the ways in which the humanization of outer space serves a hegemonic role in reinforcing 'common sense' social understanding.

The historical materialist universe

As we saw in the first part of this book, materialist views of the universe have been developing since even before the Enlightenment. Our own starting point is not just materialism, however. It is *historical materialism*. As originally proposed by Marx and Engels, historical materialism is a promising starting point for understanding not only the universe but society's relations with it. This is not to say that historical materialism has all the answers and that it cannot be usefully combined with other concepts and theories. Indeed, much of this second half of our book about society and the universe will attempt to combine historical materialism with other kinds of more recently developed theory. But historical materialism provides a solid foundation for thinking about the cosmos and how and why it is being humanized.

What is historical materialism? There are many accounts of this position and we offer just a snapshot here (for further details see, for example, Lange 1925; Moser and Trout 1995). For historical materialists, social change is seen as driven not by ideas but by the material, productive forces that characterize a society. The most important of these forces are labour, capital and technology. People are inevitably drawn into productive relations, especially the class relations organized around the making of commodities. The historically specific structuring of the relations and forces of production combined is referred to as a 'mode of production': for example, feudalism, capitalism and so on. It is from these material relationships that the ideology of a society emerges. And it is in dialectic relationship to these material and ideological conditions that new forms of subjectivity are forged. But how do these relations and forces link to our specific concern with the contemporary humanization of outer space? To answer this question we must turn to the relationships, dynamics and crises stemming from the capitalist mode of production.

Circuits of capital

In this section of the book, we draw on recent historical materialist accounts of capitalism and its crises, and how these crises are resolved or, more accurately, forestalled. Such perspectives help us to start understanding the links between the humanization of the universe and the reproduction of capitalism.

Drawing on the work of Lenin (1963), Luxemburg (1968) and Lefebvre (1976), David Harvey (1982, 2003, 2006) provides the kind of account needed to start making these links. We have here broken down Harvey's account of the circuits of capital so that we can spell out what is happening within each circuit. A circuit of capital starts with money being invested in labour power (the capacity to work), technology and resources. These are combined to produce commodities, which are then sold to consumers. This results in profits and more money available to be invested in labour power, technology and resources. The circuit is complete.

At the centre of Harvey's account is the primary circuit of capital pictured in Figure 2.1. This is at the heart of the capitalist economy. The left-hand box

Figure 2.1 The primary circuit of capital. Adapted from Harvey (2003: 110). Oxford University Press.

indicates workers making products, which are sold for consumption (indicated by the right-hand box). Money is being invested in machinery, raw materials and labour power, producing a commodity that results in surplus capital, which accrues to investors and is available to be recycled into another round of investment. It is within the labour process that surplus value is made. Profits are made in this circuit by capitalists paying workers less than the value that they add to the product through their labour. It is here too that the principal features of capitalist crisis start. The right-hand box indicates that the workers' capacity to work has to be reproduced. Workers are paid the very minimum to keep them working, but they must be maintained in other ways, relying in large part on domestic labour conducted in the home. However, as capitalism develops, there is an increasing need for workers to consume the kinds of products they are making. Therefore, whereas capitalists will attempt to keep wages down in order to maximize profit (even introducing labour-saving technology to reduce the workforce altogether), there is a real danger that too few people can afford to buy the things they are producing. The two elements in the two boxes mutually depend on each other. They form, in critical realist terms, the underlying essence of capitalism. This was the circuit of capitalism with which Marx was most concerned, and which formed the basis for his critical analysis in *Capital*.

Figure 2.2 links the primary circuit to what Harvey calls the secondary circuit of capital, in which the financial market regulates the working of the primary circuit. On the left-hand side, surplus capital in the form of money is circulated, via the capital market and other financial intermediaries, to fixed capital, this including the built environment and machinery needed (as the 'productivity of labour' arrow shows) to raise the productivity of labour in the primary circuit.

Figure 2.2 The primary and secondary circuits of capital. Adapted from Harvey (2003: 110). Oxford University Press.

The process is facilitated in many cases by credit systems and 'fictitious capital'. The latter includes derivatives that hedge some of the risks involved in owning assets subject to price fluctuations. On the right-hand side, consumers' finances are being circulated via the capital market, and gaining interest, into a fund for the purchase of consumer durables and the built environment in the form of houses and so on, provided they have sufficient funds in the first instance.

These investments in turn assist the reproduction of labour power. Note that the capital market is a set of key mediating institutions in this process, recycling surplus capital from production into new forms of consumption while also investing individuals' savings into buildings and technologies need for capitalist production. Note too that the circulation of capital into both production and consumption sets up further labour processes as shown in Figure 2.1. Making producer durables or houses, in other words, entails making further primary circuits for the creation of further profits and money for investment.

Figure 2.3 shows what Harvey calls the tertiary circuit, in which the state functions to regulate the primary circuit. On the left-hand side, surpluses are again being drawn by the state out of the surplus made in the sphere of production and reinvested in technology, science and administration. These investments in turn produce innovations which assist the production of value and surplus value in the primary circuit. On the right-hand side, taxes are being withdrawn from consumers and, via states, are being recycled into a range of social, or public, expenditures such as welfare and the production of armaments. These social expenditures in turn contribute towards the primary circuit, particularly towards the reproduction of labour power. Expenditures such as those on the police and welfare are intended to reproduce social relations, and ensure the workforce functions as intended.

Crises

Figure 2.4 shows the three circuits combined. The diagram perhaps looks rather mechanistic but it is important to note that it is full of potential and actual crises. These take varying forms. Surpluses of capital require profitable investment. But such investment may not be found. Productive capacity may lie idle for lack of consumer demand. Or there may be a glut of commodities that cannot be sold. This is what Marx referred to as 'overproduction'. Another symptom of crisis is

Figure 2.3 The primary and tertiary circuits of capital. Adapted from Harvey (2003: 110). Oxford University Press.

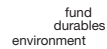

Figure 2.4 Paths of capital circulation. Source: Harvey (2003: 110). Oxford University Press.

that large numbers of people are left unemployed as a result of labour cutbacks. It was just these crises which, Marx argued, would lead to the demise of capitalism. A further crisis occurs when the supply of affordable raw materials for the primary circuit runs out.

As regards the advanced capitalist societies, the most fundamental recent crisis was during the late 1960s and early 1970s (Armstrong *et al.* 1991; Webber and Rigby 1996). The immediate postwar period saw a long boom in which healthy profits were made, one in which there was full employment and substantial gains were also made by the labour movement in terms of increased welfare. Keynesian intervention, in which governments intervened with public works of different kinds in periods of downturn, appeared to ensure this continuing capital accumulation. As we discuss later, investment in outer space exploration and the military uses of outer space were important cases in point (Baran and Sweezy 1966). The period between the Second Word War and the late 1960s was one of relative political and cultural consensus, built on the basis of growing affluence and, especially in Western Europe, an extending welfare state.

Capital, however, continued to overaccumulate. Old machines were no longer producing high levels of productivity and profits. From the late 1960s onwards labour was in short supply and trade unions and others, including students and the women's movement, became increasingly militant. Confidence was undermined and investment collapsed. But the fact that levels of profitability and economic performance have not recovered since then, and continuing crises in profitability, suggest that the strength of organized labour in the advanced capitalist countries was not the chief problem in the first place. The problem stemmed from the anarchistic competition between capitalist companies (Brennan 2006). New companies, located especially in the Far East, were able to acquire more efficient technology and undercut the old companies located primarily in Europe and the

USA. The latter found themselves with large masses of fixed capital. The result for them was overcapacity and relatively low levels of profit. A bout of neo-liberalism led to privatization, deregulation and a switch to new labour forces away from the old centres. The postwar boom finally came to a shuddering halt in 1974 when the OPEC countries quadrupled oil prices.

Fixes

Furthermore, under conditions of economic and social crisis, investments are made in new projects which manage the crisis tendencies inherent to capitalism (Harvey 2001; Jessop 2006). These crises include overproduction of commodities, in which case the fix is opening up new markets. They include the overaccumulation of capital, in which case the fix is seeking new investment opportunities. They also include access to raw materials, in which case the fix is searching out new and cheaper sources. But, while capital builds and exploits new spaces and infrastructures in an attempt to deal with these crises, any 'solution' is again provisional.

Speculative development in commercial property was one of many desperate attempts to realize profits from the late 1970s onwards. But the attempts to 'fix' capital in more profitable ways have still not brought profit levels back to the levels enjoyed during the 'long boom'. Faith in the power of Keynesian intervention to avoid such crises was now thoroughly undermined. Using state power in this way clearly had major limits.

In the present day, as regards political economy, a number of measures to ameliorate levels of profit have been taken. The first was to restructure the primary circuit itself (Sheppard and Barnes 1990; Cox 1997). Borrowing from the practices of Japanese car makers such as Toyota, capital attempted to make more flexible types of workplace. Industrial enterprises had long been composed of large enterprises backed up by subcontractors. But in the new 'flexible' workforce this process was further enhanced on a global scale. Interdependent networks of contracting and subcontracting enterprises were made, all of which were made more responsive to one another and to consumer demand. New forms of electronic communications were used, coordinating enterprises and linking them to consumers around the globe.

Spatial fixes

Importantly for Harvey and other Marxist geographers, these fixes commonly take on a 'spatial' nature. They involve the geographic expansion of the circuits of capital as new territories, raw materials, workforces and markets are drawn into the capitalist system. For purposes of exposition, Harvey (2007) initially assumes a single and closed region in which production and realization of surplus values take place. But, he argues, 'the frontiers of the region can be rolled back or relief gained by exports of money capital, commodities or productive capacities of fresh labour powers from other regions' (ibid.: 427). The tendency towards overaccumulation within the original region remains unchecked, but 'devaluation is avoided by

successive and ever grander 'outer transformations'. This process can presumably continue until all external possibilities are exhausted or because other regions resist being treated as mere convenient appendages' (ibid.: 427).

But even Earthly spatial fixes may now be proving relatively 'exhausted', unprofitable or containing people resisting their appendage status. We therefore argue that Earthly fixes may be expanded to incorporate even more 'outer transformations'. This time the fixes are in the cosmos. We therefore term them 'outer spatial fixes'. Clearly there is no question of importing labour power from outer space to help out a failing region on Earth but, as we will discuss in Chapter 6, the raw materials of outer space are increasingly envisaged as a means of developing Earthly production processes. And, as discussed in Chapters 3 and 4, outer space is being used to manage flows of capital and information and to regulate social relations (including the social relations of production) on Earth.

Once made, however, a spatial 'fix' is likely to be destroyed or devalued in order to make way for a new spatial fix, one offering new possibilities for capital accumulation. Spatial fixes are only ever provisional and therefore offer only short-term resolutions to the contradictions inherent in capitalism. Whether these fixes are (at least temporarily) effective depends on whether they are seen as profitable or, in the case of state and social expenditures, whether they fulfil their purpose of, for example, reproducing labour power or successfully managing social relations. We cannot overexaggerate the fact that success for Earthly or cosmic spatial fixes is by no means guaranteed.

The two further circuits of capital are involved in the making of these new outer spatial fixes.

The secondary circuit of capital and the outer spatial fix

Capital is invested in 'secondary' or 'tertiary' circuits, or a combination of both. The secondary circuit in Harvey's account consists of investment in physical and fixed capital that in the long term will, it is hoped, generate profits. Such investment in the secondary circuit also includes the creation of new forms of consumption. Satellites are one example of investment in the secondary circuit. After a relatively large initial investment (Japan Satellite Systems Inc. (JSAT) offer satellites for around 20–30 billion yen), though their profitability has fluctuated, the long-term outcome has been profits for the monopolistic media and telecommunication companies. Further investments have been made in commodified tourism, the aim of which is to appropriate and sell a range of cultural forms to consumers willing to part with their money in new and apparently exotic ways. Richard Branson has drawn capital from his other Virgin enterprises to set up the Virgin Galactic space tourism company. Some entrepreneurs have been taking idle capital derived from their primary circuit investments and investing it in secondary circuit space enterprise for some time. Having made his millions as an entrepreneur in the early computer industry, Jim Benson went on to found SpaceDev in 1997: a company investing in the design of cutting-edge space technologies. Figure 2.5 shows SpaceDev's roadmap for the future, which stretches from satellite services

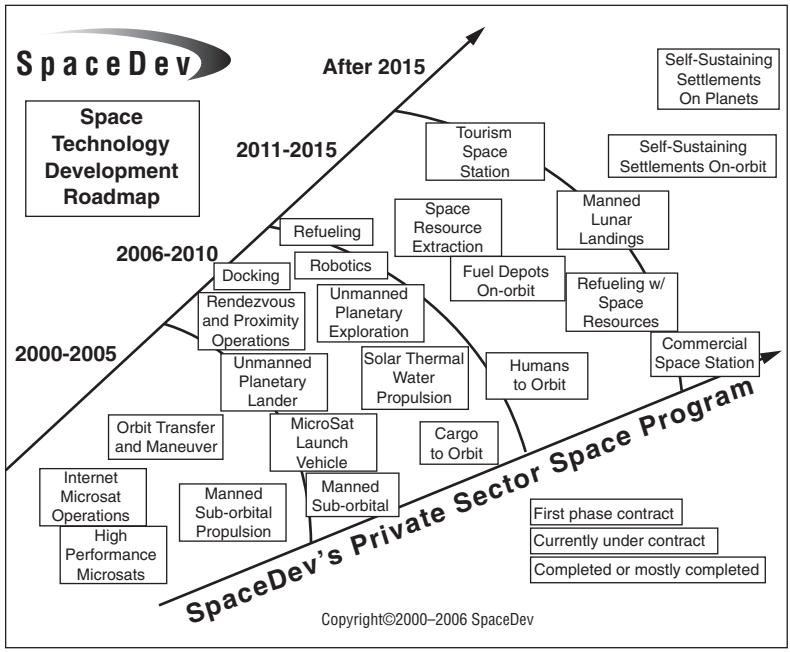

Figure 2.5 SpaceDev's space technology development roadmap. Source: SpaceDev Inc.

already being produced and sold, to research into the technology required for asteroid mining and eventually space settlement.

Investments have also been made in a number of new 'spaceports' in the southern United States, such as Burt Rutan's Mojave Spaceport, many taking the place of small airfields, and in the design and testing of vehicles for space tourism. For Lefebvre (1976), the making of new, or rehabilitated, forms of physical space on Earth as sites for consumption and tourism has now been made the main way in which the primary circuit of capital escapes from crisis and declining profits.

As Figure 2.2 showed, investments in this secondary circuit will be made by increasingly important mediating institutions such as capital markets and governments. They are able to provide, for example, 'fictitious capital' (paper assets or promissory notes), which is able to make investment in one type of goods sufficiently fluid to be transferred into another type of goods.

Manipulation of the secondary circuit can also involve apparent incentives to those otherwise lacking in the power to develop their own primary circuits. For one example, Declan O'Donnell and his United Societies in Space organization of space lawyers have attempted to establish an International Space Development Authority Corporation (ISDAC), not dissimilar in function to the World Bank, which would act as a space bank for investment in a space colonization programme. Under their proposal, loans would be made to developing countries to enable them to invest in space.

Sometimes advertising can form an intermediary between circuits of capital.

One company may invest in a primary circuit in return for stimulation of further consumption. A good example is the way in which companies like Pizza Hut have paid to put their logos on space rockets (using intermediaries like Space Marketing Inc.). Plans in 2001 to use lasers to project the company's logo onto the Moon were revealed as a radio hoax, though some research has gone into similar ideas. President Clinton in fact signed legislation banning 'obtrusive' advertising in space, aiming to keep space at least to some extent 'uncontaminated'.

The tertiary circuit of capital and the outer spatial fix

Investments are also made in what Harvey calls the 'tertiary' circuit. These are again long term, the intention being to generate future productivity of capital. They include switches into scientific research and development. The phrase 'Paper NASA' is often used to refer to NASA's more speculative research and development department (Mean and Wilsdon 2004). Government finance is used here as a form of Keynesian regulation to keep scientists in jobs, with a vague hope that some of their ideas may 'pay off'. Many scientific missions to the cosmos are bringing no obvious, or immediate, financial return. State interventions also include telescopes aimed at discovering how the universe evolved in its earliest years, monitoring asteroids that might potentially hit Earth, the search for extra-terrestrial intelligence and the possibilities for making other planets habitable. The telescopes, antennae, computers and other equipment used in these projects will have been made in a primary circuit and will have produced profits for their manufacturers, but their use offers no immediate way in which profits will be produced. But, with governments again taking a central mediating roles (through, for example, the taxation system), profitable opportunities may be opened up in the future via this tertiary sector.

Much government manipulation of the circuits of capital occurs because of the perceived value of 'spin-offs'. Spin-offs are the unintended commercial applications that spring from technology and science developed for another goal. The list of commercial technologies that were originally developed for the space programme is long: Teflon, Velcro, Tang, temperopaedic mattresses, CAT scans, ISDN management technology, digital watches, mobile phones. They are valued because it means the initial investment in space technology drives the development of further commodities and increasingly efficient technology. These technologies generate more false needs amongst the public, and promote a further round of investment from product developers. This is one way in which the contradictions arising in the primary circuit can be forestalled.

Governments will also provide large outlays of capital in the hope of attracting investors to develop new primary circuits in their region. Richard Branson's Virgin Galactic space tourism company is the primary customer for 'Spaceport America', a planned $225 million spaceport in New Mexico. They also include other investments in social infrastructure such as education, health and military spending.

Meanwhile, having been initiated by governments as Keynesian devices for stimulating the economy, space travel and privately financed missions into

outer space are already under active development. They are now being deemed profitable in the relatively near future. Correspondingly, and under pressure from libertarian pro-space organizations, the role of government in America's space programme was being re-evaluated at the beginning of the twenty-first century. Government's role was no longer the financer of an agency to explore and develop space, but to provide incentives for private sector investment. (President Bush's unexpected announcement in 2004 of a new government programme to send humans to the Moon and Mars has somewhat altered this direction.) Bills were put before Congress to offer a series of tax breaks for speculative space enterprises and for a series of financial 'prizes' for private companies able to achieve particular technological goals in space. Some commentators such as Hickman (1999) still believe government will have to have a crucial role if enterprise is to expand beyond low-earth orbit (LEO).

Surplus capital, combined with taxes on consumers, is channelled into other 'tertiary circuit' elements. These include social expenditures, such as welfare and military expenditure, in which immediate prospects of profitability for capitalism may again not be clear, though they contribute to ensuring the reproduction of the social system. Most importantly for our subject, they are directed by military and industrial elites into expenditures that, as we later discuss, make increasing use of outer space. Similarly, and in parallel with other forms of military spending, they are being channelled into surveillance: monitoring subaltern populations deemed socially or militarily problematic. Investments of this kind can be also be made in somewhat less sinister directions. These include the channelling of capital into satellites designed to monitor weather conditions or to assist refugees in their attempt to make a better life.

Military expenditures, originally siphoned off from the primary circuit, have now been made highly profitable, especially for the industries of 'developed' countries. Indeed, the American economy now deeply depends on military spending, leading some to use the term 'warfare state' (Edgerton 2005). The close working relations between the economy and the military are sometimes known as 'the military industrial complex'. The military clearly requires the materials made by private defence contractors whereas the contractors are highly dependent on military spending as a steady revenue stream. Indeed, the Global Network Against Weapons and Nuclear Power in Space has displayed posters campaigning to 'end aerospace corporation welfare': contracts given to major weapons and space manufacturers to keep them in business. Governments are again making investments siphoned off from the primary circuit in the form of taxes and ploughed into further primary circuits which, it is hoped, will become profitable.

These existing and proposed outer spatial fixes all rely intrinsically on two processes: the increasing commodification and privatization of the commons, and the increasing compression of time and space by new technology. We now discuss each of these processes in turn.

The outer spatial fix, commodification and space law

Neil Smith, a close collaborator of Harvey, has argued that:

> The reproduction of material life is wholly dependent on the production and reproduction of surplus value. To this end, capital stalks the Earth in search of material resources; nature becomes a universal means of production in the sense that it not only provides the subjects, objects and instruments of production, but is also in its totality an appendage to the production process . . . . No part of the Earth's surface, the atmosphere, the oceans, the geological substratum or the biological superstratum are immune from transformation by capital.
>
> (Smith 1984: 49, 56)

Now, just over a decade later, we can envisage capital 'stalking' the nearby cosmos in search of the resources needed for production. The object is to make the universe into 'an appendage to the production process'. Ownership and commodification are the ways in which this appendage are made. The circuits of capital pull progressively more materials into their midst.

Commodifying outer space

But this is part of a bigger pattern. One of capitalism's main attempts at crisis resolution has been via commodification and privatization on Earth. This is what Harvey (2003) calls 'accumulation by dispossession'. It extends and proliferates a process started, he argues, with 'primitive accumulation', when populations began to be removed from their means of subsistence, particularly the land. The process now continues with the privatization and commodification of assets such as welfare provisions and services previously held and operated by states. But gaining access to outer space assets is a rather different kind of accumulation, one not dispossessing anyone already using these resources.

The Arctic and Antarctic are the closest Earthly equivalents to the nearest outer spatial assets, those on the Moon. Attempts are already under way to legally subdivide, own and control these regions as a first step towards their privatization and commodification as part of a process of humanization. Oil companies are drilling in the Alaska National Wildlife Refuge as their response to the energy crisis and political upheavals in the Middle East. The Antarctic is proving attractive to pharmaceutical and biotechnology industries searching for new compounds and genetic resources. These new types of 'spatial fix' are, however, encountering strong opposition from environmentalists and others (Antarctic and Southern Ocean Coalition 2004; Tokar 1999). The Antarctic Treaty and the Law of the Sea Treaty were both used as models for the legal treaties governing outer space appropriation. But both such kinds of potential 'fix' remain fair game for future capital investment.

Commodification and space law

The contemporary development of space law (dividing outer space into items where property rights apply and over which contracts and individual juridical rights can be drawn up) is therefore an obvious harbinger of the forthcoming commodification of the nearby universe and the extension of the secondary and tertiary circuits into outer space. Since the 1980s, a number of books have examined the commercialization of outer space from a business or legal perspective. Law and property rights are, in critical realist terms, mechanisms operating in virtue of the necessary underlying relationships of capitalism. They help guarantee such relations, allowing them to be developed throughout the globe and outer space. They operate on the illusion that property rights are available to all citizens. In theory they are, but in reality they will be available only to the wealthy and to large corporations. Seen in this way, outer space law is another instance of how a ruling class rules. They do so by apparently working to the same 'universal' rules as subordinated classes, whilst choosing to overlook their social position.

Hulstroj (2002) makes the important observation that the UN declaration that space should be 'free for exploration and use by all states' assumed that space was an infinite resource and that there would be enough space for everybody. However, as he rightly says, space is not uniform in its usefulness. The geostationary orbit for satellites (an orbit that keeps satellites directly above the Earth's equator) is already overcrowded, leaving no room for satellites launched by developing countries who might in future want to do so. Similarly, if they ever are commodified, nearby resources on the Moon, near-Earth asteroids, etc. will be controlled by those already in possession of the capacity to do so. The principle of 'first come, first served' has been endorsed by the International Telecommunications Union, and Hulstroj notes that speed settles these disputes rather than value judgements (2002: 110).

According to the United Nations Outer Space Treaty (United Nations 1967), 'Outer space, including the Moon and other celestial bodies, is not subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means' (Article II). The sentiment of this article is clearly to prevent the commodification of the nearby cosmos. Indeed, in 2004, the US Federal Appeals Court rejected Gregory Nemitz's claim to an asteroid, ruling it illegal under the terms of the Outer Space Treaty. Nemitz cited parallels between the Outer Space Treaty and the Communist Manifesto as a critique of the legislation (SPX 2004). However, the wording of the treaty was sufficiently unclear that exactly what it did and did not allow has been debated, largely by lawyers and politicians within the United States. Having signed the Outer Space Treaty themselves, the US subsequently argued that, although celestial bodies themselves could not be claimed as property, resources found there could be, and this was upheld by the United Nations Committee on the Peaceful Uses of Outer Space (UNCOPUOS; see Gorove (1991) for a more detailed discussion).

A subsequent treaty, the Moon Agreement (United Nations 1979), was drafted, which held that outer space resources could be appropriated, but that

the benefits of so doing must be equitably shared amongst all countries with special consideration for the needs and interests of developing countries. The USSR, the UK and the United States did not sign the Moon Agreement, which is now considered dead (Hulstroj 2002). Appeal against the Outer Space Treaty was also made on the grounds that it forbade only appropriation by nation states, and not appropriation by corporations or individuals. This ongoing argument has instigated a jurisprudential dispute over the possibilities of a system of ownership not sanctioned in some form or other by a nation state (see Pop 2000). There have also been debates about how ownership can be claimed without the claimant being physically present (Pop 2001). The use of outer space by developed and spacefaring countries under the permission of UNCOPUOS has, however, been met with resistance. In particular, there have been two noteworthy attempts by developing countries to claim more of the benefits of the use of outer space, and specifically use of geostationary orbit (Gorove 1991; Jasentuliyana 1994; Benko and Schrogl 1997). Neither was successful. Instead, attempts have been made to encourage developing nations to take advantage of the products on offer (Benko and Schrogl 1997; Zervos 1999). It is clear that property rights in space remain contentious ground in the making of the outer spatial fix.

Time–space compression and the outer spatial fix

Investments are also made in new technologies permitting what Marx called 'the annihilation of space through time'. Spatial barriers to investment are, where possible, overcome by new technologies allowing the geographic spread of capitalism. Making new spatial fixes has been a core element of capitalism for at least two hundred years. Currently new 'fixes' are being made in Japan, Eastern Europe, the old Soviet Union and parts of Latin America such as Brazil, Mexico and Chile. China appears to be the latest target for the investment of overaccumulated capital. The process of annihilating geographic space has culminated in the making of a satellite-based, so-called network society allowing 'globalization': information and capital to be spread to all corners of the globe. Such investment has been central in enabling companies to remain in constant and instant touch with subsidiaries and to cater for rapidly changing consumer tastes in 'postfordist' enterprises. These technologies also allow capital to be transferred instantaneously from one form to another, creating a more 'liquid' economy in which capital is no longer fixed in any geographical location or physical form but can flow freely around the globe. As will be discussed in Chapter 4, satellite technology has been central to time–space compression. The development of rocketry and advanced forms of propulsion have already brought the reaches of outer space closer to us than could once even have been imagined. Technologies of speed have also been highlighted by Virilio in his essays on dromology (1986, 1997, 1998), in which he has argued for their centrality in the spread of empire.

Figure 2.6 is a reworking of a diagram Harvey uses to demonstrate time–space compression. The diagram is scaled such that the distances on the diagram represent the time taken to get between any two points, rather than the actual

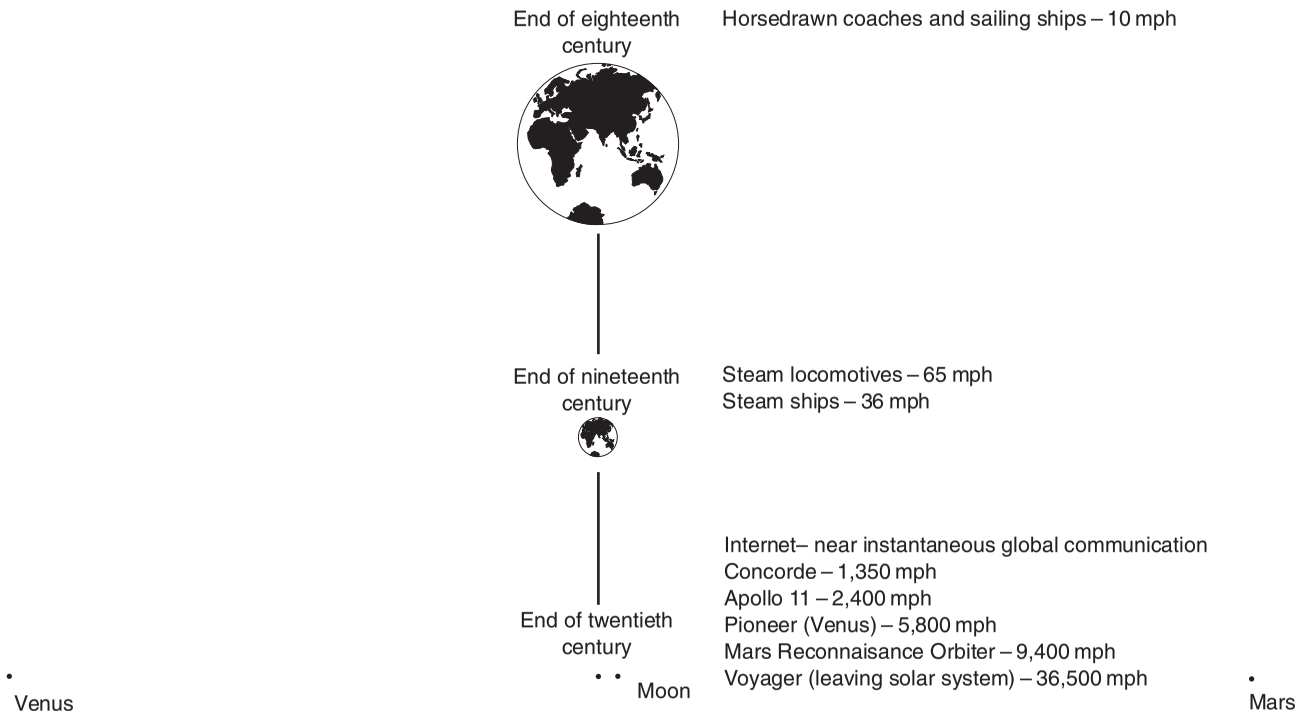

Figure 2.6 Time–(outer) space compression, from the eighteenth to the twenty-first century.

distances between them. It can be seen that by the end of the twentieth century the Moon was effectively much closer to us than the other side of the world was at the end of the eighteenth century. During the nineteenth century the Earth decreased enormously in size thanks to inventions like the steam locomotive and steam-powered ship, which were central to Western industrial revolutions, and to the spread of trade and Empire. By the end of the century, the Indian subcontinent was as close to England as its European neighbours had been the century before. Yet the two still remained a significant distance apart when compared with the way in which today's global economy involves routine instantaneous financial exchanges between the two countries and numerous British firms outsource telephone call centres to India. Most remarkable perhaps is the way in which outer space has shrunk into the picture. Even Earth orbit lay in an unthinkable fantasy world at the beginning of the twentieth century, yet now we find it shrink-wrapped to the surface of the Earth (being only minutes away), whilst the Moon and even the planets of the inner solar system make an appearance (the Voyager probe, which is the furthest man-made object from Earth, having left our solar system, would be several metres away from the Earth at this scale). It is because of this compression of space that it is now possible to envisage spatial fixes being made in the closer parts of the cosmos.

The contradictions of imperialism

As capitalism extends its dominion, it becomes subject to a range of crises. One of Harvey's intellectual predecessors argued that there is an important limit to all-conquering imperialism. It is one that may have a special relevance today and links up well with our second theme of hegemony. Lenin (1963) argued that there is a 'contradictory tension' to the continuing expansion of capitalism through endless expansion across the globe. It is one in which imperialism is itself generating obstacles to the dynamism of capitalism.

Lenin was pointing to the newest phase of capitalism, in which private sector monopolies displace competitive capitalism and operate relatively unhindered across the globe. Massive private corporations and the banks are therefore largely dictating the course of events. But this is a straitjacket for capital. The further expansion of capital is held back by such monopolies since capital depends and thrives on the tendency towards equal economic conditions and equal rates of profit across the globe. These would be the optimal conditions for further expansion but monopoly capitalism attempts to override these conditions.

The barriers presented by monopoly capital are further strengthened by nation states. These typically make trade tariffs to protect their regions and to boost their own regional or transnational 'spatial fixes'. Managing local and transnational capital, they attempt to make hegemonic projects in their national, or cross-national, interests. Examples in the pre-Second World War period included Britain isolating its Commonwealth trade, Japan expanding into Manchuria and parts of Asia, Germany extending into Eastern Europe and Italy into parts of Africa (Harvey 1982). Making such spatial fixes is not always an easy task. There

is tension between capital based in a region that is employing local labour and multinational capital attempting to invest elsewhere. Making barriers against 'free trade' in these ways can easily be made the forerunner to outright warfare between those competing blocs of power. This might seem like absolute disaster, and of course it is for those who suffer as a result of war. But for capital it is a barrier overcome. Assets are devalued by warfare and it represents new opportunities to invest and restart the process of capital accumulation.

The more powerful states are not just attempting to establish their own 'spatial fix' in their own or in other regions where they have dominion. As Lenin was well aware, they are exporting their social and political problems to other states. The position was stated clearly by Cecil Rhodes in the late nineteeth century:

> My cherished idea is a solution for the social problem, i.e., in order to save the 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 mines. The Empire, as I have always said, is a bread and butter question. If you want to avoid civil war, you must become imperialists.
>
> (cited in Hardt and Negri 2000: 232)

The perspective of Lenin and Rhodes continues to be useful today. The Chinese government, for example, is actively creating its own restrictions on world free trade and is negotiating with African countries to provide the resources it needs for its own spatial fix under the rule of its unelected leaders. And Lenin's view of states creating their own 'spatial fixes' is especially important for our sociology of outer space. As we will describe in the next chapter, new 'outer spatial fixes' are being created by some of the developing nations such as China and India. Japan is also developing its own outer space programme.

Outer spatial fixes: for war or peace?

These fixes could easily become the basis for a new global war, one in which a militarized outer space would be an important part. This is because there is a potential and actual contradiction between regional 'fixes' such as those attempted by China, India and Japan and the demands for capital to find new sources of accumulation. A regional fix is often made 'autarchic': a zone that, on account of active state intervention, allows limited trade with the outside world. As Harvey (2006) suggests, this may not be a problem so long as there are sufficient resources of capital and labour in the region in question for local capital to continue accumulation. But, if this is not the case, capital will inevitably move elsewhere. In the process, however, it confronts other capitalist enterprises over access to labour and resources. Nationally based private enterprises therefore finish up competing for shrinking opportunities for accumulation and this indeed is a recipe for potential armed conflict.

As the next chapter discusses in more detail, China, Japan and India are

amongst the countries now attempting to secure military presences in outer space. If Harvey's theory is correct, these are means of protecting regional interests by ensuring that capital in these regions will have ready access to resources and labour beyond their own limits. Regional investments in outer space could thereby form an important form of future wars over resources, hostilities which could even include confrontations with the military might of the United States. Initially these conflicts might be land-based with satellites engaged in surveillance and the guiding of Earth-based weapons, but later they could easily be of a 'star wars' type with hostilities taking place in outer space. As Harvey points out, war can be seen as the ultimate and most catastrophic form of 'devaluation': one in which whole societies are obliterated and the prospects for a new round of investment and accumulation may be started.

But regional, government-organized alliances do not have to be formed for military and surveillance purposes. Europe can also be seen as an attempted autarchy. It is making, albeit rather gradually, its own regional fix while raising trade barriers and pressurizing developing countries to open up markets. On the other hand, its outer space policy seems quite distinctive from that of other regions. The European Space Agency (ESA) does not appear to be imperialist in intent. It is relatively collaborative, allowing access to a range of players. These include public and private sector organizations and, perhaps surprisingly, a very substantial investment from China. ESA's Galileo system of thirty satellites circling the globe is to be used for peaceful purposes such as environmental monitoring and the satellite guidance of private vehicles. It is set to radically change how physical movements, especially on the roads, will be tracked. It will also pave the way for individualized road pricing, insurance pricing and monitoring. From a geopolitical viewpoint, however, the importance of Galileo is that it opens up the possibility of an independent force in outer space. It is will allow, for example, surveillance that cannot be controlled by the US. This is making American authorities treat the Galileo system with a high degree of suspicion (Mean and Wilsdon 2004).

Fixes and outer space: a fourth phase

The above accounts of regional outer space 'fixes' are, however, very Earth centred. The humanization, colonization and militarization of outer space by regional alliances on Earth also have cosmic ambitions. Securing outer space in these ways is also a first step towards regionally based alliances between capital and governments aimed at gaining access beyond Earth. Imperialism has so far gone through three main phases (Meszaros 2001). These are (1) early modern empire-building capitalism, in which European societies expanded into readily accessible parts of the globe; (2) the phase depicted by Lenin, in which monopolistic corporations used government powers to expand, a process leading to two World Wars; and (3) what Meszaros calls 'global hegemonic imperialism, with the United States as its overpowering force' (ibid.: 51). Developments in the capitalist economy remain a central explanation, the restructuring of capital–labour relations being a product of profitability and social crises around the late 1960s. Space technology

has certainly been playing a crucial role in the third phase. But the society is now entering into a fourth, cosmic, phase. A 'cosmic imperialism' is being started, one aimed at colonizing and exploiting the resources of outer space. This is a prospect discussed in detail in Chapter 6.

The neo-liberal promise and failure

It is not at all clear that the neo-liberal experiment has substantially delivered on its promises on Earth. The record is, to use Harvey's diagnosis, 'nothing short of dismal' (2005: 154). Large proportions of the population have fallen into poverty, especially in Russia and the old East European societies that fully adopted the neo-liberal creed. Global indicators of health levels, life expectancy and infant mortality have worsened almost universally since the 1960s. Significant exceptions to this trend are those societies such as Sweden and Poland which have managed to resist or at least tame the neo-liberal experiment. Neo-liberalization has therefore consolidated class power in the economic, political and cultural spheres. But the human and environmental costs have been very high.

Furthermore, neo-liberalization has largely failed to generate economic expansion. Aggregate growth rates have fallen from 3.5 per cent in the 1960s to 1.1 per cent at the present time (Harvey 2005; Keily 2007). Only East and South-East Asia, plus most recently India, have seen substantial economic growth. Capital is still looking for more profitable opportunities.

New social, economic and political 'fixes' will continue to be attempted. Some of these will be in outer space as the primary, secondary and tertiary circuits of capital look to make further parts of the cosmos into capital's appendages. But *over*-investment in the secondary and tertiary circuits typically creates its own contradictions. Investments in outer space, for example, may well undermine the profitability of enterprises on Earth. Harvey refers to the redirection of capital into the secondary and tertiary circuits as a 'spatial fix'. But he also points to the ambiguity of the term. The 'fix' involved is almost inevitably temporary and unstable. It is of the sticking-plaster variety. Equivalent social and moral 'fixes' intended by dominant orders to bind nations and military projects are similarly insecure. Meanwhile, high expenditures on outer space have been accompanied by reductions in social expenditures on Earth. Military order imposed by satellite-guided bombs from above has been paralleled by, even generated, social disorder below (Fox Piven 2004). In short, if the secondary and tertiary circuits are envisaged as devices for restoring profitability and the underlying capital–labour relation, then contrary tendencies towards disintegration must also be allowed for.

New outer spatial fixes, new risks

However, the outer spatial fix brings not only economic risk, but risks and unintended outcomes of other kinds. Human 'progress' in the cosmos is already generating a major problem in the form of space debris, as 6,791 expended rockets and payloads are disintegrating around Earth orbit (NASA 2005). There

are an estimated 110,000 man-made objects larger than 1 cm hurtling through space at up to 17,500 mph (Milne 2002). This has caused major problems for the International Space Station, and now threatens the entire space project (ibid.). One proposal for the forthcoming humanization of outer space includes the use of atom-powered rocketry. Accidents may lead to increased radioactivity on Earth and in outer space. Chemicals from rocket fuels are already being found in high concentrations in food grown near launch sites. In the much longer term, the interventions needed to change the climates of planets to make them habitable may result in much more profound unexpected and unwelcome consequences. The humanization of outer space is bringing its unique kind of risk, a cosmic equivalent to Beck's 'global risk' (Beck 1999). These risks are discussed further in Chapter 6.

Ideological crises of capitalism and the spread of hegemony

As capitalism extends its dominion, it becomes subject to other forms of crisis than those material crises that are the central concern of Harvey's work. As well as, or perhaps instead of, resolving the contradictions inherent to its underlying dynamic, capitalism must continually protect itself ideologically from resistant and revolutionary ideas that might arise from subordinated classes. The decline of Western economies and their associated cultural and political consensus from the late 1960s onwards meant that new social and political settlements between classes and other social groups needed making. This brings us to a second perspective on crisis and the development of capitalism, one also pursued later in this book. It is founded on the work of Gramsci (1971) and those who have developed his work (Hall *et al*. 1978; Williams 1980).

'Hegemony' is the central concept here. It refers to a process of domination that is not overtly oppressive and depends on subaltern parts of society accepting and adopting ways of life that are broadly compatible with the class society they are supporting. The concept refers to the subtle, non-coercive, ways in which subjugated populations finish up sharing the outlook of dominant populations. Particular views of the world come to be seen as 'common sense', though this common sense is not as natural as it seems. Such naturalization has actually been constructed through policing the boundaries between the demands and desires of the subjugated and the dominant classes. This common sense, which is not necessarily coherent and may well be inconsistent, undergoes constant renegotiation.

Hegemony and social relations

Hegemony is asserted in a number of ways, but particularly via 'civil society', the sphere of social life between the formal state apparatus and private family life. Hegemony is not the property of a specific class or group. It might be tempting, for example, to associate the dominant hegemony directly with classes of people such as bankers and stockbrokers. As Harvey indicates, such groups have a crucial mediating role in the economy. It might also be tempting to directly associate hegemonic power with, say, the chief executives and others associated

with the primary circuit of capital. Dominant, hegemonic ideas must, however, be continually responsive to the demands, ideas and aspirations of subordinate or 'subaltern' groups. Hegemonic domination cannot therefore be solely the product of particular dominant classes, not least because they must to some degree cede to the values and priorities of subordinate or 'subaltern' groups. But, although hegemonic power cannot be linked directly to a particular class, it is clear that the most powerful social groups do have an especially strong ideological influence over the rest of society. This stems from the fact that, though they make concessions to subordinate groups, they remain in control of the material ways in which capitalism is organized. Important here, for example, is the high priority given by almost all sections of society to economic growth and the creation of jobs (Gill and Law 1993). In this and other respects, including a widely shared commitment to increasing levels of consumption, the priorities of a hegemonic bloc prevail despite the fact that they are responsive to the counter-demands of subordinate classes.

What Gramsci called 'traditional intellectuals' have a central role in making a hegemonic common sense seemingly serving the interests of all classes. This returns us to the issue of abstraction raised in Chapter 1. Traditional intellectuals typically offer detached, disinterested and 'universal' knowledge, understandings apparently useful to all classes; this despite, indeed because of, the fact that traditional intellectuals maintain and enhance the age-old division between abstract thought and ideas born of practical engagement in everyday life. 'Organic intellectuals', by contrast, engage with or are directly attached to a particular class or set of interests. Organic intellectuals linked to those resisting dominant blocs of power are able to use their expertise to develop alternative, counter-hegemonic, ideas and politics.

Hegemony and outer space

There are two quite distinct ways in which the humanization of outer space is implicated in the maintenance of hegemony. The first is that space technology has become central to the process of promoting dominant cultural forms throughout the global society. Satellites serve as a medium for the transmission of hegemonic worldviews, a form of electronic cultural imperialism, and for the surveillance of the population. As explored in Chapter 4, satellites help communicate hegemonic worldviews to living rooms around the world. As Mowlana has argued with specific reference to satellites:

> The Western-fuelled system of 'communications, capitalism, consumerism and continuous change' contains seeds of a new form of conquest. This now surging e-sphere of information, communications, and capitalism seems to be seeking to conquer the culture and diverse human capacities of the world.
>
> (Mowlana 2004: 300)

This e-sphere is certainly not imposed on audiences, who voluntarily wire themselves into it, but Mowlana's argument is that, despite the illusion of consumer

choice, it is one way in which capitalism is able to spread an increasingly global culture.

Hegemonic settlements made in the postwar period have been socially and spatially uneven. In the British case a series of 'moral panics' was created by politicians such as Margaret Thatcher and sections of the media. The focus was on supposedly lawless and hedonistic groups of young people breaking the boundaries of respectable society and hence wrecking the entire social order (Hall *et al.* 1978). Authoritarian populism has been retained in the twenty-first century. Its forms are again unevenly developed but in most advanced Western societies it is a combination of appeals to 'old values' such as religion, nation, home and duty with the neo-liberal values of possessive individualism. Moral panics over 'youth' have been supplemented by panics over immigrants, Muslims and, latterly, 'terrorists'. But dominant blocs and alliances can remain dominant only if subordinated classes actually adopt and internalize such values themselves. Subordinates therefore not only must be reconstituted but must reconstitute themselves as atomized individuals whose pressing priorities, like those in the dominant bloc, include consumerism, the acquisition of property and a dedication to hard work.

Closely allied with these panics has been the increased surveillance of 'deviant' populations, and even deviant states. Subaltern groups are under pressure to accept as inevitable new forms of authoritarianism, and this is despite the massively increased social inequalities stemming from the neo-liberal experiment. Satellite technology is again central to this hegemonic project of surveillance, as discussed in Chapter 4. Restoring class hegemony is a difficult and ongoing enterprise. It needs constant renegotiation and has no guarantee of success.

The second way in which space is involved in hegemonic struggles is that space development and settlement are widely supported as solutions to the economic and environmental contradictions of capitalism. It has been seen as 'common sense' that man (sic) should continue to explore and humanize the universe. But an intellectual who, to use Gramsci's word, is 'organic' to those resisting such common sense will demonstrate the ways in which it is actually being done. It entails capital accumulation, the maintenance of class relations, the growth of a militarized industry, the withdrawal of funds from education and welfare, increased social inequalities, increased levels of nationalism and so on. Bruce Gagnon and leading members of the Global Network could be seen as 'organic' intellectuals in this sense. Nobody has forced a particular view of 'common sense' but it best serves the interests of dominant social orders. It is promoted and engaged in by intellectuals who are 'organic' to the space industry and the social movement that supports it. It also tends to be promoted by what Gramsci called 'traditional' intellectuals who claim to be politically unattached but who, perhaps unwittingly, perpetuate the social order.

Hegemony and science fiction

Some commentators on science fiction have also argued that the stories told there about human exploration and settlement of space are distinctly hegemonic. Yet it

should also be noted that there are those who emphasize the way in which science fiction explores the conflicts of Western society, and highlights the problems with imperialism and capitalism. Some science fiction clearly goes even further with narratives that attack the legitimacy of contemporary social relations through telling dystopian stories about how a human future in space might look. Kim Stanley Robinson's (1993, 1994, 1996) trilogy of books on a Martian mining colony explore the ethics of exporting capitalism to the rest of the cosmos, for example. In the trilogy, groups of Martian settlers break away from the capitalist mining operations to establish their own social order based on socialist, environmentalist and even nudist principles. As such, there is probably some truth to DeWitt Douglas Kilgore's assessment of the scope of science fiction and science writing about space (what he calls 'astrofuturism'):

> Astrofuturist speculation on space-based exploration, exploitation, and colonization is capacious enough to contain imperialist, capitalist ambitions and utopian, socialist hopes. [. . .] This [speculative] impulse has produced a strand of futurist thought that seeks an eternal extension of contemporary political and economic arrangements, albeit stripped of unpleasant resonances and rendered innocent. However, astrofuturism also carries within it an idealism, a liberal or utopian commitment that seeks alternatives and solutions to these problems and conflicts characterizing contemporary American life. It can imagine space frontiers predicated on experimental arrangements and the production of relationships uncommon or unknown in the old world.
>
> (Kilgore 2003: 1, 4)

However, it is hard to deny that science fiction, and especially popular science fiction, is often supportive of existing social practices. The futures imagined by most science fiction writers reflect a hegemonic worldview simply through their demonstrated inability to imagine anything other than an extension of contemporary social relations. This is a point made eloquently by Sardar and Cubbitt:

> Science fiction shows us not the plasticity but the paucity of the human imagination that has become quagmired in the scientist industrial technological, cultural-socio-psycho babble of a single civilizational paradigm. Science fiction is the fiction of mortgaged futures.
>
> (Sardar and Cubbitt 2002: 1)

Sardar and Cubbitt, like Kilgore, retreat from this altogether critical position to discuss the ways in which science fiction can play out the conundrums of civilization. However, some writers influenced by the critical theory of the Frankfurt School have been much more outspoken against the duping effect that science fiction has on an audience that is encouraged to accept social relations as inevitable through witnessing them projected in time and space. Goulding (1985) has argued that science fiction shows like *Star Trek* 'preserve a "halo of free choice" within rigid rules and structured inequalities'. The Federation to which the *Enterprise*

belongs promulgates male authority (preserved through the notion of the chain of command), capitalism (through military and diplomatic protection of mining colonies), possessive individualism and the 'Darwinian ethic' of the survival of the fittest. As Goulding argues, the narratives of the show are stories about the crew of the *Enterprise* teaching the various space colonies which they visit to be American. In one episode, he reports, the crew are disturbed upon visiting a planet on which people worked the minimum amount of time possible and spent all their free time high on drugs. This obvious transgression against the protestant ethic had to be redressed by the *Enterprise* crew.

Our imagination as regards possible human futures in space is the product of hegemonic relations. Not only is the imagined spacefaring civilization one that continues to operate on neo-liberal principles, but, more importantly, alternative *Earthly* solutions to our social and environmental problems are ignored entirely in favour of exporting them to space. Whether or not the readers of science fiction have the ability to critically dissect the messages of the shows they watch and the books they read has been hotly debated. Goulding's position has been attacked by writers like Jenkins (Jenkins 1992; Tulloch and Jenkins 1995), who has argued that the science fiction audience is highly creative and reflexive. If this is so, there is clearly some hope that critical science fiction writing and the critical reading of science fiction can contribute to the exploration of alterative futures to the extension of global capitalism into space, but this requires engagement in praxis.

Hegemony, outer space and public opinion

Sadly, at the moment, there is little indication amongst the general public that this engagement in praxis is occurring. We asked the MO writers an open-ended question about their thoughts on, first, humans living in outer space and, second, private companies mining asteroids for resources. The first thing to be noted is that the majority of respondents expressed no strong feelings about the desirability of these enterprises. Instead, in a number of ways, they discussed the practicality and likelihood of these possibilities. Amongst these people there was a fairly even split between those who considered it impossible, highly unlikely or so distant so as to be not worth discussing, and those who considered it necessary or inevitable.

Those who dismissed the practicality of the idea mentioned such things as the ability of the body to survive in space, the insufficient quantities of valuable materials, and the cost of extracting them. It has been suggested that such pragmatism has replaced traditional political ideologies (see Lyotard 1984). There were also a few who chose only to comment on the likely discomfort and boredom of life in space, without expanding further. Those that saw these developments as inevitable held equally depoliticized views. One said simply, 'the question implies that there could be some objection to this, but I cannot see why' [B1475]. For many, these ideas are natural common sense (or, rather, hegemonic) solutions to the problems of overcrowding, pollution and resource deficiency on Earth, and in some cases even global warming or nuclear destruction. One man said simply, 'I think it is an essential idea as the way we are leading our lives at the moment means that

our planet's resources won't last forever' [B3133]. This un-reflexive acceptance of space development as a solution to Earth's problems is translated into a more positive ideology by pro-space advocates. Furthermore, it was even assumed by some writers that space settlement and private exploitation of resources would naturally go together [B1654]. Even though this was not seen as an altogether positive development, it was seen as an inevitability: 'The truth of it is that most people on this planet live in societies based on private enterprise and military strength, and there is nothing about space to convince us to change once we go there' [H3070]. The idea of society expanding into space complete with all the contradictions of our existence on this planet is, for this group at least, a largely unquestioned form of 'common sense'. We return to this in Chapter 6.

Capitalism, outer space and resistance

Resistances to military enterprises and to what Harvey calls 'accumulation by dispossession' may well be multiple, however. Social movements like the Global Network could mount such ethical opposition to the humanization of space that investment might, for a while at least, be halted. They have been outspoken against the militarization of space, but also against the use of nuclear power in space, and have flagged up issues including the creation of space debris and the socio-environmental consequences of opening up space to capital. There is evidence that this movement is gaining in numbers and becoming increasingly militant. The links they have built with other organizations associated with the political left, such as the Yorkshire CND in England, demonstrate the awareness that activists have that issues about outer space are the result and continuation of the dynamic of a global neo-liberal capitalist economy. As mentioned above, third world governments have also contested, albeit to date unsuccessfully, the monopoly that the Western world is developing over outer space. The United Nations' role in dictating the shape of the humanization of space looks to become increasingly central, though it remains to be seen whether the US influence will continue to dominate proceedings in an era in which blocs of power in other countries such as China and India emerge as major stakeholders in outer space.

There is always the danger, however, that these resistances will be blown out of the water by those social alliances attempting to retain power. Culture and the media have a key role to play in dulling or awakening popular consciousness about these issues. As we have already argued, there is a danger that space technology itself disseminates a hegemonic worldview that legitimizes as inevitable the endless expansion of imperial capitalism into space. Organic intellectuals within popular culture and activist organizations will certainly have a key role to play if this is to be resisted.

The humanization of the universe and cosmic narcissism

In the last chapter we examined the kind of self emerging from new imagined relationships with the universe experienced since the Renaissance. The globalization

of processes set in train during the early Renaissance has continued apace. The private ownership and exploitation of the powers of nature has proceeded very rapidly and often very damagingly. What about the equivalent transformations of internal nature? An individualistic subjectivity started to be forged and celebrated by the ruling classes in northern Italy about 500 years ago. The model to be aspired to was the 'universal man', as described in Chapter 1. This person was the prototype for not only today's individualist but the kind of individualism emerging in our particular kind of cosmic society.

A recent survey reports that for the first time in ten years the majority of Britons believe the way to the good life is through looking after their own interests (Branigan 2006). This individualism is a form of identity that continues to reach and influence social classes of all kinds. But the ideal of a complete, unitary, outward-looking and socially disposed universal man has largely evaporated. In his or her place a different kind of universal man is celebrated, one more prone to dreams and much less to rationality. Self-improvement now takes the form not of developing harmonies with the universe but of potentially conquering and consuming it. Contemporary psychoanalytic theory offers one way of understanding the new kind of universal man and woman prevailing today.

Adult narcissism in contemporary society

As a number of authors have argued, we are now witnessing widespread adult narcissism as a predominant personality type in the West (Lasch 1979, 1984; Sennett 1974, 1977; Westen 1985; Craib 1994; Dean 2000; Dickens 2004). Freud (1995) was the first to outline this kind of personality disorder. Infants understandably make constant and wholly unreasonable demands on the world in general and their parents in particular, expecting their universe to orient around them. This is the stage of primary narcissism in which the child is treated, in Freud's phrase, as 'His Majesty the baby' (Freud 1995: 556). Serious problems result, however, if these attitudes persist into later life as the self becomes the chosen love object (secondary narcissism). According to Freud, in normal development, people later recognize that they must rely on significant others. 'Anaclitic' attachments are formed, self-love being displaced onto other people. The family and social life in general also come to impinge on the child's desires, and these limitations are internalized. The child becomes aware of the existence of other people with their own needs and demands.

This brings us to why this widescale shift in subjectivity is happening, a matter which Freud did not foresee. Societies like Britain and the US encourage impossible desires and make reality testing difficult (Craib 1994). Idealism, which was once focussed on altruism (and emancipatory politics), is now the pursuit of self-expression and the satisfaction of personal needs and wants. Disappointment is normal to psychological development. The process of the id (the unconscious part of the mind from which basic drives emerge) meeting with the harsh reality of social relations is, at least to a certain extent, therefore a positive thing. But it is increasingly uncommon in late modern capitalism for some groups of people. And

pro-space activists are amongst those least likely to recognize the importance of disappointment. Craib and others offer a much needed extension of Freud's analysis of the overly repressed child to cover a contemporary society in which there is simply not enough repression. Indeed, Craib believes the demand for expression of the id is the ideology of late modernity.

Consumption fulfils a symbolic role in narcissistic culture for the 'insatiable personalities' it generates (Dean 2000). Consuming goods can provide the illusory sense of omnipotence and self that the narcissist craves. They fantasize about their access to the world and its goods, failing to recognize the reality that they are still dependent individuals. If they make sufficient demands (particularly with the aid of money) they appear omnipotent and capable of acquiring and achieving almost anything. The reality principle has not struck home. And this is damaging in many ways, not least to other individuals whose rights are overridden and unrecognized. Furthermore, self-absorption of this kind is damaging to external as well as internal nature.

Narcissism and cosmic society

How does this discussion of contemporary subjectivity in a globalized society relate to our main theme, that of an emergent *cosmic* society? What forms of subjectivity are now developing in relation to a society that is socializing, privatizing and humanizing the cosmos? Again, we find a shift, one both encouraging a new vision of an owned cosmos and underpinning its acquisition. Contemporary cosmic subjectivity remains in some respects the heir to the early individualism created in the Italian Renaissance and developed between the Enlightenment and the twentieth century. But the development towards adult narcissism has now been even further enhanced. Potentially owning and occupying parts of the universe beyond Earth are the cause and consequences of a rising cosmic consciousness, one simultaneously envisaging a cosmos out there waiting to be occupied while demanding entry into that same cosmos. Today's individualistic cosmic narcissism is therefore very different from the individualism of 'universal man' in the fourteenth and fifteenth centuries.

Here we suggest, based on empirical work, that pro-space activists campaigning to further explore and develop the universe demonstrate an extreme form of this kind of subjectivity, and one in which the individual's relationship to the universe is central (Ormrod 2007). There are strong indications that these pro-space activists (many from the quasi-technical new middle class) are amongst those most affected by late modern narcissism. These activists are pursuing fantasies about exploring and developing space which manifest themes from the infant's experience of self during the stage of primary narcissism. This includes those relating to omnipotence and to unity; with the mother in particular and the universe in general. The adult narcissist seeks to regain the experience of primary narcissism, and fantasies about conquering and consuming space represent pursuit of this idealized relationship with the universe.

These fantasies are further encouraged by new developments in space tourism

and plans for the private development and settlement of space. They also achieve a certain legitimacy largely through the ideology of the libertarian right. Those who have grown up in the 'post-Sputnik' era and were exposed at an early date to science fiction are particularly likely to engage in fantasies or daydreams about travelling in space, owning it, occupying it, consuming it and bringing it under personal control. Advocates talk about fantasies of bouncing up and down on the Moon or playing golf on it, of mining asteroids or setting up their own colonies. Of course not all of those people growing up in late modern societies come to fantasize about space at such an early age like this, and most are less single-minded in their attempts to control and consume the universe, but we argue that this is nonetheless the way in which some dominant sectors of Western society relate to the universe. It is not only pro-space activists, but many wealthy business people and celebrities who are lining up to take advantage of new commercial opportunities to explore space as tourists and of other ways of symbolically consuming the universe. The promise of power over the whole universe is therefore the latest stage in the escalation of the narcissistic personality. A new kind of 'universal man' is in the making. Space travel and possible occupation of other planets further inflate people's sense of omnipotence.

Fromm (1976) examines how in Western societies people experience the world (or indeed the universe) through the 'having' mode, whereby individuals cannot simply appreciate the things around them, but must own and consume them. Mean and Wilsdon (2004) make a causal connection between the disenchanted universe viewed only as object and this kind of consumerism. 'The underlying anxiety and disorientation that pervade modern societies in the face of a meaningless cosmos create both a collective psychic numbness and a desperate spiritual hunger, leading to an addictive, insatiable craving for ever more material goods' (ibid.: 32–3). For the narcissistic pro-space activist, this sentiment means that they feel a desperate need not just to look at the Moon but to have immediate sensuous contact with it, and thereby bring it closer to their control:

> Some people will look up at the full Moon and they'll think about the beauty of it and the romance and history and whatever. I'll think of some of those too but the primary thing on my mind is gee I wonder what it looks like up there in that particular area, gee I'd love to see that myself. I don't want to look at it up there, I want to walk on it.
>
> (25-year-old engineering graduate interviewed at ProSpace March Storm 2004)

This sentiment is even more apparent when considering the companies which now allow consumers to symbolically purchase a star (e.g. International Star Registry).

Here, too, there is a dialectic movement back towards how the universe is experienced. Humans' sense of power in the universe means our experience of the cosmos as well as our selves is fundamentally changing:

> It really presents a different perspective on your life when you can think that you can actually throw yourself into another activity and transform it, and when we have a day when we look out in the sky and we see lights on the Moon, something like that or you think that I know a friend who's on the other side of the Sun right now. You know, it just changes the nature of looking at the sky too.
>
> (46-year-old space scientist interviewed at ProSpace March Storm 2004)

A widespread cosmic narcissism of this kind might appear to have an almost spiritual nature, but the cosmic spirituality we are witnessing here is not about becoming immortal in the purity of the heavens. Rather, it is spirituality taking the form of *self*-worship; further aggrandizing the atomized, self-seeking, twenty-first-century individual (see Heelas 1996). Indeed, the pro-space activists we interviewed are usually opposed to those who would keep outer space uncontaminated, a couple suggesting we need to confront the pre-Copernican idea of a corrupt Earth and ideal 'Heaven'.

The universe as object

For these cosmic narcissists, the universe is very much experienced as an object; something to be conquered, controlled and consumed as a reflection of the powers of the self. This vision is no different from the Baconian assumptions about the relationship between man and nature on Earth. This kind of thinking has its roots in Anaxagoras' theory of a material and infinite universe, and was extended by theorists from Copernicus, through Kepler and Galileo, to Newton. The idea that the universe orients around the self was quashed by Copernicus as he showed that the Earth was not at the centre of the universe and therefore neither were we (see Freud 1973a: 326). However, science has offered us the promise that we can still understand and control it. Earlier, we heard how Robert Zubrin, founder of the Mars Society, trumpets Kepler's role in developing the omniscient fantasy of science, and on that basis begins to lay out his plan to colonize Mars.

However, narcissistic relationships with external nature are intrinsically unsatisfying. Objectifying nature and the cosmos does not actually empower the self, but rather enslaves it. Pro-spacers' lack of reality principle shows its head in a number of quite disturbing ways. Many activists had wanted to be astronauts but had been turned down. The first barrier of not meeting the requirements of a governmental programme has not dampened their enthusiasm. Within the US space programme only the elite got to fulfil these dreams. Now, private industry is beginning to offer more people this opportunity. One young activist said she would pay *any* price to go into space, a sentiment echoed by two of her friends. She was so unable to accept the limit to her personal power posed by space that she was prepared to spend all her income for life on the chance to go up into space for one day. Other people, like Randall Severy, have created high-risk companies like Cyberteams with the sole aim of getting to space, extending a personal desire

to their professional lives and risking a lot in doing so. The family of Barbara Marx Hubbard, an early advocate, was clearly quite disturbed by her lack of reality principle (Marx Hubbard 1989). Her sister pleaded with her to spend less time on pro-space activism because she was neglecting other areas of her life. Her brother and father meanwhile conspired to stop her inheritance because of the money she was squandering on the pro-space cause.

The universe: from object to subject

If this is the universe as experienced by pro-space activists, then a contrary development, which we began to outline in Chapter 1, is the return to a fearful and estranged relationship with the universe, again experienced as a frightening *subject* controlling Earthly affairs from on high. It is a twenty-first-century version of the Platonic and mediaeval universes in which humans are made into repressed objects and thereby brought to heel. This is a relationship experienced by those not in control of the universe: those on the margins of Western society. Commodification, militarization and surveillance by the socially powerful are again making the universe into an entity dominating human society, as are contemporary cosmological theories divorced from most people's understanding. Once more, socially and politically powerful people (some even claiming to be on a mission from God) are attempting to make the cosmos into a means by which they can control society on Earth. The combination of these two trends is a 'Wizard of Oz' effect, in which power is maintained by those with technological domination over the universe. But this is hidden by a mask of mysticism, which keeps the public in a position of fear and subservience. These developments are explored further over the next two chapters.

But alternative forms of consciousness can be developed. A dominant form of identity appropriate to a 'cosmic society' may not be universal and certainly cannot be guaranteed. But, for example, those social movements opposed to the developments we have been discussing are working towards the use of space for peaceful purposes and an alternative form of consciousness. Historical materialism looks to real material conditions as underlying human subjectivity. But we simultaneously recognize the possibility of new resistances and forms of subjectivity. Here, too, lie real and actual instabilities.

Summary

Taken together, our two theoretical starting points lead us to argue first that the humanization of outer space is a product of economic and social crisis and second that such humanization is a means of reasserting hegemonic authority. Capitalism expands into outer space as a result of its inherent contradictions, capital being drawn from the primary circuit and invested in more speculative projects that extend the system in time and space through the secondary and tertiary circuits. Property rights are central to this process as capitalism attempts a series of outer spatial fixes. That this should happen is generally considered common sense.

Outer spatial fixes are part of a hegemonic solution to the world's problems. Rather than try to figure alternative social relationships, the extension of the current socio-economic system into space is supported uncritically. Space technology itself plays a central role in disseminating a hegemonic Western culture in which a possessive individualism is promoted; something that prevents those alternative social relationships from forming. There is, however, always hope for resistance, and for the moment it is to organic intellectuals within the Global Network and similar organizations that we must look for critical new visions of our relationship with the universe.

It is now time to flesh out some of these assertions. We now examine how our historical materialist starting point helps us understand the ways in which the humanization of the cosmos is actually taking place. How are power relations on Earth linked to the human use of the cosmos? And how does such use in turn link back to social relations on Earth? Some 'fixes' in outer space are already well ensconced. In Chapter 3, we consider the military use of outer space. This has attracted a great deal of discussion in recent years because of reincarnated plans for star wars space weapon systems, but we also draw attention to the way in which space technology is already being used to fight Earthly wars. In Chapter 4 we look at the role of satellite technology in underpinning the global economy and creating a global (hegemonic) culture. In addition to these fixes, which are well under way, there are some fixes that are only now being invested in and have yet to prove themselves as profitable innovations. In Chapter 5 we examine a case in point: space tourism. To date, space tourism has been a privilege only of the mega-rich, but a great deal of investment is now going into making it affordable for a greater percentage of the population and making it into a more stable profit-making enterprise. Other fixes remain pure idealism, and it is still not clear that they will form part of capitalism's circuits. In Chapter 6 we look at plans for terraforming planets (changing the climate so that they are suitable for humans), mining resources in space and space settlement. These are highly speculative, but the very speculations themselves shed light on the ways in which people imagine the future of global capitalism.

3 Capital, outer space and star wars

About this chapter

In this chapter we turn our attention to trying to theorize the broader social significance of the increased use of outer space for military purposes. We argue that understanding contemporary warfare also means turning to the material processes underling imperialism and 'accumulation by dispossession'. These processes are social and economic, but they are also concerned with politics. Guarantees are required to ensure that capital investments are to be worthwhile. This in turn requires systems of property rights and protection of the kind that can only be supplied by government. Protection can take many forms, but the bottom line is military force. This in turn depends on the militarization of outer space, which has a central role in establishing and maintaining the new form of imperialism, both on Earth and in space. This is attempted by 'war at a distance', which in principle does not entail the costly and politically unattractive idea of sending troops to foreign countries. This type of war relies on satellites and their capacity for enabling instantaneous response to perceived enemies. But, as recent events have shown, success for this new type of imperialism and its military handmaiden is in practice by no means guaranteed.

The space race

Attempts have been made to explain American and Soviet space programmes from the 1950s onwards at the purely cultural level, treating the drive to control the nearby cosmos as entirely unproblematic and as a necessary part of humanity's long-term mission to conquer and colonize the cosmos. When announcing his decision to embark on the Apollo programme to send a man to the Moon by the end of the 1960s, President Kennedy spoke of conquering space 'because it is there' and about the noble spirit of discovery and exploration. These programmes and their successors have relied on the 'Columbus mythology', which evokes the theme of American manifest destiny and the frontier myth of the noble explorer (Global Network 2006). The American Western frontier is used as an analogy for future exploration. We return to such analogies in Chapter 6. The Soviet space programme in turn emerged from a history of Russian cosmism, which saw space

exploration as central to the progressive future of the Soviet people (Hagemeister 1997). However, these explanations do little justice to the political-cum-industrial interests behind the programmes and are largely dismissed as rhetorical devices by political commentators.

Explanation of the early programmes is perhaps more plausibly rooted at a political level. It is often noted, for example, that the origins of these developments lie in early rocket technology developed in Germany during the Second World War and later shared between the USA and USSR (Cadbury 2006). This led to the so-called space race between the United States and the Soviet Union between the mid-1950s and the mid-1970s, a race that included the launching of artificial satellites, sending people into space and, at least in the American case, landing on the Moon.

Differences in accounts of the role of the Cold War in the American and Russian space programmes come in the way the nature of the conflict was understood. Some, like Bereinstein (2002), suggest it was a very real territorial combat for control of outer space. For others, it is portrayed as military posturing, given that the rocketry used was so similar to that delivering military warheads. It was in this sense a deliberate display of might, a symbolic flexing of military muscle. Finally, and most commonly, it is seen as a purely symbolic competition of propaganda and prestige (see Byrnes 1994), demonstrating the 'value' in each of the communist and capitalist economies and societies rather than simply a contest of military power. The timing of Kennedy's announcement of the Apollo programme in the wake of the Bay of Pigs embarrassment is often cited by adherents to this version. In a rare contrasting rendering, Bell (1985b) suggests that the Moon decision was a *sublimation of* and not an *expression of* the arms race.

In most accounts then, the space race, which incorporated rapid developments in technology, is also (and accurately) seen as part of the arms race between the USA and USSR. The launch of the Soviet 'Sputnik' in 1957 was a big shock to the military and industrial elites of the United States. As Taubman argues, 'the Russian breakthrough upended assumptions about American superiority in science and technology and seemed in an instant to reshape the cold war in Moscow's favour' (2003: 211). This shock, and the linked argument that there might now be a dangerous 'missile gap' between the US and the Soviet Union, galvanized the Eisenhower administration into creating a range of space programmes including the 1958 CIA-sponsored Discoverer satellite programme.

The 'threats' were to a large extent bluffs by the USSR and exaggeration by the US Air Force (Taubman 2003) The U2, a small aircraft capable of flying thirteen miles above the Earth, had been on spying missions above the Soviet Union as early as 1952. Photographs of military bases from this craft established that the extent of the missile 'gap' between the USSR and the USA had been considerably exaggerated. There was actually no great build-up of Soviet intercontinental missiles and most of the scares were unjustified. Indeed, such rockets as the Soviets possessed were (owing to difficulties in loading potentially dangerous kerosene and liquid oxygen) very ill-suited to a fast-moving intercontinental war. 'Intelligence' had been massaged to fit the interests of the US Air Force.

It was at this stage that the close association between military elites and large sectors of US industry started to be forged. And this introduces a still more powerful level of explanation.

The primary circuit and war

'Fixes', whether on Earth or in the cosmos, should be seen in relation to processes of capital accumulation and the attempt to develop new areas of accumulation, or new primary circuits.

At this point we can start developing and extending the notion of 'capitalist imperialism' developed by Harvey (2003), as discussed earlier. As we have outlined, he envisages three closely linked processes at work. First, and of prime importance, capital is seeking out new and hopefully profitable forms of employment. These include investments in new forms of technology, including military and space technology. Second, these capital flows are being mediated and organized by states and combinations of states. Space and military missions are at the present time conducted mainly by governments and what Harvey calls their 'productive state expenditures'. Finally, Harvey stresses that these processes actively rely on nationalisms, jingoisms and, most recently, religious faiths determined to see 'the other' as inferior, beyond redemption and ripe for military intervention.

The military–industrial complex

The first two of these processes have resulted in what has become widely known as the 'military–industrial complex'. The term was first used by President Dwight D. Eisenhower in 1961 to describe the combination between the American armaments industries, military forces and linked political and commercial institutions. Hardly a left-leaning radical, Eisenhower famously alluded to the predominance of private armaments makers over military planners and politicians when he argued that 'the munitions makers are making tremendous efforts toward getting more contracts and in fact seem to be exerting undue influence over the Senators' (cited by Taubman 2003: 278). This complex remains very much alive and well today. The political power of the bloc is now very considerable, with American congressmen and -women well aware that their political futures depend on the many blue- and white-collar workers linked to this vast industrial sector. This bloc of industrial power also makes very substantial contributions to election campaign funds (Tremblay 2006).

This relationship between industry and military expenditure has a long history. An early military example was in 1930s Germany when the National Socialist government rebuilt a severely damaged economy with a tremendous programme of military spending, an early example of 'military Keynesianism'. After the war, influential American academics and business commentators saw the space and armaments races in a very similar way. Here, for example, are the 1949 comments on this matter by Sumner Slichter, a distinguished Harvard economist:

> War increases the demand for goods, helps sustain a high level of employment, accelerates technical progress and thus helps the country to raise its standard of living . . . So we must thank the Russians for helping make capitalism in the United States work better than ever.
>
> (cited in Baran and Sweezy 1966: 212)

The *US News and World Report* similarly argued in 1954 that the armaments race, including the innovation of ballistic missiles, was basically very good news. It meant 'a long period of big orders'. Indeed, 'the H-bomb has blown depression thinking out of the window' (cited in Baran and Sweezy 1966: 213). Such sentiments lay behind the exceptionally strong levels of spending on space and armaments during the two decades after the Second World War. We are again back to 'the primary circuit' and switches of surplus capital (albeit via government intermediaries) back into this circuit. The space race and the arms race of the 1950s and 1970s certainly had deep political, cultural and symbolic significance, to which we will return. But the main driver was the demand that capital accumulation should continue on a level seen during the Second World War. There should be no return to the underemployment of capital witnessed during the prewar days of the Depression.

Reviving the military–industrial complex

In practice, such spending actually did not produce a recovery at the high levels expected. State spending on rockets, missiles, specialized troops, electronic engineers and so forth was quite different from that on mass-produced hardware (jeeps, trucks, ships, planes) during the war. The levels of spending experienced in the primary circuit were not sustained at Second World War levels, levels of military spending in the 1950s being only 16 per cent of GDP, compared with 38 per cent in 1944. This decline continued afterwards, reaching just 4 per cent in 2003. But there was a brief revival of military Keynesianism with President Reagan's 1983 Strategic Defense Initiative. This was a project to develop both ground-based weapons to attack targets in space (including long-range missiles) and space-based weapons capable of hitting targets both in space and on the ground. The programme was not really about defence, as a standoff between the US and Soviet Union had been reached (referred to as mutual assured destruction), but rather was an attempt to regain the upper hand (Wirbel 2004). It was commonly known as 'star wars', a derogatory term used by Carol Rosin to emphasize its fantastical nature. The initiative lasted until the end of the Cold War, $44 billion being spent on the planning and early experiments on the project between 1983 and 1993. We return to star wars shortly.

Now, with a revival of the national missile defence programme under the Bush administration, military spending in constant 2006 US dollars has greatly risen. Rosenberg (2006) argues that the only other epochs when the United States spent as much on national defence were during the Second World War and the Korean War. Adjusted for inflation, defence spending now is far above the annual average of $366 billion spent during the Cold War. Unfortunately, United States 'defence'

statistics make it difficult to assess whether increases in military spending are now much higher as a proportion of national income. As part of what some weblogs are calling 'Enron-style' accounting, the statistics do not include the Department of Energy's spending on nuclear weapons, the Department of Homeland Security's spending on the defence of the United States or the Treasury Department of State's spending on the finance of foreign arms sales.

The military–industrial complex has now experienced a remarkable revival, a tribute to the discovery of new enemies, specifically so-called terrorists and rogue states including Iraq, Iran, Sudan, Libya, Syria and North Korea (Klare 1996). The attacks on the US mainland of 11 September 2001 did much to justify a revived military and space industry, especially in the US. The modern military–industrial complex, incorporating the Department of Defense and the major defence corporations, is now the largest coordinated bloc of industry in America. It employs over 900,000 people and exercises considerable power not only over American government policy but over international organizations such as the World Trade Organization. All these developments have had major implications. They present the possibility of a virtually continuous war, one fuelled by the fusion of economic and military power in the United States (Escribano 2003).

Behind mere party politics is the continuing influence of what Buckley calls 'a committed cadre of true believers': special interest groups such as the Missile Defense Advocacy Alliance stand to benefit from a decision to deploy missile defences. They are a combination of contractors, conservative think tanks and weapons scientists constituting a 'formidable lobbying force in Washington' (Buckley 2001: 5). These continuing high levels of militarization are a tribute to the strength of these well-organized forces, to which we return in the Conclusion.

The military–industrial–space complex

What, meanwhile, of recent military and civilian aerospace spending? The highest Cold War levels may have declined, but 'the war on terror' is now leading to the considerable revival and growth of this circuit of capital. Many of the major aerospace manufacturers, especially Boeing, Lockheed Martin and Northrop-Grumman, have a central and direct involvement in military technology (Table 3.1). Lockheed is foremost in the profitable business of militarizing overseas states,

Table 3.1 'Big Metal Benders'. Major corporations in the military–industrial–space complex

Company	*Total revenues*	*Military revenues*
Lockheed Martin	$37 billion	$21 billion
Boeing	$54.8 billion	$18.4 billion
Northrop-Grumman	$30.7 billion	$12 billion
General Dynamics	$9.9 billion	
Raytheon	$8.5 billion	

Source: Loring Wirbel/Global Network (2006).

including Pakistan, Indonesia, Thailand and Egypt. These major corporate interests benefit from state purses for military contracts (which may be for space technology in any case) and civil space contracts. It is not uncommon to hear people refer to the military–industrial–*space* complex (Global Network 2006). Space contracts continue to be big business for these players. Lockheed Martin was awarded an $8.15 billion contract as part of the Moon–Mars Initiative. Its shares rose 7 per cent in the five weeks following NASA's announcement (Cook 2007).

Furthermore, technologies developed for military purposes are now being made available for civil purposes (Salin 2001). Information to commanders with hand-held receivers 'in the field' (in ships, naval bases, air bases and army forts) uses global positioning system technology, a form of guidance now being widely introduced to private automobiles. Another sign of the times is that the new hypersonic space vehicles were of interest to Federal Express for freight delivery (Ullman and Wade 1998). This is just one instance (along with satellites for monitoring weather conditions) of the militarization of outer space being merged with the civil uses of the cosmos.

The arms industry therefore remains a dominant player in the US economy (Del Rosario-Malonzo 2002), though for reasons already mentioned it is difficult to show its relative contribution to gross national product or to demonstrate how it is faring relative to other sectors. It is nevertheless clear that military developments, including the militarization and future weaponization of outer space, are being driven by some of the most powerful industrial classes and corporations on Earth. These are powerful political lobbyists. Furthermore, this sector drives America's primary circuit of capital as a whole. One significant indicator of the importance of military production to the US economy is the fact that over one-third of all engineers and scientists in the US are now engaged in military-related jobs. And, even though Keynesian economic regulation no longer forms an official part of US government policy, this is in practice still 'military Keynesianism' writ large. The US Department of Defense, combined with the above defence corporations, controls the largest coordinated bloc of economic power in the United States (Del Rosario-Malonzo 2002). It is greater than the combined defence budgets of the EU, China and Russia (Ferguson 2004).

There are signs now of European countries combining their efforts to make joint spacecraft or military technologies (European Defence Agency 2006). And there are indications that rapidly industrializing societies such as China and India are now developing their own military–industrial enterprises. These developments are clearly important, but the American military–industrial complex, one now integrated with the space industry, remains by far the most powerful. If anything it has become stronger in recent years with the active participation of a unilateralist neo-conservative right and its actively promoted 'war on terror'. Eisenhower implied a distance between the political class and the 'military–industrial complex'. The link may well have been closer than Eisenhower owned up to; but whatever may have been the case forty years ago, the two are certainly allied now, as the militarization, if not the weaponization, of the cosmos continues (Box 3.1).

Box 3.1 Weaponizing and militarizing space

The *Star Wars* image of rockets and missiles fighting it out in outer space has not yet been realized. This 'weaponization' of outer space, which refers to weapons in space to target ground or space-based assets, in addition to ground-based weapons used to attack space assets, has been planned. Although there is no immediate likelihood of its installation, it remains a distinct possibility. Along with the Israeli government, the United States failed to sign a UN resolution against deploying weapons in space in 2000 and withdrew from the Anti-Ballistic Missiles (ABM) Treaty in December 2001. As late as 2003 Paul Wolfowitz, Donald Rumsfeld and President Bush were discussing the addition of a space-based level to the ground-based missile defence at Fort Greely and Vandenberg. Mean and Wilsdon report that a Donald Rumsfeld-chaired US space commission in 2001 decided that:

> Every medium – air, land and sea – has seen conflict. Reality indicates that space will be no different. Given this virtual certainty, the US must develop the means both to deter and to defend against hostile acts in and from space.
>
> (Mean and Wilsdon 2004: 22)

This is despite United Nations Committee on the Peaceful Uses of Outer Space (UNCOPUOS) treaties aiming to keep space free from weapons (including the 1967 'Outer Space Treaty' and 1979 'Moon Agreement'). It is also despite Space Preservation Acts being introduced into the US House of Representatives every year from 2001 to 2005, none of which have made it out of committee. The US was also the only nation to oppose a UN Resolution to Prevent an Arms Race in Outer Space in 2006. In that year President Bush signed an order that the US would 'oppose the development of new legal regimes or other restrictions that seek to prohibit or limit US access to or use of space'.

The reality of outer space militarization, as distinct from its weaponization (Deblois 2003), at the current time is rather more mundane and everyday. It is simply a means by which hostilities are conducted on Earth. But the fact that outer space is integral to contemporary 'everyday' warfare makes it even more important to understand.

> When a precision bomb is dropped on Tikrit, guided to its target by Global Positioning System satellites, a space weapon has been used. When an unmanned aerial 'robot' plane fires a missile at a car full of suspected Al Qaeda operatives in Yemen, using electronic intelligence to confirm its target, a space weapon has been used.
>
> (Wirbel 2004: xv)

Using outer space to dominate society on Earth remains a fundamental principle of military strategy, especially US military strategy, today. Tomahawk

cruise missiles, for example, have satellite-based photos of targets directly programmed into them, further enhancing their accuracy. Spy satellites have for many years been used for monitoring nuclear detonations and the possible development of nuclear weapons. Similarly, missile launches can be detected with infra-red sensors able to detect heat from missiles and booster-rocket exhaust plumes. Satellites have therefore long been an integral part of an early warning defence system, particularly that deployed by North America's Air Force Space Command. Space-based weaponry, using the most recent developments in micro-electronics, is providing the kind of information that military commanders in the past could only dream of. Furthermore, satellite-based information is under constant development. Objects a foot across can now be readily detected. Bad weather, darkness and camouflage represent few problems to the suite of satellites now available to the US military. And the new war technologies operating in a transnational, cosmic and extremely fast fashion mean that a large, even central, part of hostilities can be conducted invisibly. They are carried out in secret and by relatively small numbers of people. One of the mottoes of the United States National Reconnaissance Office is, appropriately, 'We Own the Night'.

However, the Chinese government has recently demonstrated a capacity for destroying satellites with ground-based missiles by destroying one of its own satellites in January 2004, a development that potentially challenges United States military domination of outer space (MacAskill et al. 2007). It certainly demonstrated the vulnerability of US satellites and provoked a strong reaction from the US, Australia and Canada (Kaufman and Linzer 2007).

Capital, 'spatial fixes' and government *in absentia*

Governments do not channel funds into the military merely as a form of industrial welfare – they do so to ensure the geographic expansion of their capitalist economies. 'The new imperialism' consisted, and still consists, of 'accumulation by dispossession'. It was above all a reassertion of class power, with trade unions being marginalized, the creation of 'flexible' labour markets and financial capital having a key role in allocating funds on a global scale. Keynesianism was largely rejected as flows of capital were now injected into newly commodified and privatized public goods and services. Investments started to flow into the other parts of the capitalist economy that looked promising sources of accumulation. 'Structural Adjustment Programs' were imposed by the International Monetary Fund on developing countries, opening up global markets and reducing state welfare spending. But new investments included, and still very much include, the Far East, particularly India and China. It is the necessity of overseeing capital's geographic expansion and monitoring its social and political implications that gives space a revived significance over and above the demands of the military–industrial–space complex.

This is where we can usefully return to Lenin's understanding of monopoly capitalism as outlined in the previous chapter. Not only do regional monopolies represent a threat to global 'free trade', they represent a threat to peace. A militarized outer space becomes a medium through which some such monopolies can be protected. But for global capitalism outer space is a medium through which regional monopolies can be regulated and, if necessary, destroyed. Lefebvre (1976) refers to the creation of 'super regions', which are now expanding themselves into space.

Super regions in space

Russia and the old Soviet Union have long been an active presence in space. But there are other growing regions now also beginning to conduct this type of 'humanization'. These include China, Japan, Pakistan and India. Regional alliances of economic and political interests are beginning to use outer space as a means of countering what they see as neighbouring threats as well as that represented by the USA. Agence France-Presse (2006) reported that 'outer space is emerging as a possible theatre of operations for China's armed forces' in which 'the People's Liberation Army must be equipped and prepared to defend the nation's interests'. Three years earlier it had reported that India had responded to China's emergent programme by saying 'India has the capability to match the Chinese and our Moon mission would yield other technological and military spin-offs'. Govind Swarup of the National Centre for Radioastronomy is quoted as saying 'Space is a great success story for India. Despite poverty it is a showpiece for young people to dream and emulate' (Agence France-Presse 2003). The International Lunar Exploration Working Group is meanwhile one organization trying to coordinate lunar plans between different agencies and ensure they are working cooperatively.

One sign of the times, however, is that the Indian and Russian governments are now combining to make their own 'outer spatial fix'. They are investing $300 million in BrahMos, a private company producing satellite-guided cruise missiles. One thousand will be built over the next ten years, some exported to the governments of other developing countries (BrahMos 2003). Like their colonizing predecessors, contemporary societies such as China and India aim to use outer space as a means of protecting their region and their assets. There are obvious dangers here of regional, space-based, conflict. The US is urging Japan to join them in space-based defence of the Asian-Pacific (Gagnon 2005).

Making and retaining spatial fixes necessarily involves governments. Only state agencies (operating for the most part at a national level) can create the laws and property rights necessary to protect future property and capital investments. Even more important, only governments (perhaps operating together) can legally engage in warfare to protect such property rights and investments. The US Space Command explicitly makes this point. 'To control space', it argues, 'in order to protect U.S. interests and investments', force will be projected 'in space, from space and into space' (cited in Global Network 2006). Bruce Gagnon is one of the leading advocates for de-militarizing outer space, the coordinator of Global

Network Against Weapons and Nuclear Power in Space. He makes the same connection between warfare and the acquisition of resources through the institution of private property (Box 3.2).

Gagnon makes a useful distinction here between militarization of space in order to police the internal dynamics of neo-liberalism *on Earth* and militarization of space to protect present and future assets *in space*.

Capital fixes and Earthly wars

Harvey can also help us understand how the militarization of space helps establish new empires on Earth via imperialism at a distance or 'at arm's length'. This entails attempting to control and subject societies deemed to be weaker. The new kinds of space-based war and surveillance which have emerged since the Second World War are a central part of the attempt by American governments, combining with key sectors of the economy, to make 'fixes' *in absentia*, by remote control. As Foster

Box 3.2 Space for war and profit. Extract from 'Japan joins dangerous space race'. Source: Gagnon (2005)/Global Network (www.space4peace.org).

It is helpful to think back to the fifteenth century when Christopher Columbus sailed on behalf of Spain looking for the "new world." Upon his return with news that he had accidentally found the Americas, Queen Isabella of Spain initiated the 100-year process building the Spanish Armada in order to project power and control the shipping lanes to the new discovered lands. This essentially created the global war system that we experience today, as soon all the European powers were building navies and contesting each other's claims to the resources and lands in the new world.

This is where we are today when we look at space. Space technology is being developed for two primary reasons. One is to give nations the ability to see the Earth and to better coordinate warfare on the planet – using space to project power for military benefit on Earth.

The second reason is that many nations and corporations view space as the "new world." Gold on asteroids, water and helium-3 on the Moon, magnesium, cobalt, and uranium are believed to be on Mars. Corporations intend to venture to these planetary bodies and secure massive profits in the years ahead. But first new space technologies have to be created that make it possible, and cost effective, to "mine the skies."

If citizens can be convinced that their nation must use space technologies to "protect them" from enemies, real or imagined, then this investment in space technology can also be used to create the infrastructure that will allow these same aerospace industries to lead the way in mining the heavens. Thus space technology becomes "dual use." With the development for military use also comes the development for corporate use. The question is who benefits? Who pays the freight and who reaps the profits?

argues, it does have something in common with earlier forms of imperialism. War is the handmaiden of property relations and economic imperialism:

> The primary goals of US imperialism have always been to open up investment opportunities to US corporations and to allow such corporations to gain preferential access to crucial natural resources. Inasmuch as such expansion promotes US hegemony it tends to increase the international competitiveness of US firms and the profits they enjoy. At the same time US imperialism promotes the interests of the other core states and of capitalism as a whole insofar as these are in accord with US requirements.
>
> (Foster 2006: 145)

But, seen in the context of Gramsci's analysis of power, increasing militarization is itself a sign of weakness. Resorting to warfare is an indication that domination by consent has broken down. It is recognition that the values of individualism, parliamentary democracy and markets will not necessarily be widely shared. The militarization and weaponization of outer space is recognition that global hegemony based on a Western model can no longer be assumed. If the values of Western cultures and ways of life come under question they must be enforced.

But the success of such military and economic governance at arm's length is also by no means guaranteed. The societies and peoples deemed 'weaker' do not necessarily see themselves in that way and are likely to fight back. Accumulation by dispossession continues to generate its own antagonisms and social movements. We return to this point in summary.

Technology, speed and the cosmos

The close links between war and technological development have often been commented on (see, for example, Pokrovsky 1959; Arrighi *et al.* 1999; Ropp 2000). Access to speed has always been crucial. Superior speed, as Virilio puts it, 'has always been the advantage of the hunter and the warrior' (1998: 24). The First World War escalated this process. Technologies such as telegraphy, shipping and aeronautics were all boosted during that period. Improved scientific innovations of this kind gave the more powerful countries a distinct advantage, allowing them to invade and kill in an instant and from a great distance. In Harvey's terms, these technologies brought major advances in 'time–space compression'. Similar trends continued in the Second World War, with jet aircraft, rocketry and even faster forms of shipping being invented. Space–time was further compressed, a development that of course benefited travel technologies after the war.

Major new advances in the compression of time and space were generated by the Cold War. Rocketry, satellites, still faster planes and the internet are all products of this era. Military planners in the US are even now developing long-range, air-breathing hypersonic vehicles capable of travelling between Mach 5 and Mach 25. Enabling surveillance and very rapid attack, the aim is very clear: it is 'to make the entire world vulnerable from any point and completely reshape the geography

of surface warfare' (Friedman and Friedman 1996). Such technology again enables and supports the new kind of accumulation by dispossession. The compression of time and space, combined with ballistic missiles and increasingly sophisticated, space-based technology, mean it is (in theory at least) still less necessary to be physically present in order to control a society. The same applies to satellite-based electronic surveillance (see Chapter 4).

The successor to the U2 spyplane was Discoverer, a rocket-launched satellite. Virilio and Lotringer (1998) refer to 28,000 km/hour as 'liberation speed'. This is the velocity needed to launch a satellite into space. But speed of another kind was opened up by the launch of satellites. The new technology meant that surveillance could be conducted at will and that military commanders could now communicate with their satellites and establish what was happening throughout the globe in an instant. Similarly, military commanders could be instantly contacted, wherever they were located throughout the globe. Rockets and bombs could be guided in to a target via satellite at a distance and at the touch of a button. Those political powers with access to the speediest possible electronic technologies could conduct their wars at the speed of light. And, given the destructiveness of modern weapons (including nuclear weapons), a war could, in theory at least, be started and finished within a few minutes.

Virilio (1997, 1998) uses the word 'dromology' (derived from the Greek *dromos*, meaning 'racecourse') to encapsulate the significance of speed and time–space compression in the modern era of military conquest. The history of civilization is not only the history of wealth acquisition but the history of powerful institutions having access to technologies of speed. Wars can be won by access to these technologies. Surrender is very rapidly reinforced and with relatively little damage to the most powerful. Speed and instantaneity are therefore a central means of exercising power on a global scale. 'The resistance of distances having finally ceased, the world's expanse will lay down its arms, once known as duration, extension and horizon' (Virilio 1997: 119). With speed comes the control of place.

Pure wars

Hostilities can now, therefore, be conducted instantaneously and at great distances. What Virilio calls a 'military class' surveys and pursues enemies throughout the globe by electronic means, all, it seems, with the military class remaining well out of harm's way. The result, in principle, is a 'pure war' (Virilio and Lotringer 1998): one conducted by electronics engineers, software programmers, aerospace engineers and military strategists in the most powerful societies. Congressman Rush Holt (2006) has attempted to raise awareness of issues surrounding missile defence and has drawn attention to the missile defence computer war game simulations that congressmen get to play. Outer space has undergone, and is an agent in, 'electronic colonisation' (Virilio 2000). It has been made 'the area of violence', one in which foot soldiers are supposedly no longer necessary and victory can be declared without a physical presence in the conquered territory. Missiles surgically guided by satellites are supposed to not only annihilate an enemy but reduce the surviving population into stunned submission.

But this is not just the stuff of special effects technology in movies or the hyperbole of academic sociologists such as Virilio. Military proponents of 'shock and awe' tactics make clear that the purpose of speed on a global and now cosmic scale is not necessarily to kill large numbers of people (more often the aim is to surgically remove key individuals and populations), but to shock wider populations into mental defeat.

> First and foremost, Rapid Dominance is designed to affect and influence the will and perception of the adversary through the application of shock and awe. A Rapid Dominance Force must be capable of being employed nearly instantaneously; that is, it will have the capacity for simultaneous attack of all necessary targets to induce sufficient shock and awe. And its application will be unrelenting.
>
> (Ullmann and Wade 1998; see also Wieneck 1998)

This type of 'shock and awe' war has been simultaneously made part of the 'society of the spectacle', one in which massive public events are commercialized in the form of live TV broadcasts via satellite to a global audience (Debord 1994; Retort 2005). War is made a public circus. A new concept of 'militainment' has even been coined: military operations as a form of entertainment (Anderson 2003). Six hundred million people had earlier watched the Moon landing (Bell 1980). Now space-based war is also turned into a form of mass, commodified entertainment; one that can (or so it seems) be safely enjoyed at a great distance. Baudrillard (1995) made a similar point when he asked, rhetorically, whether the 1991 Gulf War ever took place. It was orchestrated by the media, with no recognition of the pain, suffering and ecological disaster previously associated with war. Indeed, the Gulf War was the first in which power over the production and consumption of images seemed to be just as important as the power creating the war itself. The images heightened the military ideology that this was a 'clean' war, one that was won in a matter of seconds and in which apparently no-one was killed, injured or dispossessed. The media played a similar role in covering the Iraq war (Figure 3.1).

Space technology and the future of pure wars

President Reagan's Strategic Defense Initiative was perhaps the most spectacular attempt to make war 'pure': a global conflict without conventional soldiers. X-ray lasers and particle beams from Earth were amongst the ground-based mechanisms to be used to defeat an offensive strike while space-based interceptors (known as 'Brilliant Eyes' and 'Brilliant Pebbles') would have detected and destroyed incoming missiles. It was then recognized during the two Gulf Wars that satellites had a major role to play in guiding bombs released by aircraft and assisting troops on the ground to communicate with their commanders and guide their directions. Elements of star wars are, at the time of writing, still being used in Iraq and Afghanistan. Furthermore, they are still under active development. Space-based

Figure 3.1 Shock and awe. The spectacle of war in Iraq. Source: GettyImages/CNN.

laser systems being developed could destroy any target on Earth. It was announced at one point that ground-based interceptors were to be installed in the UK at Fylingdales.

Meanwhile, space might be the fourth medium for warfare, but it also plays a central role in the digital war fought in the fifth medium – cyberspace (Oslund 2004). Encouraged by the private sector, the US military are planning towards the development of a new form of 'net-centric' warfare. This is a totally new kind of war in which, via a secure internet accessible to every member of the military, intelligence and military activities would be fused and machines would communicate with one another. The resulting perspective on the battlefield would give soldiers a 'God's eye view' according to Lockheed Martin chief executive Robert J. Stevens. 'That's real power', he adds (Weiner 2004). There can be few more obvious illustrations of the way in which powerful Earthly forces are seeking to replace God in the skies. Coupled with the designs completed for so-called 'rods of God', tungsten rods suspended from satellites that can be dropped on targets on the ground with the impact of a nuclear explosion, the image of a punishing force from on high is alive and well, orchestrated by the US military.

Yet we must be exceedingly careful not to be taken in by the possibilities of such a pure war. Winning wars by these means is actually proving to be much more difficult than either Virilio or 'shock and awe' military planners expected. The 'pure war' vision was apparently well implemented on 1 May 2003 when, at the assumed end of the attack on Iraq, President Bush famously announced the completion of

the war while standing under a banner saying 'Mission Accomplished' on the USS *Lincoln*. The initial hostilities were a spectacular example of 'the society of the spectacle'. The 9/11 attacks, to which of course the Iraq mission was a response, were themselves spectacular (Retort 2005). But, as is now much better appreciated, fast, spectacular, globalized electronic wars without damage to those in power are a disastrous delusion.

Space technology has found its limits in recent wars in the Middle East. Space weapons not only become the targets for insurgents (anti-coalition forces managing to jam US GPS guidance for missiles in 2003 (AFPN 2004)), but they fail to help soldiers on the ground in difficult conditions, where the realities of war are far from pure, but messy and full of ideological as well as physical contestations. One outcome of 'accumulation by dispossession' has been the creation of many social and political resistances, including those from within the urban 'spatial fixes' made in the rapidly emerging Muslim states (Retort 2005). The US military is now giving increasing prominence to what the Pentagon calls MOUT ('Military Operations on Urbanized Terrain') (Davis 2006). But these military initiatives still depend on the use of technology in outer space to some extent. Commanders still rely on satellites for orientation, communications and surveillance over potentially hostile populations.

Militarization and surveillance

There is now every sign that the power of the military–industrial–space complex will continue to be enhanced. This entails not only further weaponization of outer space but its use for military surveillance. (For a historical account of America's surveillance satellites, see Burrows 1988.) This is a process now very much caught up in 'the war on terror'. As in the case of the internet, earlier military applications set the original pace for making technologies that use outer space in the exercise of power. During the Vietnam War, infra-red sensors, which could penetrate clouds and storms, enabled individual soldiers to be detected walking around on the ground (Fleming 2001). Using outer space for military surveillance has taken a great leap forward in recent years.

Perhaps the most famous example was during the lead-up to the second Iraq war. In February 2003 Colin Powell (United States Secretary of State) presented US intelligence satellite images that purported to show evidence of weapons of mass destruction in Iraq. These images were part of an attempt to justify unilateral war against Iraq. It now seems likely, however, that these images dated from an earlier period before the installations were removed. Furthermore, at least according to some websites, the satellite was out of action at the time and place the pictures were supposed to have been taken. The whole experience is reminiscent of Susan Sontag's (2001) analysis of photography. On the one hand, photographs seem to offer a way of appropriating the objective reality of the world and understanding it. But photographs, a medium that has largely replaced print as a form of communication in modern society, are, in Sontag's word, 'treacherous'. A photograph may look very much like a neutral, finished, representation of an objective reality.

But photographs are 'aggressive', intrusions on selected aspects of the world. 'Ownership' of an objective reality via observing a photograph is more apparent than real. Yet this does not stop the powerful from using it as a means towards their particular ends.

Surveillance rapidly increases levels of paranoia, with the media and the internet active in promoting all kinds of conspiracy. Military planners are said by *Newsweek*, for example, to be working on new devices able to 'peer through the skull and see the brain at work' (cited in Fleming 2001). We talk more about the effects of surveillance from space in the next chapter.

At the same time, the provision of these resources for war is being infiltrated by capital. Colin Powell's famous 2003 pictures shown to the UN, for example, were provided by a private sector company called MapQuest.com. Surveillance previously conducted by military and other state authorities are now, in large part at least, being conducted by the private sector.

Important elements of Harvey's 'tertiary circuit' are therefore being transferred to the 'primary circuit' in which commodities, in this case public or state means of exercising authority and control, are being made, sold and profited from. Such, again, are ways of saving capitalism from its declining rates of profit. Mean and Wilsdon report that:

> During the Afghanistan war in 2001 the Pentagon signed an exclusive deal with Space Imaging, a US company that sells photographs from its Ikonos satellite. At a resolution of one metre, these were the best available pictures on the commercial market. For the duration of the war, at a cost of over $2million a month, the Pentagon paid Space Imaging for control of all high-quality images of Afghanistan [. . .] This blanket control also meant that humanitarian groups were denied access to information that could have helped them locate the large number of refugees created by the war.
>
> (Mean and Wilsdon 2004: 31–2)

The US government has apparently also tried to disrupt the creation of the Europe–China Galileo positioning satellite system because its 'open' policy undermines the monopoly of the US GPS system. The US has even supposedly gone so far as to threaten to attack the Galileo network 'if it is used by alleged adversaries, such as terrorists' (Xinhua News Agency 2004).

Securing space

The United States government is by far the dominant military force in outer space. And its aim in militarizing outer space is to achieve what the US Joint Chiefs of Staff call 'full-spectrum domination', one in which the US government actively enforces a monopoly over outer space as well as air, land and sea. The purpose of this monopoly is not simply to control the use of force on Earth, but also to secure economic interests actually in space, present and future.

As we go on to argue in Chapter 4, satellites have become so crucial to the

functioning of the world economy that there has been increasing tension amongst the cosmic superpowers over their vulnerability to attack, either from Earth-based weapons or from weapons mounted on other satellites. Star wars systems are conceived in part to protect space assets from perceived threats. If more people are going to be encouraged to invest in space technology, they will need guarantees from their governments that their investments will be protected.

The US has historically been anxious about other nations attempting to control Earth orbit, and for that reason an American Space Station was proposed, one that would ensure that access to space was vetoed by American interests. Fortunately, the US decided, perhaps historically rather surprisingly, that in the post-Cold War climate cooperation with other countries in the project would be more beneficial than a unilateral solution, and so the American Space Station became the International Space Station. In 1989 a congressional study, *Military Space Forces: The Next 50 Years* (Collins 1989), argued along similar lines that whoever held the Moon would control access to space. This echoed an older 1959 study, and appears to be a possible motive for the recent initiative to establish an inhabited Moon base by 2024.

With a system of property rights already being drawn up for space resources, a military presence in space to ensure these rights is becoming an increasing priority. Historically, as many pro-space advocates point out, colonization has been established through the military. Pro-space activists have generally been divided over the issue of weapons in space (Michaud 1986). There are those who are against it per se, but even fewer see it as a positive use of space. There are, however, some who see it as a necessary evil in order to protect space assets and operations, and as a possible step in the eventual settlement of space.

Harvey's analysis of the new form of imperialism is again useful in understanding these military developments. It is unlike that typically pursued until the late nineteenth century. It does not entail one society invading another with a view to permanently occupying that society and using its resources. Rather, it entails societies (and particularly the US with its enormous fusion of capital and political power) privatizing and commodifying resources previously owned by the public sector or held in common in other ways. This process is developing within the 'advanced' societies, such as the US. But, even more important, it is a strategy that is being spread throughout the cosmos.

Ideology and contemporary war

The star wars programme has so far attracted some $95 billion. Legitimacy for such sums is clearly needed and it again depends on the 'terrorism' supposedly threatening the Western way of life on a continuous, apparently never-ending, basis. But none of these developments could have occurred without a relatively willing populace. As Harvey argues, nationalism, jingoism and religious sentiment have all been drawn in as ways of legitimizing the use of outer space for military purposes. This is correct, but popular consciousness goes wider than simple religion and jingoism. It is buried deep in popular contemporary culture.

The shock of the Russian Sputnik, for example, was given extra emphasis by articles in general-interest magazines such as *Collier's*, *Life* and the *Saturday Evening Post*. These reached millions of Americans every week and, sometimes written by rocket experts such as Wernher von Braun, they played a major role in developing public consciousness over the supposed threat to the United States from the Soviet Union. Outer space, and the assertion that American dominance of outer space was essential for surveillance and future rocket launches, was given particular prominence.

Fear of Soviet domination of space was also reflected in contemporary science fiction films. Science fiction studies is a massive field, and one that has much to contribute to a sociology of the universe. However, unfortunately, here we can only offer a few examples. One relevant to our present discussion is the 1951 Robert Wise movie, *The Day the Earth Stood Still*. This had a flying saucer landing in Washington DC and its captain ordering world leaders to abandon the nuclear arms race or face annihilation from aliens (McCurdy 1997). This is just one instance of public suspicion and paranoia being reflected and amplified by the producers of popular movies. In 1938, for example, Orson Welles caused widespread panic with his radio version of the 1898 H. G. Wells classic novel *The War of the Worlds*, an account of an alien invasion from Mars. The programme was broadcast at precisely the time when America was jittery about the threat of fascism and Nazi Germany. The alien races in *Star Trek* have been read as representations of a number of threats to the US from cultural 'others', for example, the Borg as communists as well as Asians (Wertheim 2002), or the Klingons as Vietnamese (Goulding 1985). In our own time Steven Spielberg's 2005 version of *War of the Worlds* deliberately played on fears stemming from the attacks on 11 September 2001.

The ideological dimensions of wars being conducted in space are most obviously discussed, however, in relation to the *Star Wars* series of films. George Lucas, the films' director, is an anti-war propagandist and the films can be read as a commentary on the greed, aggressiveness, hatred and fear underlying war (Lancashire 2002). Still more acutely, it is an attack on greedy corporations whose interests are served by war. The natural parallel with American society is made clearer in the second-made trilogy (which are actually prequels to the first trilogy), in which we witness the formation of the Empire. Here Lucas is deliberately critical of American society, represented by the Republic, which turns its back on democracy to become the Empire. Separatists work a deal with corporations (the Trade Federation) to destroy the Republic, bringing 'profits beyond your wildest imagination'. The Republic, motivated by fear, is manipulated by greedy and ambitious rulers into investing in the development of immense military power. In the later films the empire will be defeated by distinctly American rebels seeking freedom. This is how Lucas presents the cycle of empire (Lancashire 2002).

A war far, far away

However, despite what is potentially a powerful critique of a contemporary American society gone wrong, the *Star Wars* films can also be interpreted in a less

subversive light. Hegemony works not by suppressing the truth – it is not propaganda in that sense – but by dissipating resistance to the social order (Lee Harvey (1990) uses the terms 'positive' and 'negative' ideology to make this distinction). In this case, it is not impossible to imagine a film offering a critical commentary on society that actually contributes to hegemony. One way in which films might do this is by projecting contemporary political issues far away from today's material reality. In the case of *Star Wars* it all takes place in a distant future and a galaxy 'far, far away'. They also shore up the notion of a pure war by using laser weapons, faster-than-light travel and other technological developments that remove the picture of war away from its brutal realities. The images of the movies abstract away from particular capitalist interests or particular parts of the political class. All its moral messages are worthwhile, but not here and not just yet. It offers hope that good will win out at some point in the future through the fantastic powers of an extraordinary group of activists, allowing a contemporary weakening of resistance.

Furthermore, the *Star Wars* films are entrenched in an American movie culture intimately bound to capital. Even if the message of the plot contains the potential for critical thought, then the franchise's marketing operations subsume it in another 'Disneyized' consumption spectacle (to use a term from Bryman 2004). *Star Wars* merchandise was worth billions of dollars to Lucas, as consumers bought into the *Star Wars* brand. This is a great example of the one-dimensionality of capitalism identified by Herbert Marcuse (1991). Capitalism is capable of making even our most revolutionary impulses part of its own system of social power.

Of course, no single movie is going to exert ideological hegemony on its own. And it will not do so indefinitely. Still less will it halt an anti-war movement in its tracks. But the widespread and constant projection of such messages and images must have its effect. Furthermore, such messages are always up for revision. Continuing concessions and possible solutions are made without clarifying, and undermining, the fundamental social and economic institutions and processes involved.

The public and weapons in space

How do the public react to the steady militarization of outer space? Do they share the enthusiasm of the aerospace industries and fundamentalist politicians for such militarization? And what do their responses tell us about their general relationships with the cosmos? According to a MORI poll, in 2004 66 per cent of British people believed space should be kept neutral and 68 per cent were concerned that the US was 'more interested in the military potential of space than in sending astronauts to Mars' (Mean and Wilsdon 2004: 24).

This view is mirrored in the responses to our Mass Observation directive. We asked, 'what do you think of the idea that weapons may be placed in space to attack targets on Earth or in space?' Relatively few people actually chose to answer this question on the directive, and most answers were brief. However, the overwhelming response was a negative one. Of the twenty-two people who expressed a clear opinion on the desirability of weapons in space, twenty were strongly opposed,

and only two were in favour. In fact, amongst those who did respond, this item produced the most passionate response of all the items. Many respondents used words like 'frightening', 'horrific' and 'appalling' in their answers.

The idea of a 'pure' universe uncontaminated by Earthly affairs makes its way into people's responses. This reflects the idea, which we have earlier traced from Plato and Aristotle through to the mediaeval period and beyond, that the cosmos is pure and untainted. The cosmos should be left untouched, and particularly by warmongers.

The MO writers were extremely concerned over the potential that war would spill over into space [e.g. C2256]. One very critical voice came from a sixth-form college lecturer, who acknowledged the interest that defence contractors have in exporting war into space:

> Star wars weapons systems sound like the kind of concept that defence contractors would sell to a politician. Emphasising the strategic logic and the prestige involved in a degree of space imperialism, but downplaying the enormous costs of the project, its fallible technology and its less than 100 per cent certainty of being effective. It would have been nice to have a weapons-free zone above Earth.
>
> [F3174]

Some read the idea of placing weapons in space, and using surveillance as means of targeting enemies, as the final indication of a world heading towards destruction. Like this administrator in his twenties, many blamed the US government for taking the world in this direction: 'Terrible idea. It is the sort of thing that Reagan wanted to do with his star wars programme. And Bush seems interested in this wacky and dangerous idea too. God help us all' [B3170]. The idea that space weapons would be the reserve of dominant powers like the US was an issue of concern for some, whereas for others the fact that it was our allies that were in control was the source of at least temporary relief (if also some reticence about future weaponization): 'If America did it we would be all right [sic] because they are on our side but if they could do it what's to stop another hostile country doing it as well eventually' [C1713]. A couple of people were even more positive about friendly nations developing space weapons. One older woman suggested they would be a great idea for targeting 'thugs', by which she was referring to 'perverts, serial killers, Islamic fundamentalist killers, IRA killers' [A1292]. This kind of sentiment is reminiscent of Stuart Hall *et al.*'s (1978) observations about mugging and hegemony. Similarly, a town planner in his late forties said he wasn't 'especially against the idea of powerful cameras that can pinpoint individuals, given the age of terrorism that we live in' [D3157].

As we explain in the next chapter in more detail, the panopticon was a device invented by the philosopher Jeremy Bentham (1748–1832) for observing prisoners without the observer being seen. As Bauman (1992) points out, however, Bentham's intention was that people inside the panopticon would feel safe in their

ordered world. The existence of surveillance from above clearly provides some sort of comfort for some people. Similarly, there is even the possibility that watching one's government conduct spectacular wars at arm's length can increase one's sense of power, albeit in a distanced manner. However, there is a tension between this and fear, insecurity and uncertainty about what is actually going on in space, reflected in a number of conspiracy theories amongst MO writers.

Several respondents suggested that such systems were being developed already. One meant by this that satellites were already being used in military operations to pinpoint targets and guide missiles, which is obviously correct. Others believed that actual space weapons were being developed, which would appear to have a strong element of truth about it, even if the exact extent of development is not widely known by the public. A couple of people believed that there were weapons in space already that we didn't know about, and another who was uncertain said that whoever put them there wouldn't tell us about them, so we would not know in any case.

One woman was worried about satellite surveillance, and had heard that if you say 'America' and 'bomb' in the same sentence then someone will pick it up. She said she doesn't want to believe that, but that it was the sort of thing that Bush (and his 'fear-inducing paranoid rhetoric') might be doing.

As with other questions, it should be noted that there were a number of respondents who chose to comment on the likelihood and practicality of placing weapons in space, rather than expressing a clear view for or against. Four people said that on technical grounds Earth-based weapons would be better. A few mentioned that the weapons could be used to blast an asteroid on course for Earth or debris floating in space rather than referring to their military potential. Nine people said they believed that the placing of weapons in space was inevitable, and one woman said she thought it was what the American space programme was leading up to. Another was not critical about this, expressing the view occasionally heard in pro-space circles that a military interest is necessary to get funding for a space programme at all [J3248].

What is particularly disturbing is that several respondents seemed to believe that the weaponization of space was inevitable given *human nature*. Such weaponization has been naturalized as 'common sense'. One management consultant said it was inevitable given that humans by nature are fearful and aggressive animals. Another middle-aged man, a town planner, remarked that 'Given man's persistent ingenuity and determination to find new ways of killing and maiming people, I would be astonished if this didn't happen eventually, and it's possibly happening already' [C3006]. The disturbing part is that these people, who were both critical of the idea themselves, accepted it as inevitable. This is the subtle, persuasive power of hegemony in practice. Even in crisis conditions of contestation, consent is won. There is a dialectic in place here as well, as the very idea of placing weapons in space feeds into a concept of human nature as aggressive and fearful, a concept which in turn weakens resistance to such an 'inevitable' project were it to proceed.

Summary

War is no longer an occasional disturbance to an otherwise peaceful society. Rather, it has been made a permanent feature of the social order. Outbreaks of peace are made more the exception than the rule. War is both a recognition and a cause of the fact that making a hegemonic stability via the battle for hearts and minds is proving difficult. War, at least as recently waged by the US government, has now been made 'pre-emptive', preventing supposed future attacks rather than merely responding to hostilities.

But we have insisted on a historical materialism, one focussing on capital accumulation and imperialism as underlying war. These processes are protected and enhanced on a global scale via the increasing militarization of industry combined with attempts to exert military control at a distance over the globe and nearby parts of outer space.

So, in sum, what is the militarization and future weaponization of outer space actually all about? What are the implications of using satellites to acquire global panopticism? It has long been recognized that struggles over space on Earth are intimately connected to social struggles, to contests between classes and others. As we have seen, this is a central feature of Lefebvre's work and it is taken up by Harvey in his studies of the Paris revolutions of 1848 and 1871 (1989a). Harvey invokes what he calls 'a simple rule' that 'those who command space can always control the politics of place even though, and this is a vital corollary, it takes control of some place to command space in the first place' (Harvey 1989b: 234). As President Lyndon B. Johnson argued in 1958:

> there is something more important than the ultimate weapon. That is the ultimate position – the position of total control over the Earth that lies somewhere out in space. That is [. . .] the distant future, though not so distant as we may have thought. Whoever gains that position gains control, total control, over Earth, for the purposes of tyranny or for the service of freedom.
>
> (cited in Air Force 2006)

Sadly now, those interests monopolizing and controlling the use of *outer* space are those attempting to monopolize and control social relations, social processes and forms of subjectivity on Earth. It is possible to imagine the total militarization of the public sphere from space, civilians' every move being watched and targeted. In short, the current way of humanizing outer space is again about exerting the hegemony of the powerful.

Imperialist adventures abroad are, however, inherently unstable. They breed resistances. One form of resistance is localized social movements now being made international in scope (Figure 3.2). The Global Network Against Weapons and Nuclear Power in Space makes many of the key points raised in this chapter. Unlike the mass observation respondents, it certainly does not accept the humanization of outer space as inevitable. The Global Network aims not just to prevent the arms race moving into space but to demonstrate the link between this process and the

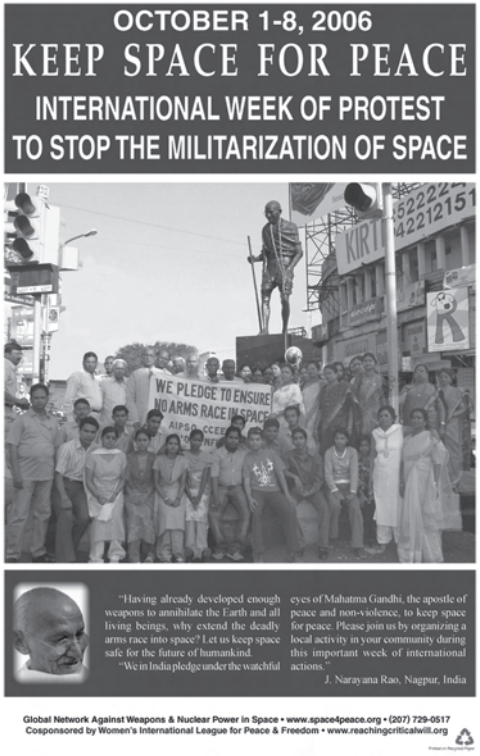

Figure 3.2 Poster for Keep Space for Peace Week 2006. Source: Global Network (www.space4peace.org).

protection and enhancement of private property on Earth. Domination of outer space is seen by them as no more and no less than a means towards the domination of global society by a bloc of interests. The central implication of the Global Network, though not one clearly spelt out, is that humanization of outer space is not necessarily of itself a bad thing. The question is who is doing the humanizing, and what kind of society is being reproduced into the cosmos.

4 Satellites and social power

About this chapter

This chapter extends our earlier analysis of the contemporary humanization of outer space. Here we focus on those satellites connecting Earthly social processes and social relations. Most of them are placed in a circular 24-hour orbit parallel to the equator, enabling them to bounce signals to any part of the globe. They are directly implicated in the flows of information. We first criticize current concepts of 'the information society' to which satellites belong. We argue that too much importance is placed on networks and information themselves at the expense of social and political power. Second, we turn to entertainment via satellites used by the media conglomerates and parts of the internet. Here again our focus is on power, especially of a cultural, hegemonic, kind. Third, we focus on surveillance and social control from outer space, arguing that Foucault's notion of panoptical power can be used on a cosmic scale. A final section focuses on forms of subjectivity emerging from this kind of humanization of outer space. Throughout, we argue that this humanization of outer space is simultaneously a response to Earthly social crisis and disorder as well as offering possibilities for resolving such crises.

Satellites and society: an overview

The development of satellites can be traced back to two demands. The first was that television signals should be instantly available around the globe. Second, there were increasing demands for long-distance telephone communication. The simplest satellite was Echo, manufactured in the US in 1960. This was an aluminized plastic balloon capable of receiving and reflecting TV and radio signals back to Earth. But it had serious drawbacks. It had a low orbit and circled the Earth every ninety minutes. So, although it was visible to almost everybody on Earth, no-one saw it for more than ten minutes out of its ninety-minute orbit. It contained a tape machine which recorded messages as it passed over a broadcasting station and then rebroadcast messages as it passed over the required destination. This, however, failed to achieve the globalized, instant, forms of communication with which we are now familiar.

The first identifiably modern satellite was Telstar, launched in 1962. Its great advantage was that it could cover more than one continent during just one of part of its orbit. Europe and the US could be covered at the same time. So could Japan and the US. A globalized telephone and television media was now at hand.

A further major advance came with the launch by NASA of Syncom in 1963. This was the first of many geosynchronous communications satellites. These are satellites orbiting at 36,000 km altitude over the Earth's equator, which take the same time to orbit the Earth as the Earth takes to rotate, therefore remaining above the same spot on the ground. In reality they are flown by telemetry command within a 12 km box to prevent drift from their fixed location generated by the Sun's gravitational pull. These satellites, of which there are now around one hundred, are able to view only a part of the Earth but, for those able to 'see' it, the satellite is available 100 per cent of the time, 24 hours a day. And, as the space fiction writer Arthur C. Clarke pointed out as early as 1945, a mere three such geosynchronous satellites connected together can easily link almost any part of the Earth (excluding the polar regions) to any other. But the number of geosynchronous 'slots' is strictly limited and launches into this zone are strictly regulated by an international governing body. The global scope of satellite-based technology, combined with limited availability of geosynchronous slots, has helped to make satellite production into very big business. Satellite communications, especially those direct to consumers, are now the largest and fastest-growing element of the satellite industry.

Satellite functions

Communications satellites now provide an array of services central to the functioning of global society, and are often taken for granted, especially by those privileged citizens of the West best placed to take advantage of them. According to NASA figures there were 2,465 active payloads in orbit as of the year 2000 (with another 22,507 objects having been launched and now debris or decayed). There are 250–300 satellites in geostationary orbit at the present time. There are also up to a thousand satellites in low-earth orbit (LEO) and medium-earth orbit (MEO), with estimates of a thousand in LEO alone by 2012 (Salin 2001).

There are 100 million satellite terminals on Earth capable of receiving transmissions via satellite (in homes, offices, ships, cars, etc.). Satellites have contributed a third of the $1 trillion revenue generated by space activities over the last decade. In 2003 satellite communications were worth $40 billion worldwide, and $75 billion in directly related activities (Pelton *et al.* 2004).

Satellite TV has enabled us to witness global events on a massive scale (3 billion of the world's 6.6 billion population are believed to have watched some of the 2004 Olympics) as well as soap operas and indeed the output of 12,000 TV channels. They are vital in enabling the global 'liquid' part of the economy to function. Capital is now less fixed to any investment or geographical locale. It can be switched and moved around instantaneously, a picture captured by Appadurai's

(1990) concept of 'finanscapes'. Contemporary capitalism is characterized by the rise and rise of financial and/or state institutions with a central role in switching flows of capital between the three circuits of capital. This is done by electronic fund transfers (EFTs), in which stock and account transactions are processed electronically. Satellites are again central here. At any given time they can process $400 trillion in transactions (Pelton *et al.* 2004: xiv).

Satellites also allow communications for diplomats and scientists and the spread of electronic education and healthcare. Pagers and some mobile phones also rely on satellites, as witnessed by the chaos in 1998 when the Panamsat network of communications satellites went off-line and, apart from CNN going down, thousands of pagers (including those of many doctors) stopped working. Global positioning satellites are increasingly utilized in a range of applications from family cars (where devices are increasingly fitted as standard), to mountaineers and skiers, to the military, who use satellites to guide missiles. Civilians and the military also make use of a number of remote-sensing, reconnaissance and meteorological satellites.

Many satellite services are utilized, however, via the internet network. Although terrestrial fibre-optics carry most internet traffic on a local level, only half the world's countries are connected together in this way, the rest relying on bouncing signals off satellites, bypassing in most instances the problem caused by huge distances and impassable terrain. Satellites support internet connections to countries that do not have fibre-optic connectivity or within countries that do not have a terrestrial internet network. This is very much the case in many African and Asian countries. In 2004 Pelton *et al.* projected a figure of $750 billion for internet and e-commerce in 2005, a figure which has doubtlessly only risen since. The total number of webpages, if we include those dynamically created on request and the document files available through links, is now more than 600 billion or roughly one hundred webpages per person alive (Dennis 2007a). We discuss the implications of this later in the chapter.

Many commentators have lauded the economic and social benefits that satellites have brought. One argument is that if they were not economically advantageous they would not have been built and users would not subscribe to their services. And the potential for satellites to bring television and internet to the most remote and rural locations in the developing world, and with them increased education and health (and, via remote-sensing, local knowledge), has enhanced the image of the benefits of satellite technology. They have overcome geographic isolation and economic specialization, and may serve to contest national propaganda and parochial knowledge. Undoubtedly, where funded (for example, Intelsat's Satellites for Health and Rural Education programme, SHARE, in the 1980s), satellites have made improvements possible in some areas at least for a certain period of time. Projects like the Chinese National TV University (which reaches over 5 million students (Pelton *et al.* 2004: 22)) or space technology used for disaster observations all have positive implications. An example of the latter was the monitoring of the October 2006 Tungurahua volcano eruption by NASA.

A new 'information' or 'network' society?

How should we begin to understand all these developments? Since the late 1970s social commentators have been describing Western society in a number of ways that might seem especially relevant. These include, for example, the idea of 'the information society' (Nora and Minc 1980; Lyon 1988). This understanding refers to work with and on knowledge and information as sources of profit. This is contrasted with a society based on industrial production. It is a perspective developed by a number of writers towards the end of the twentieth century, including Alain Touraine (1971) and Daniel Bell (1973). The economy of the developed nations at least is seen as increasingly based on provision of services rather than goods, with trade in information becoming a primary economic driver.

The adjectives employed to describe this mode of social development have become a hot topic for sociological debate, and are not always helpful if it means conflating terms like post-industrial, information, knowledge, service and post-modern. Two parallel and interrelated developments have recently spawned their own terms to be added to this list. More significantly, they have added their own important understandings of how contemporary society is made possible.

The first is the greater degree of interconnectedness between people made possible by advances in information and communication technology. For these reasons contemporary society has been called the 'internet society' or 'digital society' or 'e-sphere'. The most recent and most influential writer in this field is Manuel Castells (2000a,b, 2004). His concept of 'the network society' (see also Barney 2004) points to the fact that a networking logic pervades the principal institutions and processes of modern society. As we discuss later in more detail, this logic tends to be expressed in two main, connected forms. The first is the fact that institutions of all kinds (especially those in the private sector) are now based less on conventional hierarchies and more around networks of people. Often these networks are created around particular projects and tasks and, in the case of a 'postfordist' society, they may well be spread around the globe. Second, this social networking is closely related to increasingly sophisticated communications technologies in which information is created and shared. This information usually takes a digital form (Barney 2004). Communications satellites linked to computers are directly involved. They are used, for example, as means by which information of all kinds is very rapidly transmitted between the different parts of a company, such as sales and production, or between companies or subcontractors. Castells and others argue that the new information technologies have not only altered, but made obsolete, the conditions of time and space that previously determined possible social relations (see also Harvey 1989b). Mobile phones and the internet are two of the major ways in which this compression of time and space has been achieved, and made a huge amount of information available to connected individuals instantaneously.

Second, because these media allow communication and exchange on such an unprecedented transnational scale and the major players on the economic stage

are transnational corporations, this 'network' mode of development is depicted as an ever more 'global' society on both economic and social levels. Terms such as 'global society' or 'global village' also allude to this new form of consciousness, a global brain or worldwide mind supposedly resulting from these trends (McLuhan 1966; Pelton 1999). All of this combines to form a picture of a society that is increasingly complex.

'Information' and 'networks' in social and political context

The purpose of this section is not an extensive review of all these ideas. Many commentaries are available, and our references will point to the most popular discussions of the role of new media, especially the internet, in redefining society. But, bearing in mind our central concern with social power, some of these ways in which contemporary society has been and is being characterized are somewhat misleading and unhelpful.

There are several related issues with 'network society', and associated ideas of 'information society' or 'knowledge society'. The central problem is that networks, information and knowledge appear as though they themselves are making relationships, wealth and identities (Benkler 2006). People, institutions, power and social relations are getting left out, or at least treated as 'add-ons' to 'the network'. This is disastrous because the global economy that has been created by network capitalism has if anything created increased inequalities of power, advantage and wealth (Barney 2004). Furthermore, there is a danger of neglecting the fact that making and transmitting knowledge is as much a 'productive' activity as supposedly old-fashioned production. It entails combining capital with labour in a labour-process resulting in an end-product, however ethereal this might seem. A commodity might be a physical thing or a piece of information but property and power relations are central to both cases. Transmitting information from one institution to another is done to a definite end. In a capitalist society it is being done in the search for profits. Castells is well aware that the informational mode of development is underpinned by capitalism, though 'information processing' is seen as its performance principle and economics is de-centred.

But terms like 'network society' offer a beguilingly simple picture of society. They remain vague about how wealth is actually made, the class and other relations involved and precisely why information and particular forms of culture are circulating in the form of 'information' through 'networks'. The 'nodes' in the network society can, according to network theorists, be individuals but equally they can be transnational corporations, non-governmental organizations or governments (Dennis 2007a). Explanation must focus on these latter social and political institutions at the expense of 'networks'. 'Nodes' are not mere things. They are knowing, reflexive individuals and people. Furthermore, they are capable of making and unmaking networks.

The distinction between an 'informational' and 'industrial' capitalism is also artificial and obfuscatory. The two forms of capitalism have close similarities and furthermore run in parallel with each other, one actively interacting with the

other. Over-promotion of 'informational' or 'network' societies again gives far too much explanatory weight to the concepts of 'network' societies and 'information' in themselves (Thompson 2003). Whereas modern capitalism is clearly 'informational' in so far as it critically depends on the production and rapid distribution of knowledge, the notion of a 'network society' is, in Marx's terms, a 'chaotic concept', which needs penetrating, unpacking and further explication (Sayer 1992). To put this in critical realist terms, the causal powers and mechanisms underlying social change and expansion are treated as something of an afterthought in 'network society' analysis.

The critical, historical materialist perspective we adopt means moving beyond the mainly anecdotal accounts of what amazing feats of information exchange and time and space distortion are made possible by satellites in the realms in commerce, journalism, politics and entertainment. Many accounts of the postmodern society focus on the freedom technology has provided its users, streamlining lives and opening up new opportunities for education, identity creation, and work and sexual relationships. It is often now argued, for example, that the internet is allowing new forms of interaction and decentralized forms of 'community' using blogs, discussion groups and so on (Benkler 2006). These arguments, however, underestimate the powerful economic, social and political forces also using the network. It is now being argued, for example, that the initial hopes for a net promoting democracy are being undermined and taken over by powerful states and corporate interests (Benkler 2006; Goldsmith and Wu 2006).

Power in the network society

Uncritical thinking about 'networks' is dangerous. There are reasons to doubt that what some commentators have called a win–win scenario resulting from increased use of satellite technology is actually as beneficial or apolitical as it appears.

First and foremost it needs to be pointed out that the use of satellite technology by the developing world remains a potential rather than an actuality. Most internet terminals are located not only within the developed world but within the major cities within the developed world. It is thus to those already well connected that the internet is offering an advantage. The benefits that satellite communication offers to Western business and social organization therefore heighten the 'digital divide' or 'information gap' between North and South, exacerbating inequalities between the two (Graham 2001; Pelton *et al.* 2004). In the North, satellites are a major enabler of economic growth, although through the escalation of the liquid economy that they allow they may soon be agents of economic collapse. In the meantime, though some Samoans may have been able to use the internet to get the best prices for their produce (Pelton *et al.* 2004: 22), it is overwhelmingly a tool of use to those with capital. The internet is predominantly a tool with which to manage a global economy in which production is relocated away from the developed nations and markets are spread internationally.

Because of the economic utility of satellites, as explained in Chapter 2, the development of space law has been marked by battles over access to geostationary orbit

(GEO), or rather bandwidth that they can use to transmit from GEO. Two attempts have been made by developing countries to claim their share of GEO, one under the conditions of the Outer Space Treaty and one (the Bogota Declaration) in which twelve equatorial countries claimed the orbital space above them as extensions of their own airspace. Neither was entirely successful, though there has been some concession in recent years, with each country being entitled to some satellite bandwidth. The commitment to developing countries has also supposedly been met in proposals to provide services to the third world at the cheapest possible cost. This still grants ownership of the massive means of (information) production represented by GEO to the world's most powerful nations and companies, reducing the rest of the world's population to consumers of their services (discussions in Harris and Olby 2000; Hulstroj 2002). Hulstroj advocated an auction system for satellite bandwidths, a case, he says, of 'basic Adam Smith'.

It is also true than even where developing countries have procured their own satellites they have purchased them from developed nations. This includes the cost of development, build, launch and maintenance. Nigeria-Sat, for example, heralded as Nigeria's entry into space, was designed and built by a company in Surrey, UK. Often satellites and satellite capacities are not even bought but leased from the major satellite organizations, such as Intelsat and Panamsat, which have dominated the satellite sector as private/public entities since the 1960s and as private corporations since the end of the Cold War. Again, monopoly capitalists own these means of production and extract their profit from the rest of the world's use of their services. Satellite production remains part of the primary circuit of capital in the West, and yet it also represents investment in the secondary circuit as users then pay for their services.

Media, capital and control of satellites

Another way in which satellites are implicated in the exercise of power relations is in TV and internet broadcasting in the form of entertainment. The media, especially broadcasting by large corporate organizations, are especially important in terms of the making of hegemonic worldviews.

The media, and television in particular, are central to the satellite industry, one highly dependent on globally broadcasting geostationary satellites. If capital is tending to disinvest from satellites as the only means of telecommunication, significant re-investments are being made in satellites for the distribution of digital entertainment. Twenty-first-century visions of a cultural universe are being increasingly delivered from geostationary orbit as a means of keeping us diverted and entertained. This is a fairly reliable and inexpensive way of transmitting TV pictures to whole countries and regions. Geostationary satellites can bounce signals between a vast number of transmitters and receivers. Their importance is growing even further with the rise of digital television. Large numbers of extra channels can be broadcast without substantially increasing the number of satellites to be made and launched.

It is easy to forget, especially in the light of the popularity of the 'information

society' thesis, that relatively ephemeral output such as film or TV programmes of the so-called information age are made *products* as much as those made in the earliest eras of industrialization. A TV programme or a movie is, like any other product, made with a combination of labour, capital and technology. Time and budget constraints therefore also bear down on these apparently more glamorous forms of production activity, the overriding demand again being to make profits out of their consumption, profits which can be recycled into other forms of production or indeed taxed by governments for 'social' purposes.

The processes deriving from the neo-liberal era of commodification and privatization have extended as much, if not more, to the media as to other forms of production. In fact, the media were amongst the first to experience these processes, media conglomerates from the 1970s onwards taking over, or combining with, public sector outlets such as the Australian Broadcasting Corporation and the British Broadcasting Corporation. The result has been the making of a few truly massive conglomerates which have largely replaced public broadcasting and are dominating the global media market. Time Warner, the Walt Disney Corporation, News Corporation, Sony Corporation, General Electric, Viacom and Bertelsmann are what one author calls the 'media oligopolies' (Steven 2003). They and their content are highly dependent on advertising, and this means, that they are less likely to make their own 'original' or nationally based programmes (Seaton 2003). It also means that they are focussed on wealthy people who not only can afford the correct electronic equipment to access the media but have sufficient finances remaining to buy the advertised products (Herman and McChesney 1997). However, so-called 'developing' countries such as India and those in South America that aspire to Western consumerist values are primary targets for satellite-based TV companies to open up. DirectTV Latin America, whose satellite 'beams a diet of sport, game-shows, *telenovelas* and pre-digested news to twenty Latin American countries', is testament to this process (Gott 2006: 149). This particular company is owned by Gustavo Cisneros, an individual worth over $4 billion who owns other TV companies in Latin America as well as shares in the US's main Spanish-language TV station and a joint venture with AEL-Time Warner (Gott 2006). Sreberny describes this relationship between media superpowers and globalization:

> The transnational media moguls have shifted from ignoring the South to recognition of the potential spending power of Third World middle classes, hence the expansion of satellite provision, fast-changing takeovers and buyouts of media companies and the testing of new formats. STAR TV had already by 1995 reached 54 million homes with a footprint that stretches from Israel and the UAE to China, Hong Kong and Korea. CNN, BBC WORLD and MTV have all found satellite distributors and southern audiences.
>
> (Sreberny 2000: 112)

Transnational media corporations can be seen as 'informational capitalism' personified, making information of all kinds from TV and film on the one hand

to magazines and newspapers on the other. But we need to understand the enormous levels of capital and control involved in this 'informational capitalism'. One of the most famous instances of this supposedly new form of capitalism is News Corporation. This produces a wide range of newspapers and magazines as well as films, television programmes, books, the Fox News Channel and TV channels in Asia. It has large, sometimes controlling, stakes in 'regional' outlets based in Asia, Japan and Latin America. In summer 2005 it bought the internet friendship network MySpace for $580 million. There is a long history to making such conglomerates. From as early as 1914 onwards, Wall Street financial interests started circuiting capital into Hollywood and the production of films. Such films of course became globally dominant at this very early stage.

Hegemony in the cosmic society

In an era of 'informational capitalism' it is important to be sensitive to what 'information' actually consists of. As long ago as 1974 Raymond Williams reflected, in a highly prescient way, on the paradox surrounding such global spread of satellite television. On the one hand a worldwide television service could be an enormous gain to large numbers of people who are currently marginalized. It could be used to create alternative forms of 'common sense', opening up alternative social prospects and forms of politics well beyond national boundaries and controls by elites.

A supposed advantage has been that as a liberal communications medium it cannot be subjected to censorship or be used to maintain propaganda in authoritarian regimes. But the position is almost certainly more complex than this. For example, the US Army 'Psyops' programme actively promotes pro-US propaganda towards 'enemy' countries, using commercial companies such as CNN as a means of influencing local populations and winning wars by persuasion (see Robinson 2002). At the same time, the fall of the USSR has been attributed in part to the alternative visions of society provided by satellite TV and radio from other parts of the world (Pelton 2004). Taliban and Iraqi governments have also objected to the ways in which liberal media invade the Middle East, portraying images and messages that they find offensive. Presumably they fear that these will appeal to some within their country. One writer almost goes as far as suggesting the Al Qaeda attacks were motivated by the introduction of *Baywatch* to satellite viewers in the Middle East, though this may well be attributing too much to the influence of pro-Western media (Pelton 2004: 23)!

However, the Chinese government has made efforts to censor broadcasting into the country. Activists are using the internet to pursue democratic forms of government but with a highly undemocratic state apparatus meanwhile resisting these attempts through heavily controlling internet technology (Box 4.1). Weak government and powerful individualism are a central feature of neo-liberalism, and such views may not find favour with the authoritarian regimes in receipt of images and ideas from News Corporation and other conglomerates (Steven 2003).

A global media broadcast via satellite could extend beyond the parochialism sometimes associated with local knowledge. But the expense of satellite production

Box 4.1 'China's leaders launch smokeless war against internet and media dissent'. Source: Guardian Newspapers/Joffe-Walt (2005).

China announced a fresh crackdown yesterday on the internet amid further revelations of a plan by Hu Jintao, the president, to suppress dissent.

"The state bans the spreading of any news with content that is against national security and public interest," said a statement from Xinhua, the official news agency. The announcement called for blogs and personal web pages to "be directed towards serving the people and socialism and insist on correct guidance of public opinion for maintaining national and public interests".

[. . .]

The government employs a cyberspace police rumoured to number 30,000 and has spent lavishly on internet filters. Journalists and human rights organisations say the "smokeless war" amounts to a transformation of the government's tactics from violence, open harassment and the closing of newspapers to more covert methods of maintaining control.

[. . .]

While the barriers are easy to get around with a bit of techno-wizardry, journalists, editors, internet service providers and cybercafe owners are all under heavy pressure to abide by the rules and to self-censor to stay in business. The experience can frustrate – thousands of sites are blocked, emails can just disappear and even search engines will not turn up results for certain words. Banned phrases from news sites, blogs and instant messaging services include independence, democracy, Taiwan, Tiananmen Square, freedom and the Dalai Lama.

and launches has meant, as Williams predicted, that the users of the technology have almost entirely been large corporations and, to a lesser extent, powerful governmental interests. One indication of how things have gone since Williams was writing, and of the submission by the heavens to the powerful forces of media barons and commodification, comes from Sreberny (2000: 112), who quips, 'God's biggest current problem is not being in geostationary orbit. The celestial spheres have been purchased and occupied by satellites.'

The new satellite TV technologies have certainly enhanced and consolidated those already powerful in the global media market. Leftist protest groups have not yet singled out satellites as *the* dominant agents of the spread of US neo-liberal hegemony, but they well might. There are some important further considerations. In the developed world in particular, the concern, which develops a line of critique stemming from critical theorists like Theodore Adorno, has been over the way in which the 24-hour preponderance of trashy, repetitive, commercial-driven, substance-less satellite TV has numbed 'the MTV generation'. It is a generation of consumers bombarded with rapidly changing images vying for attention, the result of which is a superficial involvement with all of them (Pelton 2004). This social and political apathy is the key, in Frankfurt School thought, to creating

passive consumers distracted from the real conditions of their existence in alienation and exploitation. However, this is not saying that TV companies do not make concessions to and incorporate 'alternative' worldviews. Nor should it be taken to imply that audiences are incapable of reacting to (or 'decoding') media in sometimes oppositional and creative ways. People are obviously not mere automated dupes, and mass-TV broadcasting using satellite technology helps people make a certain sense of the world, even if more often the end-product finishes up serving dominant interests (Hall 1977).

The complex, sometimes quite subtle, ways in which hegemonic domination is asserted via television need to be recognized. Hegemony, as Gramsci insisted, is based on 'negotiation' with spectators, offering what Jones calls 'symbolic concessions with subaltern groups' (Jones 2006: 69). And TV can appear to be speaking in 'common cause' of both dominant and subordinate groups. An appeal to nationalism and national interest is one of the most obvious means to this end, creating a form of consciousness that deflects attention from the real interests of different social classes. Television also offers symbolic resolutions to seemingly insoluble everyday problems. It can bring escape via distraction and fantasy in the form of, for example, space travel or wars in which enemies are zapped out of existence without injuring innocent people. We discussed some of the implications of science fiction TV for hegemony in the last chapter and return to it in Chapter 6.

Potentially, the use of satellite-based TV opens up the possibility of understanding other societies and other cultures. But this is hardly the case. The localism offered by the TV conglomerates and their colonization of nearby outer space is no more than tokenistic. Some globally broadcasting channels, such as the BBC, attempt to frame information as largely 'national' but, since they are in competition with organizations such as Murdoch's cross-national News Corporation, they are under increasing pressure to make their output global and hence detached from almost everyone's everyday lives. Williams had in mind a globalism or internationalism which included some kind of mutualism rather than one in which cheap entertainment was produced for consumers making 'choices' between the alternative cultures prefabricated by powerful companies dependent on advertising. The problem stemming from global satellite broadcasting is not globalization in itself but the kind of global picture being produced.

Electronic colonization

Satellite services have long been predominantly supplied in English and so bring with them a loss of minority languages and cultures. This seems like a classic case of 'cultural imperialism' (Schiller 1976, 1998). On the other hand, it seems likely that Chinese websites will overtake those in English over the next ten to fifteen years (K. Dennis, personal communication) and these will of course reach the substantial Chinese populations in other countries such as Singapore and Taiwan. In the developing world, and countries with different social regimes, internet-based entertainment broadcast to remoter areas by satellite has similar catastrophic

effects. The diversity of knowledge available by the internet is exaggerated, most sites not being the creation of dispersed local populations. The majority are from the USA, with California being especially well represented. The content of the information broadcast is therefore predominantly in the hands of those with a particular set of interests and corresponding ideology.

Furthermore, 'electronic colonization' (McPhail 1987) via satellite TV and the internet invades the lives of its consumers in developing and developed worlds. The damaging effects of this can be felt at the local level. Education and entertainment is increasingly conducted directly by these sources, usurping the role of the family and even the state. Satellites have enabled the rapid growth of 'teleworking': working electronically 'in' another area or country. This has helped generate important shifts towards corporate 'flexibility', with more paid employees working from home (Pelton and Oslund 2004). The effects on 'community' and 'community life' are, however, still a matter of considerable debate (Barney 2004). As regards the internet, mental health issues have also just begun to arise associated with excessive use. The continuous stream of information has a numbingly addictive quality to it and coupled with withdrawal from community it can have damaging effects. There are now internet addiction clinics in California. Mental health has also been affected by the increase in some sectors of irregular (and sometimes long) working hours, which are dictated by the 24/7 life of the network society (see Pelton (2004) for a discussion of all these effects).

It is true that, for all the enlightening messages they can bring, satellite media are capable of being turned to much more offensive uses – child pornography, the spread of religious and racial hatred, etc. Equally, as we have attempted to highlight above, we must remember the subtle hegemony that is distributed by this electronic colonization. The media finish up supporting the society that has created them, as witnessed by the torrent of commercials that accompany satellite TV programmes, attempting to persuade new audiences into a life of mindless consumption.

An unstable 'fix'

Harvey uses the term 'spatial fix' to refer to the flows of capital into new areas for investment. But he also uses the term ironically, knowing that it could never be a permanent fix in terms of guaranteed or continuing capital accumulation. Still less could it bring a stable cultural and political fix.

Returning for the moment to the economic level, the 'fix' represented by the several thousand satellites surrounding the Earth is unstable for a number of reasons. It is not finally fixed because of capital's own fluctuating commitment to a particular technology. This includes telecommunications via satellite. Twenty years ago satellites were a central part of the global communications network as they bridged continents and allowed ubiquitous coverage of the globe. Fibre-optics has since been further developed and used as a means to transmit signals. This capital switch has, as we have seen, resulted in satellites no longer being the only favoured medium for telecommunications transmission.

In truth, capital's switch away from satellites is only partial, and there are social and political reasons for this. Satellites do remain the favoured medium in circumstances that are hostile to significant military or social interests. They are used, for example, to bring communications access to South America, Africa, the Far East and zones where civil wars continue to threaten landlines. In parts of Africa subject to civil war, sub-sea cables bring communications to the main seaport or capital city while satellites are still used to make the networks over the remainder of the country. Similarly, British banks with global operations use satellite links to their automated teller machines, allowing branches to communicate with their headquarters where landlines can be readily accessed or interfered with.

Counter-hegemony

If we are concerned with the instability of 'fixes', perhaps still more important is the fact that satellite technology itself can be subject to resistances and countercultures. New kinds of resistance, the most obvious being the Al Jazeera TV station, which systematically broadcasts anti-Western views, can also use technologies originated by the socially and politically powerful to transmit counter-hegemonic values. It is an irony of the satellite media's war cry of free speech that satellites do provide the opportunity for resistance to the neo-liberal hegemony of the global media. As of 2002, Al Jazeera TV broadcasts to 310 million (with a regular audience of 35 million) with a message of its own, perhaps too government controlled for some, but certainly an alternative to Western influence (Miladi 2003). Non-Western leaders from Marcos to Bin Laden have used the internet to broadcast messages to their followers and enemies (most gruesomely including the kidnap and decapitation of Nicholas Berg in 2004), as well as making use of satellite phones. Meanwhile, anti-war and anti-globalization protesters continue to coordinate themselves across continents through the internet.

These new kinds of heavenly power represented by satellite TV and the internet are not quite so complete and stable for other reasons. While, for example, much of media production has indeed remained centralized, there have in recent years been developments towards its *de*centralization. And satellite technology has enabled this process. This applies particularly to the production of news programmes and the distribution of news. Relatively inexpensive access to satellites has meant that comparatively small media companies have also gained access to this technology, using their own correspondents and making and broadcasting their own version of 'the news' (Gurevitch 1991). Even the phenomena of eBay and the shareware community (in which computer software programming codes are freely distributed without profit) could be considered as resistance to capitalist strangleholds, as could the online sharing of music. However, we must remain cautious and ask ourselves to what extent these groups have managed to seize popular control of the satellite media. Capital seems increasingly able to commodify organically emerging media like MySpace. And the ability of governments to regulate what happens through satellite exchanges, both through legal

measures and by eavesdropping on 'satellite chatter', is a matter only beginning to be grasped (Keefe 2005; Naftali 2005).

This is part of the social and political context of most of the 2,500 satellites now circling the Earth. Seen in this light, they have been made a means by which dominant economic, social, political and cultural forces attempt to impose and manage neo-liberalism, 'accumulation by dispossession' on Earth. But, in humanizing outer space in these ways, the conflicts and contradictions of Earthly society are inevitably transplanted back on to a humanized and socialized cosmos.

Surveillance via panopticism

Hegemony is exercised via relatively non-coercive forms of social control. We have explored one incidence of this being achieved through satellite media; we now turn to discussing another application of satellite technology for social control: surveillance. Foucault's notion of panopticism offers a way of understanding this process. Foucault (1977) famously presented the panopticon as the means by which power is exerted in modern society. It was designed in the eighteenth century by the philosopher Jeremy Bentham as a means of creating an improved moral order, a rejuvenated economy and minimal state expenditures. The proposed building was cylindrical, with individuals in need of reformation living in isolated rooms around the periphery. They were observable by a governor located in the building's central space. Yet those living on the periphery were never aware if they were being observed, since the governor could not be seen. Indeed, it was not even necessary for the governor to be there at all for the prisoners (or workers or schoolchildren) to *feel* as though they were being observed and to regulate themselves accordingly (see Figure 4.1).

Foucault used the panopticon to represent the invisible forms of control and coercion over the body and the psyche that characterize modern society. Such a system is also often represented by buildings such as schools, prisons, factories and a range of other institutions typically associated with the rise of industrial society in

Figure 4.1 A prisoner kneels before the panopticon's central watchtower. Source: University College, London.

the eighteenth and nineteenth centuries. Through 'biopower', governmentality is being exercised. Individuals regulate themselves, making their own bodies docile, useful and integrated into society. The state is concerned with the administration of the population and its productivity. Foucault refers to this kind of power as 'capillary'; it penetrates into the smallest channels of the body. Such general infusion of power contrasts with older (though by no means extinct) 'subtractive' power in which authorities, in the form of kings and others, control populations by the exercise of outright physical force and punishment. Rights may have been ascribed to individuals and their bodies during the Enlightenment but the same discursive practices were also a way in which power was exercised on those individuals. Biopower is a peculiarly invasive and psychological form of management since those exercising authority do not even need to be physically present. Foucault's notion of 'biopower' has some parallels with Gramsci's notion of 'hegemony'.

Satellites and biopower: a cosmic panopticon

Foucault's account is useful when we turn to one of the main ways in which the socialization of outer space is being deployed today. There is a direct parallel between Bentham's panopticon and this new orbital or 'planetary' panopticon (Whitaker 2000). Both involve a watchstation up on high that observes deviant populations, and in neither case do the monitored have any knowledge of whether or not they are being watched. About 200 of the Earth's 2,500 satellites can be seen exercising 'biopower' and 'capillary' authority via satellite. Satellites capable of monitoring and transmitting pieces of information around the globe are a step towards making a global panopticon. If Foucault is right, the outcome is a cowed and self-policing population. A system of geosynchronous satellites is arguably the modern-day equivalent of a punishing God or supreme power in the sky feared by societies throughout human history. As we shortly discuss, however, this picture needs some modification.

Surveillance is becoming especially important in contemporary society. Not only does it involve the observation of populations, but increasingly it is implicated in the transmission of information about people around the globe. The planetary panopticon monitors and transmits highly personal information. Data on consumers' purchases, for example, is used not only for stock-control purposes but also to make profiles of individuals as consumers. This data can be used to target consumers, to bring to their attention new products via advertising or promotion over the internet. But personalized surveillance goes even further than this. Closed-circuit television monitors the activities of individuals. Telephone conversations can also be quite easily monitored, even though the sheer amount of information generated by all these technologies is difficult to cope with. Car number plates can be photographed and matched to centralized records to track individuals or to charge them for the use of certain streets.

Even a person's biology is being made a means by which he or she can be identified and tracked. An iris, for example, is incorporated into an identity card. DNA can be used to track down sex offenders and other deviants. Many of these

developments are quite recent. Computer databases appear to be taking the digital 'construction' of the subject still further. Biometrics (fingerprints, iris scans and genetic sequences), medical details (including predispositions to certain diseases) information about a person's job and leisure habits, taxation and social security history are amongst the many pieces of valuable personalized information now being actively amassed (Lyon and Zureik 1994; Agre and Rotenberg 1997; Sykes 1999; Garfinkel 2000).

Furthermore, this data is being made into private property and databases are bought and sold by institutions and companies. And this data can now be readily made accessible across the globe and without the permission of the people being surveyed. Echelon, launched in the 1970s to spy on Soviet satellite communications and now run by the National Security Agency (NSA), is currently the key way in which 'biopower' is operated. Linked with similar systems monitoring information of all kinds in Canada, Australia, New Zealand and elsewhere, it conducts massive automated searches of all forms of communication, including those by satellite. One commentator, an ex-employee of the US State Department, describes Echelon graphically below. His book has been cited by none other than Osama Bin Laden.

> Like a mammoth vacuum cleaner in the sky NSA sucks it all up: home phone, office phone, cellular phone, email, fax, telex . . . satellite transmissions, fibre-optic communications traffic, microwave links . . . voice, text, image . . . captured by satellites continuously orbiting the Earth, then processed by high-powered computers . . . it runs on electromagnetic energy, NSA is there, with high, high tech. Seven days a week. Twenty-four hours a day.
>
> (Blum 2005: 271)

The result is a 'super panopticon' (Lyon 2001). The subject is now given *many* identities and subjected to many forms of digitalized surveillance in the still-developing 'network society'. Information of all kinds can be readily transferred around the world, satellites being a key element of the 'cosmic panopticon' in which we all live.

> Like the prison, databases work continuously, systematically and surreptitiously, accumulating information about individuals and composing it into profiles. Unlike the panopticon, the 'inmates' need not be housed in any architecture; they need only proceed with their regular daily life. The super-panopticon is thereby more unobtrusive than its forebear, yet it is no less efficient at its task of normalisation. Each characteristic of an individual's profile in a database is easily distinguished for unusual qualities, from credit ratings and overdue book notices to excessive traffic violations.
>
> (Poster 1995: 69)

It seems clear that panopticism of a personalized nature is indeed on the increase (Whitaker 2000; Lyon 2001). Personal information can be readily transmitted via

computer and satellites around the globe to anyone with ready access. This might include a company, for example, or a police force.

Surveillance and hegemony

Hall *et al.*'s 1978 book *Policing the Crisis* was a Gramscian analysis of attempted social control through ideological hegemony in Britain in the late 1970s. Capitalist profits were in crisis, social consensus was breaking down and increasingly authoritarian measures were being taken by the state. A provisional 'solution' was found at the ideological level, with the black mugger being made an internal enemy against which a new, broad, social consensus could be forged. Now, some thirty years later, something similar is developing on a global scale. 'Accumulation by dispossession' remains in full flood and there have been important developments in civil society that are being widely accepted as 'common sense' by subordinated, or what Gramsci called 'subaltern', groups. These developments include the rise of new methods of surveillance, many of which depend on satellites, as a means of regulating today's threatening enemies. Airport passengers are now regularly monitored as a means of enhancing security (European Union 2007). Muggers and bombers are of course real enough but they are used to caricature social minorities as essentially alien to the common sense image of solid, mainstream society. In such a way hegemonic domination is constructed.

Given that there is little or no distinction now between 'the enemy without' and 'the enemy within', a global panopticon exercised via satellites in geostationary orbit can be seen as a means by which society as a whole (not just those under suspicion) is being made equivalent to the prisons, schools and factories of eighteenth- and nineteenth-century capitalism. Linking this back to Gramsci, we could argue that, to the extent that such surveillance is accepted by even subordinate classes or groups as 'common sense', satellites are one of the main means in which a new form of global hegemony is being produced.

Satellites, biopower and regulation of the primary circuit

What, in more concrete terms, is the cosmic panopticon actually regulating? To an increasing extent the global panopticon is being used to regulate work life. In *Capital*, Volume 1, Marx lays out the historical process by which labour has been subsumed, or incorporated, by capital. The 'formal process' is 'the direct subordination of labour to capital, irrespective of the state of the former's technological development' (1976: 1034). The 'real' process is the next stage. It is one entailing the thoroughgoing transformation of labour processes and the relations of production under the social and technological conditions characteristic of industrial capitalism. At this stage workers lose their autonomy. Their work is governed by the movements of the capitalists' machine. Under the pressure of capitalist competition working hours are extended and the physical intensity of labour is also increased. Control is exercised through rigid timekeeping, for example, or 'payment by results'. Marx briefly alludes, however, to a further stage, one in which human internal nature is itself made to submit to capital's demands. Her or his whole nature is transformed.

Now combining the insights of Marx, Gramsci and Foucault, the exercise of 'biopower' and 'capillary' management of workers are the contemporary means by which surplus value is squeezed out of employees. Many of the old means by which this process is achieved remain extant. Perhaps the most obvious in the era of neo-liberalism, with its constantly high levels of unemployment, is that if you do not work with sufficient diligence you will lose your job. More important in the most advanced sectors of the capitalist economies is the increasing individualization of the workforce. To an increasing extent progress, or lack of progress, within a company is made to depend on purely personal qualities, such as the capacity to work 'flexibly' or put in overtime, etc. Pay levels, and other benefits such as private healthcare, are based on such personal qualities (Morgan and Sayer 1988).

The humanization of outer space is now offering a novel way in which biopower can be exercised and profitability enhanced in a global, and increasingly competitive, business environment. The intensity at which employees are working can now be readily regulated by the cosmic panopticon monitoring movements of people wearing tags which emit radio waves (Box 4.2).

Perhaps, given the use of mobile phone as another current way of checking on workers' movements and making them work harder, such developments should not come as a great surprise. Nevertheless, they offer just an inkling of how outer space is being incorporated into the conduct of social affairs, specifically conducted within the primary circuit of capital. They are another alarming instance of 'biopower' being exercised through the global panopticon.

Satellites, biopower, and the tertiary circuit

Satellite surveillance is also playing an increasing role in what Harvey calls the 'Third Circuit', that in which taxes are drawn off with a view to maintaining law and order. They are being regularly used by state authorities to monitor the movements of offenders who are on bail and deemed likely to conduct future offences. Importantly, however (and in line with the wider process of commodification earlier alluded to), the systems are being designed by private firms, a striking instance

Box 4.2 'Firms tag workers to improve efficiency'. Source: Hencke (2005).

Workers in warehouses across Britain are being 'electronically tagged' by being asked to wear small computers to cut costs and increase the efficient delivery of goods and food to supermarkets, a report revealed yesterday.

New US satellite and radio-based computer technology is turning some workplaces into 'battery farms' and creating conditions similar to prison surveillance, according to a report from Michael Blakemore, Professor of Geography at Durham University.

The technology, introduced six months ago, is spreading rapidly, with up to 10,000 employees using it to supply household names such as Tesco, Sainsbury's, Asda, Boots and Marks & Spencer.

of previously state-run practices being commodified and thereby returned to the 'Primary Circuit'. An example is 'the STOP solution', as outlined in Box 4.3. Here is another apparently successful instance of Foucault's 'biopower'.

This is yet another example of how the more routine but most coercive functions of state authority are now being conducted via outer space. And they are being increasingly conducted via the commodification of yet another part of the 'commons'; that engaged in ensuring public order. It is one outside democratic control.

Panopticism and the regulation of protest

Finally, panopticism is also being extended to the monitoring of more exceptional threats to the social order. Resistance by trade unions may have been weakened or sidelined by the programme of 'accumulation by dispossession' but new, very diverse, kinds of struggle are now a regular feature of contemporary society. Resistance to privatization and commodification, including programmes by the International Monetary Fund and World Bank, is widespread, covering countries as far apart as India, Africa and Latin America. The rapidly growing anti-globalization movement, one with its own counter-hegemonic values and which

Box 4.3 'The STOP solution'.

A number of companies are now offering global positioning system (GPS) offender monitoring services. Offenders who are released on parole or probation can be fitted with tag devices that can be tracked via satellite and located 24 hours a day. These systems can automatically alert authorities if an offender goes anywhere that has been set as off-limits or fails to turn up at a specified point at a particular time. They are targeted especially at the monitoring of sex offenders and others that present a high risk.

Though the benefits to the offender of being allowed to rejoin society are lauded, economic considerations lie behind the decision to adopt GPS offender monitoring systems. The company STOP, for example, suggests that its product can save on prison space, which is limited and expensive, and offer savings of 75 per cent or more on the cost of imprisonment (STOP LLC 2005).

Companies like STOP suggest that monitoring systems work in the best interests of everyone, including offender and public. There are, of course, alternative measures that could be considered, such as therapeutic intervention or programmes to address the social problems at the root of crime. Yet there is no doubt less money to be made from such low-tech solutions and they represent a much greater challenge to our understanding of the nature of criminality.

regularly turns up at meetings of the World Trade Organization, requires regular, global surveillance. All these developments require monitoring and, if necessary, stopping by state authorities in many parts of the world. Even leading activists in the Global Network have been subjected to surveillance in recent years.

Critiquing panopticism: potentials for resistance

But these instances lead us to a central question about Foucault's concept of power. He suggests that subjectivity remains active but conformist under panoptical observation. But this does not convincingly account for the resistance to power that is regularly conducted, sometimes led by 'organic intellectuals' making alternative forms of 'common sense'. Anti-globalization protesters, peasant farmers, and undoubtedly many others, are clearly not subsumed or cowed into conformism by a pervasive, all-conquering biopower. The problem here is that Foucault has in the abstract always asserted that wherever there is knowledge/power there is resistance, and he should certainly not be seen as a functionalist. But he then largely ignores the historically specific ways in which people resist (Brenner 1994). In the case of the global panopticon this can mean escape from the panopticon or using and subverting its power.

As we have said, the Al Jazeera broadcasting station, for example, often uses its access to satellite technology to counter Western hegemony and anti-Islamic rhetoric. Periodically Al Jazeera beams out videos actually made by 'terrorists'. Similarly, activists resisting the First US Gulf War in 1990 and 1991 used inexpensive video cameras and leased relatively inexpensive channels on commercial satellites to advertise their resistance to the war via public service television in the US (Lucas and Wallner 1993).

People can also, for example, hide, disguise themselves, remove an incriminating computer file or video or widely broadcast the activities of those in authority. The last is known as 'sousveillance' or 'surveillance from below' (Dennis 2007b). One of the best-known examples is George Haliday's 1991 recording of the Rodney King beating by police in Los Angeles. His home video was rapidly circulated around the globe. Of course, these subversions of communications technologies may not be successful either, but they again point to social struggle over technology and the continuing power of human agency despite, indeed because of, high levels of surveillance.

Foucault's theorizing about resistance to panoptical power has been hotly contested. Habermas argues, for example, that he fails to engage with people's self-understanding in their historical contexts. He rejects any attempt 'to make comprehensible what actors are doing and thinking' (1987: 267). At the same time, in Brenner's words, 'the static undifferentiated character of Foucault's account of power and resistance is linked intimately to his failure to relate the latter to the economic, social and political institutions with the historical and national forms of welfare-state capitalism' (1994: 701). It is important in any account of resistance to pay attention to the ways in which reflexive counter-hegemonies are formed and to identify what they are formed in relation to.

Subjectivity and cosmic society

There are important issues here of subjectivity and identity. One feature of the network society, according to Castells (2004), is a division between subjectivity as experienced and that imposed by the network. Individuals' lives are typically organized on the rhythms of day and night and on the reality of time being needed to travel in space. But the network society, Castells argues, is based on exactly the opposite assumptions: simultaneity and the compression of time and space. Information of all kinds flows between organizations and individuals independent of day and night. Furthermore, the importance of space is overridden. An internet message sent from California to London arrives at almost the same time as it is sent. In Castells' picture, a particular kind of estrangement thereby develops in modern 'network' capitalism, one in which the self is profoundly separated from the processes and relationships which affect it. Castells suggests that the separation of a global networked society from people's daily lives is leading to all forms of contemporary protest, from Mexico's Zapatistas, through the American Patriot Movement, to Al Qaeda.

The new information technologies are certainly helping to generate new forms of powerlessness and estrangement as well as identity. But it is important not to over-emphasize the role of new technologies alone in this. Powerlessness and estrangement are the products of other relationships and processes, many of which are deep-rooted within modern capitalism and have a long history, such as consumption and individualism. As argued in Chapter 2, these forces all contribute to new forms of individualized and narcissistic subjectivity. But the internet also offers a multitude of resources for the construction of new 'fluid' identities and the formation of elective and temporary 'neo-tribes' (Maffesoli 1988) for some people. But a critical sociologist might well ask to what extent these really provide a stable sense of social identity to compensate for social fragmentation. And what of those who do not have the ability to remake themselves in such a way?

Here we return to subordinated populations who may be affected by the individualizing processes of late modernity, but who remain fearful cosmic citizens rather than celebrating new-found freedoms. As we saw in the previous chapter, responses to the Mass Observation directive showed some evidence for this. Remember the respondent who was not 'especially against the idea of powerful cameras that can pinpoint individuals, given the age of terrorism that we live in' [D3157]. People thus consent to a social order over which they have no control, leading to paranoia and estrangement created not simply by the network but by the powers controlling it. This is a process by which people willingly participate with the panopticon. It is the kind of process Foucault seems to have had in mind.

'Common sense', Gramsci wrote, 'is not something rigid and immobile, but is continually transforming itself, enriching itself with scientific ideas and with philosophical opinions which have entered ordinary life' (1971: 326). Thus, a common theme amongst many dominant groups is that outer space is there to be used for its resources and for the general betterment of the social order. But a successful hegemonic project is also one in which dominant groups or blocs select key issues,

such as the surveillance and targeting of selected minorities, that also appeal to subordinated constituencies.

Summary

This chapter has explored the social significance of the early humanization of outer space. Specifically, it has examined the role of satellites for surveillance and for media transmission. However, Castells' idea of 'an internet galaxy' and similar visions of 'the information society' underplay the power relations and causal mechanisms involved in Earthly society. By contrast, Harvey's theory of 'spatial fix' continues to be useful, particularly in terms of seeing these investments in the nearby cosmos as attempts to resolve economic, social, political and economic crises and contradictions on Earth. But also important for this chapter has been Gramsci's concept of hegemony, with understandings of society and of the self being largely created by the media. Flows of capital and information in and around 'networks' need locating within these contexts.

Foucault's concept of 'capillary power' has also been useful, though this theory too needs to recognize the forms of power being exerted via surveillance. The bottom line is that outer space is being used by military-cum-civil authorities and by companies (including media conglomerates) as a means of consolidating and extending their social and political power. On the other hand, we have used the notion of hegemony to suggest that the use of these technologies in outer space does not necessarily result in long-lasting solutions to overaccumulation and social-cum-political crises on Earth. They generate possibilities for new resistances (including resistances to commodification) and preliminary attempts at popular control. Satellite technology is capable of being subverted, captured and used by subordinated interests. At the same time, of course, they can be used for humanitarian purposes – tracking refugee populations, for example – and there is always the potential for educational and health programmes to provide genuine assistance to those in poverty, provided their agenda is not dictated by the ideological interests of Western neo-liberal capitalism. Dominant forms of politics and culture exercised via control of outer space are not stable and are constantly up for renegotiation and reworking.

5 Space tourism and human identity

About this chapter

Space tourism is a rapidly growing field of economic activity. It is another part of society's 'outer spatial fix', one in which surplus profits are being ploughed into outer space. Now that virtually all space on Earth has been humanized and thoroughly populated, outer space is being made by elite groups into the new exotic destination of choice. But this is only part of the picture. The humanization of outer space also uses and reinforces an ancient and powerful worldview, concerning society's relations with the cosmos. It relies on the idea that outer space is an apparently pure and serene 'other' place offering a profound sense of awe, wonder and renewed identity to the space tourist. Travelling there supposedly brings the same kinds of rewards, in the form of a new self, as does travelling to a holy site during a pilgrimage. Tourism in outer space will be the newest way in which social elites forge their identities. This hegemonic view of the cosmos and society's relation to it is a product of a new dominant social bloc, one incorporating pro-space activists, the aerospace industry, the tourism industry and governments.

A burgeoning industry

Paradoxically, early space tourism was a result of the Russian state 'embracing the capitalist mantra as they seek to make money from their orbital ventures. They have the only space program to date that has made millions of dollars by selling seats on their rockets to private companies and private citizens' (Spencer and Rugg 2004: 23). Perhaps the most dramatic point is that the Russians have so far embraced capitalist tourism in space much more than NASA. As Spencer and Rugg put it 'The Russians have become the "cowboys" of Earth orbit' (ibid.: 23). After a number of abortive attempts by American and Russian conglomerates, American company Space Adventures sold flights on board a Russian Soyuz rocket to the Russian part of the International Space Station to three multimillionaire businessmen. Each flight cost $20 million, the first being that of Dennis Tito. There has been no shortage of applicants, most famously including *NSync singer Lance Bass.

In the relatively near future we can envisage a string of wealthy individuals after Dennis Tito taking advantage of this new way of spending their money. However, this picture of a few elite individuals in space is unlikely to appeal to the space tourism entrepreneurs, who have their sights set on opening up space to more and more people. Space Adventures has since reported that nearly two hundred potential space tourists have paid a total of almost $3 million in deposits for more modest suborbital flights (flights to altitudes of 62 miles where passengers experience zero gravity and the darkness of space and officially become astronauts).

A number of teams are now competing in the space tourism business, including SpaceEx, Xcor, Blue Origin, Armadillo, SpaceDev and Scaled Composites. Following the familiar pattern of competitive capitalism, we can expect some of these companies to succeed while others go out of business. Virgin Galactic is, however, the largest company currently selling vacations in space. This is a collaboration between Sir Richard Branson (head of the Virgin group of companies), Paul Allen (Microsoft co-founder), Burt Rutan (a developer of spacecraft) and Philippe Starck (a design guru). Allen contributed $25 million towards the successful attempt by Rutan's company Scaled Composites to win the $10 million Ansari X-Prize. This company won the prize for developing a reusable suborbital vehicle, flying SpaceShipOne to the edge of space twice in five days. Virgin Galactic is now spending $100 million on SpaceShipTwo, a transporter specifically designed for space tourists. Charging $200,000 per person, the company had in late 2006 collected $13 million in deposits for future space flights.

Projections for the future of privately financed space tourism are ambitious. Spencer and Rugg (2004) make the analogy between the growth of luxury cruising on the oceans and that in space. They argue that Tito's flight was a 'pioneering phase' (Figure 5.1). In ten years or so the International Space Station will have been converted into the first 'private orbital yacht' and around one thousand private citizens will have travelled 'off world'. In the next 'exclusive' phase, wealthy individuals and corporations will be engaging in orbital yacht racing and celebrities will be making outer space their preferred venue for weddings. The 'mature phase' will be one in which cruise ships seating one hundred persons and offering a range of recreational facilities will be available. By 2050, one million people will be touring off-world and 'the year 2075 could see 3000 to 5000 tourists and sports fans going every day' (Spencer and Rugg 2004: 52).

Similar optimism was expressed over the possibilities of government-funded space travel during the twentieth century, much of it proving to be unjustified. A survey of US residents earning $250,000 per annum and with a net worth of $1 million is arguably more hard-headed (Malik 2002). Ashford (2002) cites US market research suggesting that the market for $100,000 flights is ten thousand per year. Twenty per cent said they would buy a $100,000 ticket for 15 minutes in space. Seven per cent said they would pay $20 million dollars for a two-week trip on-board a space station in Earth orbit. Many commentators in the space industry are predicting a major extension of space tourism over the coming decade. Space tourism is now argued to be *the* likely growth sector of the space industry as a whole over the next 15 years. Some estimates suggest that it will be worth $20 billion a

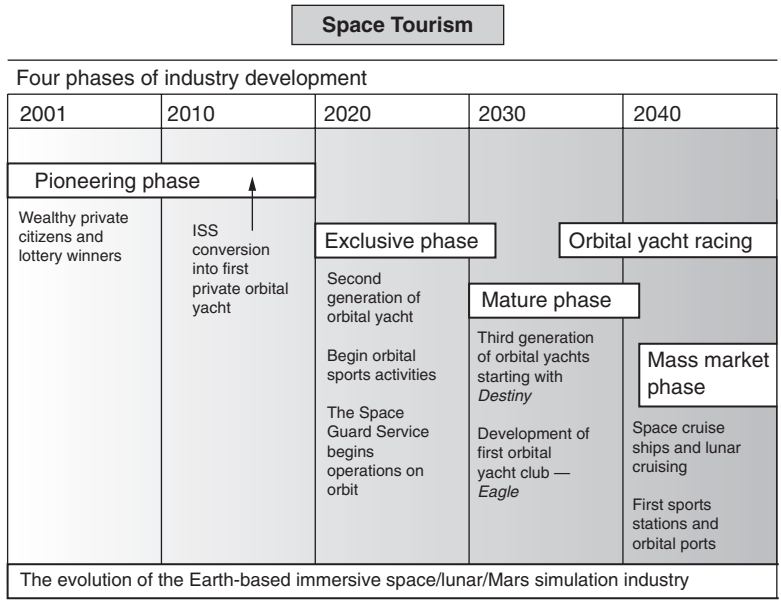

Figure 5.1 Four phases in the development of space tourism. Source: Spencer and Rugg (2004). Apogee Books.

year (Ashford 2002). Space Adventures are now planning a mission, Deep Space Exploration, to send space tourists to the far side of the Moon in 2008. Working closely with the Russian Federal Space Agency, it plans to charge these early space tourists around $100 million each (Than 2005).

There is even greater promise when orbital tourism is finally mature. This includes the creation of orbital 'hotels' – destinations in orbit more geared to the tourist experience than the ISS. The idea was first mentioned by Barron Hilton, president of Hilton Hotels, as long ago as 1967 (Spencer and Rugg 2004: 160). In addressing the American Astronautical Society, he assured them that 'when space scientists make it physically feasible to establish hotels in space, the hotel industry will meet the challenge' (Billings 2006: 162). A Hilton hotel, as well as a PanAm orbital flight, featured in Stanley Kubrick's *2001: A Space Odyssey* (1968). Designs for hotels incorporate large viewing windows and, in an extended weightless stay, the space tourism visionaries can imagine even more fantastic leisure pursuits and games to be enjoyed in zero gravity. Ashford (2002) elaborates a couple of these ideas in a book on space tourism as he describes how orbital hotels will allow tourists to fly with wings (Figure 5.2) and play in cylindrical zero-gravity swimming pools. Collins *et al.* (2000) have produced a design for an orbital sports stadium. These fantastic orbital hotels sound like something of the distant future, but again research and design work is already well under way. Bob Bigelow, the leading contender, has already built working 1:3 scale models.

Figure 5.2 Varieties of zero-gravity wings. Source: Ashford (2002: 66). Imperial College Press. (Orig. Collins and Graham 1994.)

A sociology of space tourism

How should we understand space tourism from a sociological point of view? Inevitably any such understanding must be somewhat speculative at the moment. Only a few Dennis Titos have so far made the trip. But, bearing in mind our earlier focus on historical materialism and forms of subjectivity, we can begin to offer some understanding.

We divide our discussion here into three distinct sections, although all are in their own way related to the dynamics of late capitalism. The first looks at space tourism from the perspective of industry's interest in developing new circuits of capital. The question here is why people have come forward to invest in the fledging space tourism industry despite the obvious financial risks involved in so doing. The second focus is on the likely future consumers of space tourism. How is space tourism sold? Why are people prepared to pay vast sums of money to visit space? And how do they experience it once they are there? Thirdly, we discuss briefly those activists who are campaigning in support of the space tourism industry. These form a more-or-less distinct part of the pro-space movement studied in our previous work (Ormrod 2006). Although there is bound to be some overlap with this constituency and those hoping to take advantage of the space tourism industry once up and running, there will of course be many consumers who are not activists, and there are some activists who do not even aspire to become consumers, let alone who will achieve that dream. We argue that a slightly different account needs to be given of activism in support of space tourism from that given of its consumers.

Circuits of Earth, circuits of capital

Given our earlier account of the interacting circuits of capital, explanation at the economic and political level is relatively simple. On the one hand, here is capital again exploiting outer space, using it as another means of generating profits. It is a further 'outer spatial fix', capital still restlessly seeking out new markets, and new collaborations with state authorities, as demand for goods in other circuits declines

and surplus capital needs profitable investment. Space tourism offers another way of making such a fix, the assumption of course being that there will be large numbers of space tourists able to make this into a profitable enterprise. Meanwhile, some analysts of Earth-bound tourism are becoming gloomy. A weakening of growth in the main tourism-generating countries (the United States, Germany and Japan) combined with the terrorist attacks of 11 September 2001, attacks on tourist sites such as Bali and Kenya and continuing hostilities in the Middle East are cited as underlying the declining number of tourist trips and tourist revenues worldwide (Cabrini 2003).

Getting the industry off the ground, quite literally, has meant considerable risk in developing the infrastructure for space tourism. This includes investment in vehicles. According to some accounts, Burt Rutan invested over $100 million in order to win the $10 million X-Prize. This was done with the hope that the vehicle would go on to far outstrip this in terms of revenue generated. It also includes investment in terrestrial and orbital facilities, as Bob Bigelow's hotel developments demonstrate. These are examples of money being siphoned off from primary circuits by previously successful businessmen and reinvested in a speculative new arena for the production of surplus value.

The feats of outstanding private entrepreneurship now being witnessed rely, however, on government support. This tertiary circuit investment occurs in order to stimulate the development of new primary circuits. The government of the state of New Mexico, for example, has financed the new $225 million Spaceport America. This in turn has attracted major investors to the area, including their 'anchor tenant', Virgin Galactic. The government has also assisted the space tourism industry through legislation concerning tax and safety (supported by the pro-space movement). Recent acts include the Invest in Space Now Act, the Zero Gravity, Zero Tax Act and the Spaceport Equality Act. The last allows the issue of tax-free bonds to those developing 'spaceports' in the US. Zero Gravity, Zero Tax means a tax-free window on profits made from space enterprise. The government thus encourages renewed investment and gets into space without any immediate calculable cost.

If plans are extended to actually landing and accommodating tourists on the Moon or nearby planets, a system of legalized private property rights beyond Earth will be required to protect investments. A system of legalized commodification will be needed for this kind of imperialization of outer space. The fact that 'space law' is under active discussion is a good indicator of that this process is very much under way.

Tourism and conspicious consumption

The possibility that those who can afford to do so would want to take a holiday to visit some very different place does not seem to require much explanation. It appears very much to be 'common sense'. But the question of its social significance is not that easily answered. One long tradition of sociological analysis of leisure time has focused on the way in which leisure time creates and maintains social

distinctions and identities, rather than on the sensuous experience of leisure. In his 1899 *Theory of the Leisure Class*, Thorstein Veblen (1973) examined the forms of 'conspicuous leisure' practised by an eighteenth-century leisure class who were freed from labour. It was argued that extravagant forms of leisure incompatible with the daily toil of the rest of society helped to maintain class distinction. Photographs of the conspicuous San Tropez holidaying of a new leisure class of film stars, musicians and sportspeople are now plastered all over tabloid newspapers and gossip magazines. For Veblen, the lower strata of society strove to emulate the conspicuous consumption, leisure and waste of higher classes. Once the middle classes caught up with the latest fashions and pastimes of the leisure class, the latter evolved new forms of leisure and consumption to set them apart yet again.

Tourism has since been subjected to the pressures and changes affecting most other industries. First, it has been increasingly 'McDonaldized' (Ritzer 2000). Principles of rationalization and scientific management applied to the fast-food chain have, at least since the 1920s, been extended to the production of a mass tourism. The original result, in the British case, was a 'Fordist' holiday. Typically represented by the 'holiday camp', it was a form of mass holiday production consisting of standard holiday experiences undertaken at fixed times of the year.

Leisure and identity

But, again like many other industries since the 1960s era, tourism has seen the continuing rise of 'postfordist', variant types of vacation experience being targeted at particular niches or sectors of the tourism 'industry' (Williams 2006). In particular, the production of holidays has been fused with aesthetic and cultural appeal to particular sectors of the middle classes, the aim being to make distinctive lifestyles and tastes in exotic places and throughout the year. The holiday 'industry' is therefore no longer merely 'industrial'. It promises distinctive lifestyles and adventures to people with different tastes and incomes. 'Adventure' holidays are one such niche. The American company Incredible Adventures offers space exploration as one of a number of thrilling exploits being created by a postfordist tourist industry, including swimming with sharks and skydiving. Campbell (1987) criticizes the one-dimensional focus on displays of wealth in Veblen, suggesting that leisure can be used to create and symbolize many different kinds of identity. How you holiday can be seen as one part of a much more reflexive project of creating the self in late modernity.

Whichever kind of tourism is consumed and participated in, the chances are that it will help make and reinforce a particular kind of social identity. As a number of sociologists have argued, people do not simply 'consume' holidays and images of holidays offered by brochures. They actively use this commodity, and its images, to literally make their 'selves' (Britton 1991; Crang 2006; Crouch 2006). Another form of 'circuit' is therefore involved here, one in which consumers are using purchased commodities to develop their aesthetic and cultural identities. It is well recognized that capitalism caters to the narcissistic personality type prevalent in

late modernity by offering consumer goods that claim to replace a widespread loss of identity.

> Consumption addresses the alienated qualities of modern social life and claims to be their solution: it promises the very things the narcissist desires – attractiveness, beauty and personal popularity – through the consumption of the 'right' kinds of goods and services. Hence all of us, in modern social conditions, live as though surrounded by mirrors; in these we search for the appearance of an unblemished, socially valued self.
>
> (Giddens 1991: 172)

Giddens is almost certainly wrong to suggest that literally all of us are narcissists searching for a sense of self. Rather, he is pointing to a certain tendency, one which particularly afflicts some classes of consumer. But the producers of commodities are recognizing these tendencies amongst the consumers and are producing new forms of 'aestheticized' or 'cultural' tourism (Lury 1996; Ateljevic and Doorne 2006; Oakes and Minca 2006). Space tourism forms part of this process, trips into space being presented by the space tourism industry as an ultimate aesthetic and spiritual experience, and space tourists confirming that they have made new persons out of themselves as a result of their experience.

Identity and capital

Class and identity are brought together by Bourdieu (1984). Tourism of all kinds can be analysed using what he termed 'cultural capital', a phrase referring to the form and level of education and upbringing that a person experiences. Bourdieu's work also shows how social and economic processes relate to individuals' identity. People, especially the middle classes, are able to exchange economic capital, or money, for cultural capital. The latter includes holidays offering not just sand, sea and shelter but nowadays a broadening of the mind, an uplifting of the spirit, an extreme experience and a confirmation of life's meaning (Goss 2006).

All this can be achieved, or so the tourism publicity assures us, via particular kinds of tourism. For some, particularly those middle classes with high levels of education and cultural capital, vacations might be limited to historic sites such as parts of France or mediaeval and Renaissance towns of northern Italy. For others, particularly the socially dominant classes in finance and allied employment, vacations might be less cerebral. These classes are more prone to celebrating 'body culture' in, say, the Caribbean or the south of France. They might also now include an adventure holiday, perhaps even to outer space. But typically, these classes with high levels of economic capital engage in both adventure holidays *and* the more 'cultural' type of tour. Indeed, their social dominance stems largely from their ability to sample any number of lifestyles and cultures, even if these are sometimes in contradiction with each other. On the one hand, for example, they are indulging in cultures of health and the body while on the one hand they are engaging in 'adventure' holidays which can be relatively dangerous (Savage *et al.* 1992). Those

with little economic capital but plenty of cultural capital will meanwhile likely dismiss those who are signed with Space Adventures for a suborbital flight as having plenty of money but no real 'taste'. The pleasure is simple sensual titillation (and is perhaps even infantile and irrational) rather than cerebral. Furthermore, the trip seems particularly extravagant during this phase when it is so expensive relative to other holidays. Cynically, they might ask if the high price tag adds attraction to the holiday as a conspicuous flaunting of economic capital.

As regards making class identities through tourism, there are some parallels here between contemporary space tourism and travel as it was created in the eighteenth century. The tourism experience was also then being made a way of improving the human 'self'. Wealthy people now circulating in outer space are the twenty-first-century equivalents to those undertaking the Grand Tour of Europe. Travel to far distant parts of Europe, again particularly northern Italy, was then seen by social elites as a means of self-discovery. Elements of the landed aristocracy and gentry attempted to improve themselves as they visited Classical ruins as part of the Grand Tour (Urry 2002). It was a civilizing, improving mission. Later, a Romantic version of this progress developed, one inspired by the Romanticism endorsed by Rousseau and others (Feifer 1985). The attractions became less a means of enlightenment through engagement with Classical culture and more a means of encountering new, more 'primitive' qualities. Travels, usually made on foot, were made in frightening, 'awe-inspiring' settings such as the Alps and the Lake District of Great Britain. Torrents, steep roads and rocks were actively sought out and visited, often at considerable danger. But these dangers were themselves seen as beneficial, allowing the development of a more fulfilled and spiritually robust self. The Romantics were trying to distinguish themselves from the Grand Tourists, making themselves men of the common people, rather than supporters of aristocracy. There are some parallels here with those tourists now engaging in dangerous outer space travel. But the latter are probably trying to distinguish themselves from the common people rather than trying to identify with them.

Enlightening and frightening sights and experiences have again now been incorporated into mass tourism, one of the biggest industries on Earth. Fear and experience have been democratized and tamed to appeal to those without substantial funds or a serious desire to risk their lives. Over the past two hundred years, railways, ships and budget airlines have opened up the same places of unspoilt nature and society for the previously subordinated classes. Expanded selves are again to be made via touring the world but now on a mass scale. Making a new, or recovered, self by long-distance travel is now 'common sense'.

The new Caribbean

But, as subordinate classes buy into the myth of a Romantic reconnection with nature via tourism, the myth itself starts to go sour. The actual experience of mass travel again does not match the Romantic vision originally described by Wordsworth and now promoted by the travel brochures. This is a major problem for the dominant social orders with their high levels of economic capital (Urry

2002). They first flee to Mustique or some other Caribbean island where a *really* authentic experience can be gained, one regenerating a sense of 'awe' and 'mystery'. Failing that someplace else must be found. Once there is no awe and mystery left on Earth, outer space is due to be the new Caribbean. Outer space is therefore the next, even final, stage in this game of social leapfrog; elites identifying themselves *as* elites by travelling somewhere no-one else has been. As Phillippe Starck, co-founder of Virgin Galactic and designer of SpaceShipTwo, puts it: 'There is nothing new to see at the moment, and it will be replaced by something more conceptual like this' (Baker 2006: 27).

Selling space tourism

Many contemporary visions of space tourism remain somewhat fanciful. A modern holiday production system of this kind will entail a wide range of intermediaries such as travel agents, brochure producers and the like, whose job is to invent new kinds of exotic destinations and to persuade people into purchasing new 'authentic' experiences (MacCannell 1976; Britton 1991; Urry 1992, 2002; Paradis 2006). These intermediaries are not yet fully in place, though the first stirrings are apparent in the publicity of the small number of companies so far involved. The visions of space tourism currently on offer are an example of what Lefebvre (1991) calls 'abstract representations', those made by dominant elites. People's perceptions and plans for outer space tourism are obviously very dependent on such images since very few of us have had the benefit of direct experience of living and working in outer space. How people actually perceive and behave in relation to an 'outer spatial fix' will ultimately depend not just on these representations but on space tourism as experienced, shared and remembered. But powerful ideas and myths about society's relations with the cosmos are advanced by dominant elites when describing this industry with their 'abstract representations'. This brings us back to question of hegemony.

Hegemony might appear to be a contemporary set of beliefs, but it can be shot through with much older ideas, traditions and ideologies. Indeed, reversion to old and familiar ideas helps to gain widespread popular support. As regards society's relations with the cosmos, dominant forms of hegemony use, depend on and reinforce a very ancient and very powerful myth about what the universe actually is and how human society relates to it. It is a myth encountered in many early societies and their theologies, in which the cosmos is a zone of peace and God,one entirely separate from that of everyday existence with its pain, insecurity and suffering. We discussed some of these ideas in Chapter 1.

The result today is an uncomfortable, even contradictory, form of hegemony. On the one hand, it is recognizing an essential difference, that between ourselves and an external, literally universal, 'Other' containing 'life's great secrets'. At the same time, these qualities and secrets are to be understood by penetrating and actively humanizing it. The Enlightenment instigated the removal of God from the heavens. Now humanity is slowly starting to take his place. The pre-

Enlightenment notion of the perfection of the heavens endows this mission with special significance for those able to make the trip.

The space tourist as pilgrim

The emergent hegemonic 'common sense' of society's relation with the cosmos can be illustrated with an analogy often used in the sociology of tourism. The parallel made is between a tourist trip and a religious pilgrimage (Shields 1991; Urry 2002). The analogy becomes even more acute when we turn to tourism in the cosmos. Here people are touring no less than the realm of harmony and God. There are three phases to the space pilgrimage.

1 People separate themselves socially and spatially from the Earth. On the one hand, everyday life is, for many, relatively unhappy and alienated. People are estranged from one another and they lack a sense of connection with one another and with external nature. Their work lives are so rationalized and bureaucratized that there is little sense of mystery or spirituality left in their lives. They are, to use a word employed by Weber, 'disenchanted' from the highly rationalized world of which they are part. Marxist theories of alienation of the self also point to estrangement, both from other people and from external nature. On the other hand, they have heard experiences of pilgrimage from others who have returned. Leaving Earthly society for the unknown entails some danger and a removal from social relations and a remaking of the self. The abstract representation of a life-transforming, incredible trip are, in combination with the tales told by returning tourists, sufficient for the space tourist to risk undertaking the trip. Capitalism, while generating alienation and disenchantment, is capable of providing apparent cures to these same problems.
2 With the tour in outer space we encounter the dominant, hegemonic view of the cosmos. In outer space the individual is detached from everyday life, removed from time, place and social structure (Urry 1992, 2002; see also Boorstin 1964; Turner and Ash 1976). It is a zone of 'liminality', one in which 'people are in transition from one station of life to another' (Shields 1991: 83). It is 'the experience of a lifetime', the very opposite to the Earthly unhappiness and chaos from whence they came. The tourist pilgrim has escaped from the rationality and alienation of everyday life to enjoy a spiritual or religious experience. He or she is 're-enchanting' his/her life with a sense of awe and mystery. Note that Dennis Tito meditated to opera while watching the Earth from the International Space Station. They have found something apparently authentic which was missing in their daily lives. Other extraordinary adventures are on offer as tourists swim or fly with the aid of artificial wings in a space hotel. These activities are feted as changing the tourist's relationship to the universe and the self, as we discuss further below.
3 Coming home also entails major danger and further 'excitement'. But on return the space tourist is likely to be celebrated as a charismatic hero, as was Dennis

Tito. He or she will acquire 'celebrity status' and 'the respect and admiration' of friends and relatives (see Box 5.1). Having engaged with this liminal zone beyond society and detached from time and place, the tourist pilgrim will not be exactly the same person. The tourist pilgrim has been transformed in some way. Having enjoyed something genuinely authentic, something playful and/or non-serious, something dangerous and something with real or quasi-real religious significance, she or he is a new, improved, person (see Heelas 1996). The 'next generation' of space tourists will be inspired. Society's deteriorated and impure state will be improved.

The overview effect

In his book charting the experiences of astronauts, *The Overview Effect*, Frank White (1987) reports on astronauts' experiences of being in space. His concern is with the effect that looking back on the Earth from space has on one's perspective on the planet and on the self. The overview effect rests on a new appreciation of how small and precious the planet is, and on observing a world without political boundaries. As above, the experience of travelling into space has supposedly profoundly positive effects on the self.

There is a real tension in White's writing, which most probably reflects contradictions within the experiences of astronauts. On the one hand, he presents these new insights as steps towards humility. This can be seen as part of a historical de-centring of the planet, humanity and the self. It is often recognized that Copernicus and Galileo, who were the early contributors to the scientific revolution pre-dating the Enlightenment, contributed to this progressive de-centring. They showed the Earth was not the centre of the universe. Darwin de-centred humanity by showing that *Homo sapiens*, along with all organic beings, is probably descended from one primordial form or creature. And Freud demonstrated that humans were not even masters of their own psyche (Freud 1973b; Craib 1998; Best and Kellner 2001: Tarnas 2006 provides a slightly different account).

On the other hand, White seems more than well aware of the ways in which visiting outer space provides a sense of empowerment. Although rejecting the idea that space travel is inherently a spiritual experience, he acknowledges the power of the myth of the heavens as the dwelling place of God, and refers to the 'demi-god' status of astronauts and cosmonauts based on their ability to travel to the heavens. Arguably they have been made the new intermediaries in the Great Chain of Being. White talks about the trip being like a death and rebirth, marking a transition of the self. His desire to write the book came from his own feelings when flying over Washington DC and thinking how preposterous it was that the tiny beings down there were making decisions for him. It was 'like ants making laws for humans!' (White 1987: 3). Clearly he envisages the overview effect as aggrandizing the self, this clearly being more a part of Space Adventures' advertising campaign than is humility (see Box 5.1). White most definitely sees space travel as a positive thing for the self and for society, but in order to understand what is going on we need to reconcile these two very different elements.

Box 5.1 Publicity for Space Adventures, Ltd. Source: Space Adventures, Ltd.

Space Adventures, Ltd. is the only company in the world currently operating commercial orbital spaceflight and will be the first to launch clients using a new breed of lower cost suborbital spacecraft currently under development worldwide.

Whether your desire is to conduct science experiments, achieve what few have done before or simply enjoy the feeling of weightlessness while taking in the spectacular view, Space Adventures is your opportunity to discover one of life's greatest secrets: the wonders of space.

Seize the moment, push yourself farther and higher than ever before, and join one of the most elite groups of individuals in history.

Reasons you might enrol in Space Adventures' spaceflight programs:

- Live the experience of a lifetime and create memories that you will always cherish
- Invest in the future of spaceflight
- Earn the respect and admiration of your colleagues and home nation
- Conduct experiments aboard the most advanced and unique laboratory ever constructed
- Be one of the first 500 people ever to go into space
- Achieve worldwide celebrity status
- Inspire the next generation of space explorers

Journeys into outer space and journeys into inner space

Another possible lens through which the journey into space and back could be understood is Jung's (1968) myth of the hero. This is certainly compatible with the tourist's pilgrimage and may help explain some of its appeal. It is impossible to conclude for the moment, however, precisely what significance the trip has for those able to make it, as we have not been able to conduct such research ourselves. This remains a speculation on the way in which the journey into outer space could be read as a parallel to an internal, psychic journey. For Jung, myths were particular cultural manifestations of underlying universal 'archetypes': shared representations of the unconscious. For him, all hero myths seek to express the human psychic journey, charting the emergence of ego consciousness in adolescence and eventually death and a return to the womb to be reborn in immortal form. The passage often involves a period of separation and wandering, symbolizing a longing for the lost object (classically the mother from whom the infant must separate) that cannot be possessed.

This archetype could be used to describe the 'universal' appeal of space tourism. Earth is often referred to in mythology as a 'mother', and is nearly always female, as it is in Lovelock's concept of Gaia. In this sense, a journey away from Earth into space represents a universal need to break away from the mother and achieve transcendence and individuation, a term used by the psychoanalyst Margaret Mahler (Mahler *et al.* 1975). Keller (1986) explores how destructive this process is, and yet how central it has become, in the modern world. This particularly applies, she argues, to men. White agrees with the use of the mother metaphor for Earth (ibid.: 113), and provides a striking example of it from the astronaut Russell Schweickart: 'I viewed my mother quite differently when I was in the womb than I did after birth. Afterwards, I was able to take more responsibility for her.' This clearly expresses the theme that travel to space symbolizes a process of individuation whereby the infant is able to recognize the mother as a separate entity, and, furthermore, one towards whom the adolescent feels a certain (possessive) responsibility.

Return to the Earth then becomes a much desired return to the womb, a 're-entry' to use the space terminology. But, as White's book demonstrates, it is also a rebirth of a very changed person with a different, more complete perspective (note that White himself refers to the moment of take-off and the fear associated with it as a death and rebirth in space – a slightly different interpretation). Furthermore, as the Space Adventures publicity stresses, this new self becomes celebrity, one way in which immortality can be achieved according to Jung.

Jung's concepts of archetype and myth explain popular and recurrent stories as expressing certain universal psychic processes. A positive view is often taken of them. They are less able to explain why in particular societies some people are driven to pursue fantasies to the exclusion of other needs and wants, and possibly to the destruction of the self. It is Freud's theory of the psyche that is much better able to comprehend these fantasies and their historical nature.

Pro-space activism and the psyche

Future space tourists may go to space because it is sold as a pilgrimage, a way of constructing a new and improved self or a hero's journey. They may even go simply as a demonstration that they can afford the latest 'exotic' extravagance. But in the pro-space movement we encounter a group of people, mostly members of the American technocratic middle class, who have been consumed by the fantasy of space travel from an early age. In recent years there has been a much more open statement from pro-space activists that they want to go into space themselves. Early groups rarely expressed that wish openly. The pioneering activist Barbara Marx Hubbard (1989) admits she found herself quite shocked when after several years of advocacy she realized she had wanted to go into space personally the whole time. There were exceptions, however. In 1984, the World Space Foundation adopted the slogan 'I want to GO' (Michaud 1986: 103). New groups have become even more explicit about their ambitions. The Artemis Society supports a privately funded colonization project, the Artemis Project, which advertises that 'you can come too!'

The feasibility of this desire has been bolstered by the burgeoning private space tourism industry, which offers customers the chance to visit outer space as a paying tourist. Sections of the pro-space movement have turned their focus so much towards commercial space tourism that a distinct 'space tourism movement' has been identified (Ashford 2002: ix; Spencer and Rugg 2004). Spencer and Rugg chart the rise of this space tourism movement. It was inspired by visionaries like Kraft Ericke and G. Harry Stine and centred around the Space Tourism Society and a small band of space entrepreneurs and engineers (like Tom Rogers), but now increasingly encompasses other pro-space organizations. Early space tourists like Dennis Tito can be considered a part of this movement too. Tito was desperate to make the trip into space long before space tourism became possible, and was active in trying to make it a reality. In this sense he is quite different from future tourists who may decide to go to space more or less whimsically once the industry is mature.

A narcissistic journey

Previously, we have shown that the economic interests and value commitments of pro-space activists are insufficient to explain their involvement in the movement. We have argued that members of the pro-space movement exhibit a form of adult narcissism (Ormrod 2007). In the absence of any other socially imposed sense of self, they are in pursuit of the kind of self experienced during the stage of primary narcissism. This is a position of subjective omnipotence in which the whole universe is experienced as an extension of the baby's self (Grunberger (1989) refers to this unity of baby and mother as the 'monad'), orienting around it and meeting its every need. Fantasies about life in a spacefaring civilization can be read, according to this, as manifestations of unconscious narcissistic conflicts surrounding the desire to return to such a state. As explained in Chapter 2, various theorists have

identified a culture of narcissism pervading the late modern developed world (e.g. Lasch 1979), a trend which is capable of explaining the timing of the movement's emergence and the type of people drawn to it.

There is clearly a theme of transcendence in pro-space fantasies (Ormrod 2007). Travelling to space does, as previously suggested, entail a separation from social life and 'mother' Earth. It also aggrandizes the self, reflecting the omnipotence of primary narcissism. Abercrombie and Longhurst (1998: 82), following Berger (1972) and Debord (1994), have suggested that the tourist's gaze commodifies and consumes its object – it places the seer in a position of power over the seen (see also Urry 2002). Activists also referred explicitly to their wish to see the Earth so small that it could be covered by their thumb. This could be read as a desire to see the mother 'under the thumb' and subservient. Yet fantasies about being in Earth orbit also retain strong themes related to the state of primary narcissism. For one thing, being weightless in space is often said to be a regressive fantasy related to the feeling of unity experienced not just in the first few years of life, but in the womb (in White 1987: 23; Bainbridge 1976: 255). The fantasy of having 'zero-g sex' (sex in zero-gravity conditions) combines this weightlessness with the fantasy of sexual union, or reunion with the mother. More than this, many activists anticipated a new sense of unity with the Earth, not only upon returning to Earth, but whilst still in space, observing it as a whole of which they feel part. White argues that it is 'the ultimate journey from part to whole' (1987: 3). So travelling to space and looking back at Earth might seem like a journey of transcendence and separation, but it also denies the break from primary narcissism. The object is at once lost, even discarded, and at the same time consumed and brought back into one unified being with the self. Kleinian psychoanalysis is well aware of the often conflictual fantasies that surround separation from the mother. Activists' fantasies oriented towards objects in outer space, rather than those directed back towards Earth, seem to manifest themes more directly related to omnipotence and power. We return to these in the next chapter.

But a new kind of cosmic society and its emergent hegemony is not made by enthusiasts alone. The new kind of hegemonic bloc combines the somewhat eccentric dreams of space activists and tourists with the multimillion-dollar aerospace and tourism businesses as well as, perhaps most importantly, the major financial interests funding the outer spatial fix. Governments themselves are at the centre of this bloc. They will not be directly paying for large-scale tourism into outer space but they will be providing legal frameworks and guarantees of profitability, not least via the militarization of the supposedly 'private' aerospace and defence industries.

The public and space tourism

The most obvious finding from our MO data is that, contrary to some market studies for space tourism, and correcting the picture received from studying pro-space activists, the majority of the MO writers did not want to go into space. Gender does not have a very significant effect on the answer, nor does age seem to have a clear

bearing. Perhaps unsurprisingly, the old are those less likely to want to take a trip into space, although it is almost as unappealing to the young. Occupational class does not seem to have a massive impact, though there is a definite trend towards those in higher classes being more likely to say they do want to go into space. If the results suggest anything it would be that those least favourably inclined towards a trip into space are the old, women and those in working-class jobs. Those most likely to say they would enjoy such a trip are the middle-aged, men and those in professional occupations. This seems to support the idea that the fantasy of taking a trip to space probably appeals most to those who are more likely to belong to the culture of narcissism. It is to those people most used to being able to control and consume that a visit to outer space promises most. On the more marginalized MO respondents, a much more 'realistic' picture of space tourism has been imposed.

However, amongst those who said they would like to go into space there were three main reasons forwarded for wanting to do so. The first is the experience of weightlessness. As one man said, it would be fun simply to 'float around' [A883]. As mentioned above, this is also common amongst pro-space activists. The second, again found amongst activists, is the idea of seeing the Earth from that far away, though none of the respondents went into much detail on this. The third reason, not given as frequently by activists, is to see and wonder at space. Female writers in particular talked about seeing the blackness of space outside the Earth's atmosphere, of being able to see stars undisturbed by light pollution as well as nebulae, galaxies, etc. In contrast to the majority of pro-space activists, there was a general intent amongst the MO writers to observe space rather than do anything whilst there. However, one elderly male writer, who had been on an aerobatic flight for his eighty-fourth birthday, did give one rather narcissistic-sounding reason why the new perspective was appealing, suggesting the pleasure comes from again becoming the centre of things:

> I've noticed a similar sense of being at the centre of things when sailing; look at a small yacht from the cliffs and it looks like a lonely speck on a vast sea. Be on that yacht and it is your world – everything across the water is 'other'. I feel sure that is how I should feel if I was in a spacecraft.
>
> [B2240]

This fantastic aspect of taking a trip into space was mentioned by other writers, who importantly recognized that this was a fantasy associated with their childhood. One man admitted 'I did fantasise about this when I was young, but not now' [B1426]. Another middle-aged man, a local authority town planner, said that to do so would be the 'realization of the dream of a small boy in Gloucester in 1962' [C3006]. This childish fantasy has been balanced by a strong sense of reality by many of these writers. As one man says, 'as much as I like the idea of going into space, my fantasies are tempered with the knowledge of the realities' [G3025]. This tempering to reality is absent in most pro-space activists.

One of the realities acknowledged by those who weren't keen to take the trip was of the dangers involved and the bravery needed to overcome them. Though

most obvious in the accounts of older women, this was even present in the accounts of young male writers:

> I personally would not like to go into space. I think it would be extremely exciting but I'd be worried about the risks and I don't really like change; I don't think I could stomach such a different experience.
>
> [B3133]

The problem of not having 'the right stuff' deterred a lot of respondents, even those who would in principle have liked to have gone. We could bring back Bourdieu's understanding of different types of capital and different tastes in holidays amongst different social groups here.

Those that did not admit to being too frightened by the thought often mentioned the conditions of the flight as being too uncomfortable to make it enjoyable. Several mentioned the claustrophobia of being in a spaceship, others the boredom of the flight. One man joked:

> I hope it will be better run than our present transport systems – no one will go to Mars if you have to spend six hours on the Moon, your luggage goes to Andromeda and a small child throws up in your helmet.
>
> [H3070]

There were also many who believed the experience of being in space itself would be boring. Asked if he'd like to go, one older man said humorously, 'No. There's nothing to do out there. That's why they call it space' [H1543]. One woman also doubted she would get much out of the trip, saying she would not have anything useful to say when she got home, except 'it's big' [C1191], though part of this seemed to stem from her feeling that she was not personally equipped to make the most of the experience.

Some respondents justified their devaluation of the experience by contrasting it to the more beautiful landscape they could enjoy on Earth:

> Why would anyone want to live in outer space, no beautiful countryside. And all the other delights I can savour living in Britain . . . No, I wouldn't go into space, not for a million pounds, what can be better than walking on the South Downs or in Wharfendale, or a visit to the Bluebell Railway; not much.
>
> [A883]

There was only one respondent in our sample who objected to personal space travel as being the wrong thing for humanity [G3201], in contrast to the more common ethical complaints about space development and settlement. There were just a couple of writers who discussed religious objections to it: 'Perhaps it's because my mind links the wonders of space with the thoughts of God's kingdom. That is what I was taught to believe as a child, that only God was in heaven' [H260]. This woman demonstrates, in contrast to the materialistic conceptions of the

universe that abound amongst pro-space activists, a pre-Copernican understanding of a universe in which God is literally located in 'the heavens' of outer space, and objects to this contamination of the heavens by man rising above his estate. Another woman said that she would enjoy going into space to look down on Earth from a different perspective, but that she would do that anyway one day, 'from Heaven' [C2677], again suggesting some parallel between the two experiences. Some have suggested this is a confusion of many pro-space advocates wishing to achieve a God-like position. Extending our argument about narcissism, it could even be argued that the omnipotent fantasy of entering into God's realm is a manifestation of the psychoanalyst Ernest Jones' (1913) 'God complex'. Fulda has argued that pro-space groups confuse outer space and heaven (in Bell 1985a: 98). Here, however, this is the basis of an objection to mankind ascending into space.

It is interesting to note that, for all that is under way with humanity's humanization of the universe, the majority of people (or MO writers at least) have no burning desire to travel into space, the very idea being for some one of their worst nightmares [B1771]. The majority of people would be happier leaving this to those braver than themselves and are content to appreciate the wonders of this world. It is nevertheless difficult to detach individuals' sense of braveness and 'right stuff' from their physical and material circumstances, and the various forms of capital that would enable them to make such a trip.

Summary

Daydreaming and the search for pleasure or authenticity in some kind of 'other' world are central not just to tourism but to modern consumerist capitalism as a whole. This is a point Campbell (1987) makes, though he does not take a critical stance on the matter. Daydreaming about space, and indeed actually achieving these dreams in reality, can be seen as just another feature of consumerism infecting the whole of our lives. Daydreaming and space travel are, on the one hand, an 'escape attempt', one in which people are proverbially or actually jetting away from social monotony and from themselves (Cohen and Taylor 1992). But they simultaneously entail being drawn towards something that promises a revived sense of self and relationship with the universe. Space tourism offers this reconnection as part of an 'outer spatial fix'. As Urry argues, 'to gaze as a tourist is to insert oneself within a historical process and to consume signs or markers of particular histories' (2002: 184). The nature of the gaze back to Earth of the space tourist will depend on whose gaze it is and the kind of society being created both on Earth and in space. For the foreseeable future this is likely to be the gaze of those who are socially, culturally and politically the most powerful.

6 Industry and empire in space

About this chapter

The humanization of outer space is at an early stage and attempts by social scientists to predict the future have almost always ended in failure. On the other hand, there are some important straws in the wind, indications of how society's relations with the cosmos are changing. To an increasing extent capital is setting the pace, displacing governments and using outer space for commercial purposes. It may well be used, for example, as a means of harvesting energy for the Earth. It is also increasingly envisaged as a source of materials for investment in new circuits of capital. In the more distant future, investments may be made in outer space colonies. Science fiction and forward-looking space scientists give some indication of the nature of these developments. This chapter is in part speculative, but there is also a sense in which the proposals for humanizing the universe are in themselves interesting illustrations of the way in which humanity imagines its future. Science fiction shows, for example, outer space being used as a refuge from disasters, or alien life confirming the superiority of Western democracy. But a number of sociological theories offer better insights into the future humanization of the cosmos. 'The Risk Society' is being made cosmic, with projects supposedly beneficial to society actually generating considerable potential for disaster. Some authors borrowing from Marx might interpret the colonization of outer space as an attempted resolution of 'the second contradiction of capitalism', with capital despoiling the natural environment to such an extent that it searches for new materials 'off-planet'. The spread of society into an external nature far beyond the Earth also raises ethical issues which already form part of a wider debate. What right does humanity have to model the cosmos in its own image? Finally, this chapter raises the possibility of a 'cosmic consciousness' taking the form of an individualism which envisages the whole of the cosmos as within its reach. Signs of this subjectivity are already in evidence and we predict that, unless tempered, it will become a central feature of a 'cosmic society'.

Outer space as object

A recurrent theme of this study is that of outer space being made an object rather than a subject by some classes of people. In the 'primitive' societies such as those

examined by Durkheim or in many of the older civilizations such as Ancient Egypt, the universe is seen as a subject: a force dominating and controlling affairs on Earth. Such societies were made to conform to the pattern of the cosmic order, with the social hierarchy reflecting, and being linked to, the cosmic order. In many instances these links are formalized through religious and spiritual architecture, temples and churches. These are the points of contact between societies and a dominating cosmos, with priests and kings being allowed special access (Krupp 1997).

But visions of a universe subjecting society have undergone major change. The change in attitude started with the European Enlightenment, though only now are the full implications of Enlightenment thought about the cosmos being fully realized. To an increasing extent the universe has been envisaged as an object, something to be constrained, managed and used towards human ends. Such a view is often equated with the philosophy of Francis Bacon (1561–1626). We saw in Chapter 1 the ways in which an enchanted universe gave way to a material universe within the reach of humanity construed by a new cosmic elite of Enlightenment philosophers and scientists.

Nature, Sir Francis Bacon argued, can be in three states: at liberty, in error or in bondage (Merchant 1980). The first state is one that might have been recognizable to the philosophers of Ancient Greece. Here nature is managing herself as a living, growing, self-making being. The second state is one in which nature acts perversely, damagingly to human beings and therefore needing control and management. The third is one in which humanity interrogates nature, controls and bends it to the wishes of human society.

Though Bacon could not have been aware of it, his view foreshadowed the prevailing attitude under later industrial capitalism. The gendered nature of Bacon's discussion is of course very evident: examining and constraining nature is made equivalent to the management of women. Feminist philosophers, including Plumwood (1993), have emphasized that contemporary power is exercised via a series of social constructions. These take the form of dualisms between superior and inferior realms. Some of the most familiar of these dualisms are culture/nature, male/female, mind/body, self/other, reason/emotion. The first half of all these pairings is associated with masculinity and dominance whereas the second half is 'inferior' and associated with nature. We might now add 'society'/'universe' with the universe as an inferior object to be colonized and subjugated.

Our point is that 'the heavens' are now being envisaged, at least by dominant social orders, in a form very similar to Earthly nature. They too are being made into Baconian objects, as means towards ends. They exist to be used, to be lived in, to be worked on and to be domesticated and dominated by society. Such a view has long been prevalent in human society, especially Western society. But now that access to outer space is becoming feasible the same values and orientation are being extended to outer space by extremely influential classes of people. The exploitation of space continues apace. Mary-Ann Elliott, for example, is a 'space broker' working in this sector. She has recently announced that 'over the last five years we've grown 1061 per cent'. Jim Benson is another space broker. 'Natural resources in space', he informs us, 'are on a first come first served basis' (ABC Australia 2005).

Privatization and commercialization of space

Private corporations have always been used to make and maintain space activities funded by the US government, but there is a trend towards increasing private sector participation, especially through new competition schemes. This process is part of a much more general trend that has been experienced by almost all societies since the 1980s. Now, as we have seen, it is being extended to the military and to surveillance. Previously state-run activities are being contracted out to the private sector. But, furthermore, space activities are now being envisaged as profitable in themselves, and so space activity is now becoming increasingly commercialized as well as privatized. This is another stage of Luxemburg's restless search for further profits or of what Harvey (2003) calls 'accumulation by dispossession'. Using outer space as a source of raw materials is one suggestion under very active consideration. Harnessing the Sun's rays with solar panels in space and beaming the energy to electricity grids via Earth-bound receivers is another kind of outer spatial fix under discussion, though it is not seen as profitable within the next twenty years. In the more distant future humanization will further encroach on its 'outside', making planets into zones appropriated for the further expansion of capitalism.

Materials from outer space

Outer space is now increasingly envisaged as providing inputs to the Earthly production process. It is, for example, seen as an unlimited source of metals for human use. Private companies have also been established working on the research and design for asteroidal and lunar mines. This is discussed in a number of books elaborating the commercial potential of outer space (e.g. Lewis 1996; Zubrin 1999; Hudgins 2002). The expansion of industry into space has been referred to by Harry G. Stine (1975) as the 'third industrial revolution' and by Krafft Ehricke (1972) as 'the benign industrial revolution' (as there were supposedly no environmental issues associated with it). Asteroids are receiving special attention (Lewis 1996). The Moon might seem an obvious first target for the acquisition and mining of resources, but asteroids are currently seen as a better bet thanks to their metallic density. They have three hundred times as much free metal as an equal mass taken from the Moon. Metals found on the Moon are just the dispersed debris from asteroids. In the mid-1990s the market value of metals in the smallest known asteroid, known as 3554 Amun, was about $20 trillion. This included $8 trillion worth of iron and nickel, $6 trillion worth of cobalt, and about $6 trillion in platinum-group metals (ibid.). As and when it is possible to launch thousands of people into orbit and build giant solar power satellites, Lewis argues, it should be possible to retrieve this and mine other asteroids to supply Earth with all the metals society will ever need. Extracting valuable helium-3 from the Moon is another possibility. One metric ton of helium-3 is worth $3 million, and one million tons could be obtained from the Moon. This has led Lawrence Joseph to question in a *New York Times* article whether the Moon could become the Persian Gulf of the twenty-first century (cited in Gagnon 2006). Needless to say, we need

to remain cautious in accepting these highly optimistic forecasts. Even the most enthusiastic pro-space activists see materials in space as useful only for building in space. The cost of returning materials to Earth would add so much to the cost of extracting them that this would never be financially viable.

Research is also being conducted, however, into the production of fuel for further humanization from space materials (Zubrin and Wagner 1996). NASA has recently given the chemical engineer Jonathan Whitlow a grant of nearly $50,000 to develop computer models that could lead to the production of propellant from the lunar regolith or rock mantle (SPX 2004).

The issue of ownership of means of production is again vitally important here. United Nations legislation and the most optimistic proponents of space exploitation assume that space resources are infinite and there will be enough for everyone to own plenty of space. Considering the immensity of space as a whole, this is of course true. But it is overlooked that the nearer parts of space are those which are most profitable and viable to exploit. In reality, the part of space that is not yet owned and exploited will always become further and further from the Earth, and as this happens investors will need to be increasingly wealthy to afford to exploit it.

Solar energy

Outer space is also being seen as an unlimited source of energy for industrial and domestic production. Solar panels are already allowing electricity to be generated in outer space. The International Space Station provides itself with around 80 kilowatts continuously from an acre of solar panels. The principle can in theory be extended to cover much larger satellites generating huge amounts of electrical power (Macauley and Davis 2002). A further suggestion is that this could be converted to microwaves and beamed to Earth via laser beams, providing electricity with no greenhouse gas emissions or toxic waste of any kind. A long-standing dream is for Earth's power to be projected directly from space, 'simultaneously providing a large profitable business and dramatically reducing pollution on Earth' (Globus 2005). Solar panels in space are never obstructed by weather conditions and benefit from the greater intensity of the Sun outside Earth's atmosphere. If there is a desperate demand for electricity, energy companies could stand to make substantial profits; the station receiving the laser beam would become a new Middle East! On the other hand, they would be transmitting such energy back to Earth via giant laser beams, a prospect likely to generate major risk, especially for those Earthlings near to the point of reception.

The idea of using satellites for harnessing solar power was introduced by Glazer (1968), and became central to Gerard O'Neill's space colony plans discussed below. But we need again to remain cautious. The main criticism is the expense of the electricity they would produce. There are serious questions about its profitability, at least in the short to medium term (Macauley 2000). Those who do not write off the idea completely believe that it will become profitable and viable and may actually happen fairly soon, though requiring some form of private–public

partnership or World Bank funding (Collins 2000; Kassing 2000; Woodell 2000). But this will only be at the point when the unit cost of electricity produced by Earthly power sources rises above the unit cost of satellite solar power. According to many estimates this will not be until reserves on Earth are much more depleted. Only then will this particular outer spatial fix become profitable. If it were ever to happen, the energy produced would be extremely expensive and, because of the massive investment it would require, would very likely be monopolized. However, it can be argued that it will simply never be viable because it is cheaper to produce renewable energy on Earth than it would be in space. One commentator (Launius 2003) outlines the argument that equivalent electricity could be produced by covering a section of the Sahara in solar panels, and it would be a great deal cheaper, safer and easier to maintain (Collins (2000) disagrees). To Launius, outer space collectors of solar power look like an excuse for a space programme rather than a legitimate solution to energy problems.

So it is advisable to again be cautious about much of the highly optimistic publicity surrounding the use of solar power for Earthly needs. A study of representatives of the energy industry and of industry concluded that, for the next quarter of a century at least, conventional electricity generation in both developed and developing countries will be more than adequate to deal with demand (Macauley 2000).

Colonization

The contemporary humanization of the cosmos can be seen as prefiguring the human colonization of outer space. Certainly this is a central theme in space fiction and popular culture. It is usually traced to Hale's 1869 short story 'The Brick Moon' (see Hale 2002) (though *voyages* to the Moon were described as early as the second century by Lucian of Samosata, according to Michaud (1986), and the journey of the soul to the planets or stars is a theme of many world religions). It was developed more seriously at the beginning of the twentieth century by the Russian Konstantin Tsiolkovsky, and in the 1920s by the British physicist J.D. Bernal. Space colonization was then popularized by 1940s/1950s science fiction and by Gerard K. O'Neill in the 1970s/1980s. Bernal's design was for a spherical colony orbiting in space measuring some 16 kilometres (10 miles) and housing some twenty to thirty thousand inhabitants. The Sun's energy would be harnessed by such globes, there being no limit to their numbers. Almost half a century later, Gerard O'Neill used the same idea for his 'Island One' space colony. The spheres were only 500 metres in diameter and, rotating twice a minute, they would generate a gravity the same as that on Earth (O'Neill 1974) (see Figure 6.1). O'Neill took one of his most famous ideas from a mathematician, George Hazelrigg, who suggested that two of the 'Lagrangian points', L-4 and L-5, would be good places for a space colony as the Earth and Moon's gravitation fields interact there in such a way that a colony placed there would remain stable. What O'Neill did differently was to work out a feasible plan using current science and technology and to work out the costs mathematically. His innovation was coupling the colonization idea with satellite solar power.

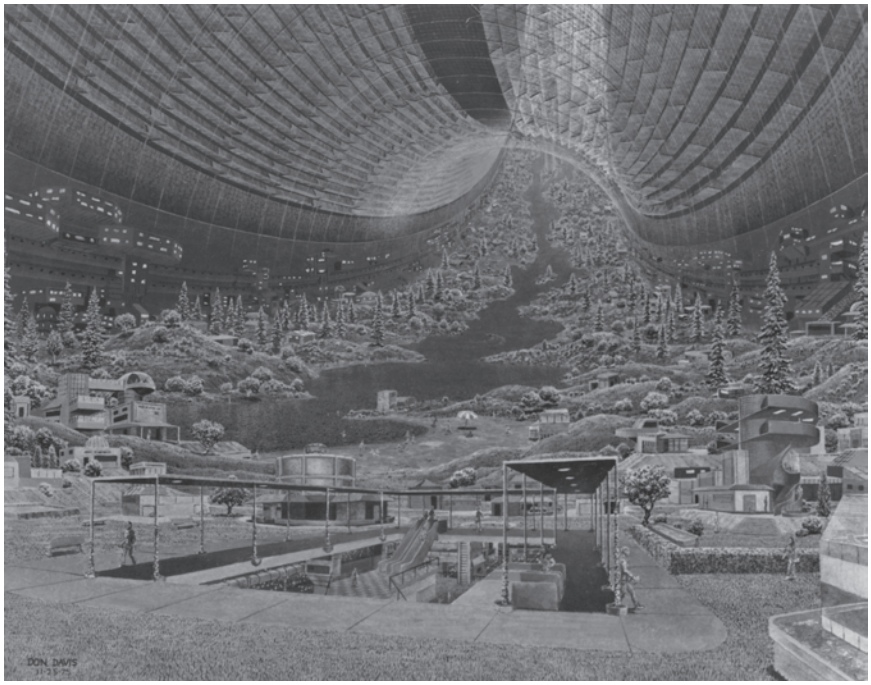

Figure 6.1 Artist's conception of a Bernal space habitat by Don Davis. Source: Space Frontiers.

O'Neill also linked his colonies with a revision of the 'limits to growth' thesis. In 1972, a study commissioned by the Club of Rome, *The Limits to Growth*, concluded (following the concerns of Robert Malthus in the late eighteenth century) that if the current exponential increases in population, consumption of resources and pollution continued at the same rate then the limits to growth on Earth would be reached relatively soon – within the next one hundred years – at which point there would be a sudden decline in population and industrial capacity (Meadows *et al*. 1972). O'Neill's revision was not accepted immediately, but after a successful, and now legendary, conference at Princeton in 1974 and a seminal article in *Physics Today* (O'Neill 1974) his ideas began to find popular support. In 1989, he published *The High Frontier*, which was to replace older books like Lasser's (1931) *The Conquest of Space* as the bible of space colonization. Although O'Neill himself was not the instigator, the L-5 Society was formed by followers of O'Neill dedicated to making his plan a reality. Often utopian dreamers, these visionaries were inspired by O'Neill to think that their dreams could become a reality. Many of their arguments *why* this should be done still inform today's pro-space movement. Arguments about the resources and living area available in space, the value of spreading life and civilization, etc. can be traced to this era. These groups, though founded on plans that would supposedly be profitable, still put much faith in NASA to achieve them. Recently, private colonization plans such as those of the Artemis Society have been developed.

But it is little appreciated that the colonization of outer space has already started with the International Space Station. Here are living quarters for human beings. And here experiments are being conducted on the effects of gravity loss on human beings and other species. George W. Bush's Space Exploration Initiative includes plans for a permanent lunar base manned in six-month shifts. Other still less exotic forms of humanization are already well in place. We have already encountered humanization in the form of militarization and, via satellites, the surveillance of society and broadcasting information and propaganda. It now seems clear that this process is to be extended, with outer space being envisaged as a source of energy and materials. In the longer term the 'terraforming' of nearby planets, making them into environments suitable for human beings, may be possible.

Terraforming

The central idea of terraforming is to enhance the capacity of a planetary environment to support human life (literally to make it Earth-like). This would entail making the surface temperature appropriate for human beings, increasing the mass of the atmosphere, making water available in liquid form, reducing ultraviolet and cosmic rays and making an atmosphere that humans could breathe. If plants are to survive, higher levels of atmospheric oxygen would be needed to enable root respiration (Fogg 1995a,b; Zubrin and Wagner 1996).

Mars is usually seen as the most obvious 'bio-compatible' candidate for terraforming and eventual occupation by human beings. It appears to contain considerable amounts of frozen water and large quantities of carbon, nitrogen, hydrogen and oxygen. These four elements are the basis of food and water and of plastics, wood, paper and clothing, and even of rocket fuel (Zubrin and Wagner 1996). It is also the right distance from the Sun to be neither too hot nor too cold to rule out life surviving (the so-called 'Goldilocks effect'). Making a planet such as Mars into a fully terraformed and colonized setting for human beings entails doing the opposite of what many scientists, activists and political regimes are attempting on Earth. While many individuals and governments on Earth are trying to overcome the destabilization of the climate because greenhouse gases are trapping too much of the Sun's heat, terraformers are actively attempting to make a new greenhouse effect.

What are the environmental and social implications of terraforming? These are matters almost wholly missing in the optimistic accounts of scientists and pro-space advocates. There are a number of potential risks, dependent on how such planetary engineering is achieved. Perhaps most drastically and dangerously, one proposal is to terraform Mars by using war-surplus bombs.

> Four, 100kg fusion warheads, launched from a Mars orbiter, can throw into the air enough dust to cover Mars' South Polar Cap, darken it, and cause it to sublime [sic] through increased solar heating. The added atmospheric pressure will set off a runaway greenhouse effect and partially terraform the

> planet. We have the warheads and the orbiters. We can start whenever we like.
>
> (Mole 1995: 321)

There are less dramatic ways of producing gases to start a Martian greenhouse effect. Zubrin suggests three possible ways. Selected parts of the planet could be warmed 'to release reservoirs of the native greenhouse gas, carbon dioxide' (Zubrin and Wagner 1996: 250). Alternatively, factories could be established on Mars to make very powerful greenhouse gases known as halocarbons, or the infamous 'CFCs'. A final alternative would be to release bacteria that create natural greenhouse gases. The heating necessary for the first solution could be achieved by using dyes, artificial dust clouds or pigmented organisms to change the climate. Zubrin's favoured solution is to reflect the Sun onto the planet with huge orbiting mirrors. Another extreme strategy is to induce climate-altering meteor strikes or change the position or rotation of Mars (Birch 1993a,b). The scale of possible consequences at the level of the solar system is quite frightening. It is worth noting that some scientists believe we already have the technology to implement planetary engineering, if not necessarily to control it (McKay 1990). This is perhaps the ultimate reflection of a 'cosmic risk society'.

The rationale for planetary engineering

Within the scientific literature itself, a number of reasons have been put forward for planetary engineering. Haynes and McKay (1992) summarize eleven arguments, which can be reduced to four distinct grounds for planetary engineering.

1. *Planetary engineering could be the first step in colonization*. Terraforming a planet for human settlement can resolve Earth's 'ecological crisis' and its 'limits to growth'. It could also provide escape in the case of nuclear war or asteroid impact.
2. *In a postmodern society, which lacks any sense of unifying mission or purpose, a grand project would reunite a fragmented and disillusioned world.* It will provide inspiration to young people as well as economic and scientific stimulation to other areas of society.
3. *Changing the climate of another planet would lead to improved knowledge and appreciation of Earth's ecology.* It is argued that, by gaining a working knowledge of how to create a planetary ecology, we will be better able to understand our own.
4. *The intrinsic worth of life makes spreading life to other planets desirable*. Finally, it is argued that planetary engineering should be undertaken merely on the basis that spreading life has value in itself.

Haynes and McKay also provide a list of arguments against planetary engineering, many of which point to possible unforeseeable consequences. They are

clearly not really concerned, however, that the bacteria we transplant to Mars may mutate and return to Earth!

The more fundamental issue is how the very idea of planetary engineering reflects on our perceived relationship with the rest of the universe. The rest of the universe according to these arguments is something to be mastered, a mere means to human ends. This is a modern reflection of the Baconian position. There are, however, some less anthropocentric positions, including some that want to introduce life to other planets without making them fit for humans at all (ecopoiesis). But across all positions there is without doubt a faith in human ability to control nature, even if this is perceived as being for nature's own sake. Indeed, it is even seen as being humanity's role to do so, as Frederick Turner argues:

> The radical ecological thinker would have us ignore the reflexive and dynamic capacities of the human mind and act as if we were merely one species of plant or animal among many in the garden – and not the gardener or shepherd which is our true role.
>
> (Turner 1990: 37)

For Plumwood, this version of 'mastering' would be as problematic as a straightforward exploitative relationship. The form of reason that she attacks is distanced and objective (sometimes interpreted as 'masculine'), the kind of attitude present in Turner and some other terraforming advocates. This stands in contrast to a relationship that is involved, emotional and 'feminine'. We return to the more general question of ethics later.

The arrogance of humanism

Whatever we may think of this equation between gender and types of 'mastering', the potential dangers of making new Earth-like planets seem obvious. Here again, humanity's submission of the planets is being applied on a quick-fix basis and generating potential risks. The planetary engineering project rings alarm bells as the kind of 'deadly manifestation of bigness' that Ehrenfeld (1981) had in mind in *The Arrogance of Humanism.* Indeed, it is a project he cites in that book. It relies on humans' complete confidence in their ability to master nature for the better. Ehrenfeld says of the history of humanism as he defines it: 'we have chosen to transform our original faith in a higher authority to faith in the power of reason and human capabilities. It has proved a misplaced trust' (1981: viii). He points to the failure of other great human projects aimed at controlling nature, though he does not seem to be implying a reversion to a mediaeval deference to religion. As a solution for Earthly problems, planetary engineering also reverberates with Beck's theory of late modernity (1992, 1994), according to which society is characterized by escalating projects of unprecedented scale and high-consequence risk manufactured by an increasingly global social system. We return to Beck shortly.

Despite the arrogance of the would-be planetary engineers, they do still engage with the massive risks involved in the project. However, their answers tend to be

either dismissive satire (as in Haynes and McKay's idea of bacteria returning to take over the Earth) or to advocate increasingly complex computer modelling (as in Haynes 1990). The latter returns us to our discussion of chaos and complexity theory in Chapter 1. Reality is reduced to a complex equation, which it is hoped we can understand well enough to create desired outcomes. Zubrin (Zubrin and Wagner 1996) provides many such equations, despite his continuing references to creating a 'runaway' greenhouse effect, which presumably becomes harder to predict and control as it progresses.

However, even those modelling how planetary engineering might advance do offer words of caution. Lovelock (1989) argues, for example, that very little is known of the complexities of ecosystems even on our own planet, never mind on Mars. He therefore constructs a simple computer model for terraforming, one in which a single type of organism such as a daisy competes for survival within a naturally changing climate. Mars therefore evolves in a 'natural' way. It is terraformed in a fashion that is not aggressive, slowly developing its own natural, non-imposed ecological order. In recognizing complexity and the dangers of terraforming, Lovelock's proposal is a useful corrective to proposals seemingly unconcerned with environmental consequences, though some might argue it still does not do enough to break with the arrogance of believing that humans can create new worlds.

Yet environmental risks are not the only ones associated with planetary engineering. It brings another possible set of risks, this time of a social and political kind. Lovelock's proposal for terraforming is entirely unforthcoming about the kind of society that would live and work on a terraformed planet. What social relations are involved for the making of its harmonious, slowly evolving, terraformed environment? Respect for environments and ecological systems may be an inherently 'good thing', but it is always worth recalling the kind of society transforming nature. Environmental sustainability does not always imply social justice. We may well ask who might actually dwell and work in 'terraformed' zones and who might actually benefit. The most likely scenario is that it will be groups of highly qualified and highly paid scientists who will benefit most from the project, as well as those corporations which might supply genetically engineered bacteria or orbital mirrors to heat the planet. Indeed, some are even winning research grants now to study such things. On the other hand, it could well be expendable and exploitable people who will work in zones of growing environmental risk once it is under way. Yet of course, should the environment ever prove truly stable and lush with vegetation (as utopian space art would have us believe) then one can only assume it will be the most privileged members of society who escape the chaos of Earth to achieve a new freedom in the Heavens.

A cosmic risk society?

One way of understanding society's new relations with the cosmos is via Ulrich Beck's notion of a 'risk society' (1999, 2000). According to Beck, the Baconian optimism associated with modern scientific discovery and the domination of

nature has been largely dissolved. Unexpected consequences are a regular feature of today's engagement in the complex ecological and social processes that scientists and governments do not fully understand and cannot control. Risk society is also one in which unanticipated environmental damage is increasingly detached from its spatio-temporal sources and is being made global and lasting. Furthermore, although such damage is widely recognized, no-one takes responsibility for it and it is left to run unchecked. This is what Beck calls 'organized irresponsibility'. In our 'second modernity' society is left coping with the unanticipated results of its earlier 'scientific' interventions. Key Enlightenment philosophers promised great advances resulting from the implementation of science and technology. But science is often now deployed as a lifeboat to rescue society from its previous scientific applications.

Beck's 'risk society' is obviously extendable into outer space. Space development is a scientific response to some of the problems created by modern techno-scientific development. This includes satellites launched as a response to the necessity for businesses to communicate instantaneously around the world, or in order to monitor environmental degradation. Future plans to mine or settle other planets are being developed because of environmental crises and resource depletion on Earth.

Health risks

The risks to astronauts of engaging in space travel are well publicized. Less spectacular but arguably more far-reaching are the risks now being generated by the current space research programmes. Environmental activists are now actively campaigning against the environmental destruction caused by rocket launch emissions. In Russia, for example, children's illnesses have been linked to the launching of rockets (Caramelli 2005). Children living near the Baikonur Cosmodrome in Kazakhstan are twice as likely to need medical attention as a result of high rates of hormonal problems and blood diseases. On launching, the rockets release hydrazine, a fuel said to be 'nasty and toxic'. A tablespoonful of the substance in a swimming pool is said to be capable of killing anyone drinking the water. Similarly, traces of rocket fuel chemicals have been found in milk and lettuce grown in Arizona and in bottled spring water from Texas and California (ABC News 2004).

The nuclear risk

As humanity has attempted to explore ever further into the solar system, it has turned increasingly to nuclear power, despite the development of safer propulsion methods like the solar sail. The massive risks associated with nuclear power being used in a programme where accidents and explosions are commonplace cannot be underestimated. These risks certainly operate on a cosmic scale given the geographic spread of the potential devastation. In 1997, NASA's Environmental Impact Statement for an accident concerning the Cassini mission put potential

clean-up costs at $241 million to $1.3 billion per square mile. Plutonium could, dependent on prevailing winds, be carried over a 60-mile radius. All people, buildings, vegetation, animals and the top half-inch of soil would have to be removed. If the slingshot manoeuvre in which Cassini's journey was accelerated by flying round Earth had gone wrong, Dr Ernest Sternglass estimated that 20–40 million deaths would have resulted (Grossman 2006). In spite of this, the American government spent $220.7 million on developing its Prometheus nuclear propulsion system in 2004, $431.7 million in 2005 and $319.6 million in 2006.

There are also considerable environmental and social risks associated with the possible use of nuclear missiles to destroy satellites. So reliant is the world economy on satellites that an electromagnetic pulse created in orbit would have catastrophic consequences (Helen Caldicott cited by Sieff 2006).

More science and technology, not less

In recent years, space scientists have been enlisted in various attempts to counteract some of the problems which at least to a certain extent have been caused by Earthly science and industry. These problems, in keeping with the ethos of Beck's second modernity, are addressed by means of scientific and technological solutions on a much greater scale, rather than changing Earthly practices. One idea is that 16 trillion glass discs might be launched into orbit in order to deflect harmful rays from the Sun, which would otherwise reach Earth (Barker 2007). This solution is, needless to say, incredibly expensive and technically extremely difficult and would necessitate further pollution in the manufacture and launch of the discs. Space technology has also been implicated in some of the plans by the US government to control or 'own' the weather. One idea is that satellite solar power could be used to heat the air in a tornado to dissipate it (Eastlund 1998, 1999). The US Air Force is also looking at schemes to control the weather for its own purposes.

Space junk and manufactured risk

Possibly even more important, however, is the growing crisis over space debris or 'space junk' (see Figure 6.2). Here Beck's prognosis of risk undermining the promises of a first modernity seems to be coming true. As mentioned in Chapter 2, it was estimated in 1999 that there were some 110,000 potentially damaging artificial objects hurtling through space (Milne 2002). These include old spacecraft, rocket bodies and miscellaneous items left by early space missions and explosions generated by collisions in outer space. There are now many millions of pieces of such rubbish circling around the Earth in low orbit. Debris poses a substantial risk to people on the ground. An example was the hazardous material left on the ground by the space shuttle *Columbia* exploding across East Texas.

Space junk is also a substantial risk to satellites and space vehicles, especially the space shuttle. In 2003 the International Space Station was itself nearly destroyed by collisions with space junk. It has even been argued that this problem of surplus material circling round the Earth could place the whole space effort at risk, a

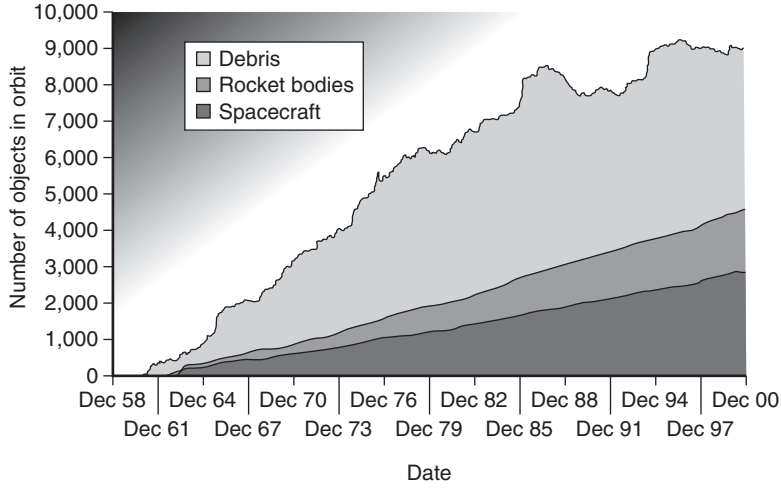

Figure 6.2 Number of artificial objects in Earth orbit since the beginning of the space age. Source: The Aerospace Corporation.

speculation which has led the European Space Agency to inaugurate a 'comprehensive solution' to the problem (Bell 2004; ESA 2005). Space debris mitigation procedures have been drawn up but are voluntary on the part of states. The UN has acknowledged the problem and kept a database of all space debris, but so far little has been done to tackle the problem. The colonization of space therefore mirrors the kind of risk society generated by colonization on Earth. Activists, such as those in the Global Network Against Weapons and Nuclear Power in Space, are taking up the issue (with a section of their website devoted to it). The humanization or conquest of space also well embodies Beck's notion of 'organized irresponsibility', the problem again being a result of an apparently highly scientific enterprise needing yet more intervention to cope with the consequences.

The risks associated with terraforming and solar power, for example, are further examples of what Beck calls 'manufactured risk'. These are risks generated by the social system. The industrialization of outer space simply extends the 'risk society' beyond planet Earth, 'organized irresponsibility' being made to operate at a cosmic scale. Ehricke's (1972) optimism that the development of space would be a benign industrial revolution is misplaced, as it generates whole new risks of its own.

Beck's theory brings many insights but it offers rather little illumination to the relationships and processes underlying and generating risk. To address this problem we need to return to historical materialism. Even here, however, there are major debates.

Capital and the final frontier

Capitalism is necessarily an expanding and crisis-making type of society. But capital, in order to continue reproducing and expanding, necessarily encounters limits,

resistances and barriers of different kinds. Indeed, it could be said that it requires limits, since these are the basis for capital's 'dynamism', its constant restructuring and reorganization. As Marx himself put it, 'The tendency to create the world market is directly given in the concept of capital itself. Every limit appears as a barrier to be overcome' (1973: 408).

As discussed in Chapter 3, today's main power blocs (the United States, the European Union and in due course other societies such as China and India) are beginning to scramble for outer space in much the same way as the European societies competed for African territory in the eighteenth and nineteenth centuries. The establishment of property rights is central, as indeed it was when the African continent was subdivided by rival powers.

As Rosa Luxemburg, one of Harvey's antecedents, argued in developing her theory of imperialism, capital needs an 'outside' beyond its boundaries, off which it feeds (Luxemburg 1968; Hardt and Negri 2000). This 'outside' takes two main forms. First, capitalism expands by making other kinds of society in its own image; making feudal or aboriginal societies, for example, into capitalist forms. But zones outside capitalism can also be used as just a source of materials. This is where outer space is becoming significant. In the same way that gold and diamonds were taken from Peru and South Africa or sugar cane was taken from Jamaica and Java in eighteenth- and nineteenth-century forms of imperialism, so can the materials of the Arctic or of the Moon and Mars be incorporated into capitalist production processes. Assuming that the cost of reaching the Moon and the nearby planets is sufficiently low, this makes the Moon and nearby planets an attractive prospect for the further expansion of capital.

But, in line with Marx, Luxemburg also went on to argue that by incorporating a non-capitalist society in either way, capital creates yet another barrier. The very commodities it needs (whether it be labour power or just materials) are now brought within its ambit. As regards materials, it will in due course use them up or make them prohibitively expensive to extract. This means that capital must find yet another source to satisfy its demand for infinite expansion. Regions such as the Arctic or outer space are good examples. So, as soon as the Moon is exhausted, capital will be seeking more resources on Mars, and so on.

Resolving the second contradiction of capitalism?

Outer space exploration can be seen as an attempted resolution of what some historical materialists call 'the second contradiction of capitalism' (O'Connor 1994, 1996). This contradiction was recognized by Marx and Engels, though given little prominence by them. Here the contradiction is between the forces and relations of production on the one hand and the *conditions* of production on the other. The second contradiction points to crises in supply rather than demand. 'Conditions of production' refers to inputs necessary to production: labour, nature, infrastructure and physical space. The last three are especially important for this discussion. Through the degradation of the environment or the failure to make or maintain sufficient physical infrastructure, a crisis in supply is produced, one in which what Marx called 'the natural or external conditions of production' are insufficient or have been degraded.

This kind of crisis in supply is not usually, however, one in which there are absolute shortages of resources. Rather it takes the form of rising costs, which in turn threaten to undermine profits. Furthermore, social movements of different kinds can be expected to make greater demands for socialization of, and control over, the means of production.

In a rather different language and with radically different political priorities, the early proponents of space travel and exploitation offered means by which the second contradiction can be resolved. For example:

> Shortage of resources is not a fact; it is an illusion born of ignorance. Scientifically and technically feasible improvements in launch vehicles will make departure from Earth easy and inexpensive. Once we have a foothold in space, the mass of the asteroid belt will be at our disposal, permitting us to provide for the material needs of a million times as many people as Earth can hold. Solar power can provide all the energy needs of this vast civilization (10,000,000 billion people) from now until the Sun expires.
>
> (Lewis 1996: 255)

This perhaps suggests that there need no longer be problems or contradictions on Earth. The writer Trudy Bell (1981: 54) adopts the pro-space position that 'space industrialization does not simply fly in the face of the "limits to growth"; it makes them obsolete'. But even if contradictions cannot be eliminated, they can be resolved by moving such problems away from Earth. As one enthusiast for the private development of space reassuringly puts it:

> Continuing private investment in space development will ultimately allow us to move some polluting industries off the planet and to develop unique products, thereby improving our quality of life. The settlement of outer space will ensure the survival of our species in the event of a global catastrophe.
>
> (White 2002:124)

On the other hand, some sociologists have started mirroring the arguments of pro-space advocates and are considering the development of space resources as a permanent resolution of the second contradiction, and working this into a fundamental critique of Marx's political economy (Thomas-Pellicer 2004). This raises some of the debates surrounding the second contradiction thesis. Like the proponents of capitalism's infinite expansion into an infinite outer space, the second contradiction thesis can be seen as depending on a form of catastrophism: the idea that society and nature are doomed. But, first, it is not clear that this is an accurate account of the Left version of the second contradiction. O'Connor (1996) is the leading contemporary Marxist proponent of the second contradiction and he argues that it is most likely to be addressed by state intervention and limited state ownership of the means of production.

But the picture of catastrophism, whether propounded by Left or Right, is quite misleading. Whatever happens to the Earth and the cosmos there will still be some

form of a nature there (Harvey 1996). Certainly some people, specifically the poor, may come off much worse than others as a result of such humanization. But this is a long way from saying that capitalism and nature will come to an end as a result of commodification and environmental degradation. As pro-space activists show, the pessimism of the second contradiction thesis can easily be adopted not just by socialists but by the promoters of capitalism who would use the possibility of the Earth's 'demise' as an excuse to continue privatizing the cosmos. One example is the revenue generated by Earth-imaging satellites, used largely to monitor climatic and environmental change. Harris and Olby (2000) projected a market of $6.5 billion in 2007 for Earth observation data and services.

Developing the rest of the cosmos entails what Enzensberger (1996) might call the next stage of the eco-industrial complex: providing economic opportunities for those in the business of rectifying the degradation caused by capitalism in the first instance. Humanizing nature on Earth or in the cosmos need be neither a complete disaster nor a complete triumph. The priority for historical materialism is to consider the implications of outer space humanization for particular societies, particular sectors of the population and particular species and ecological systems.

Valuing outer space

As alluded to previously, the scientific literature on terraforming has at least begun to consider the ethical dimension of human interference with other planets (Haynes 1990; McKay 1990). It raises in an acute form some issues that are already familiar to environmental ethicists. One possible stance discussed by McKay (1990) is the 'wise stewardship position' described by Frederick Turner, which is human-centred and envisages 'the bounty of nature' as something to be used, albeit in a constrained and conservative manner, toward human ends. This Baconian position, McKay argues, would support the terraforming of a planet in ways that would be of use to humans.

The other perspectives McKay forwards hinge around 'intrinsic worth' being attached to non-human nature. As in Naess's (1989) 'deep ecology', this can mean attaching value to human and non-human life for its own sake. Or it can mean a 'cosmocentric' ethic in which value is extended to inanimate objects like dead planets and asteroids. At first glance McKay notes that the former position would seem to advocate planetary engineering on the basis that we have a duty to maximize Mars's 'biological potential', even though this would be at odds with the deep ecological principle of non-interference. The latter position would appear to reject planetary engineering as 'life has no precedence over non-life' (1990: 192). The rocks of Mars would have a right to remain unchanged. Yet, as McKay notes, both positions raise important dilemmas. The deep ecology-type position does not demand that life be spread to Mars. How is populating Mars to be weighed against human lives that could be saved on Earth with the money involved in reaching the planet? What if spreading life to Mars destroys what little life may be there already? Similarly, were we to take the cosmocentric ethic seriously, would we not be morally obliged to try to prevent asteroid collisions in space? And what if

the survival of life on Earth really did depend on changing the climate on other planets? Surely upholding the rights of lifeless planets is absurd?

Ultimately, as Val Plumwood (2001) recognizes in relation to Earthly environmental ethics, we cannot identify cosmic need in a disinterested, asocial way. The universe has no 'value' except that ascribed to it by society, for values are social constructs. Tarnas (2006) disagrees strongly with this position, arguing that it only leads to further human self-aggrandizement and a continuing denial of humanity's spiritual links with the cosmos. An anthropocentric standpoint is, however, inescapable. It does not necessarily entail a view that humans are masters of the universe. Crucially, if the universe is treated with care and respect rather than as a resource to be exploited, there is every hope that the benefits of space exploration and development may be made available to everyone. These values are, in the end, *socially and politically made*. The values are all inevitably human. And more often than not they are an expression of power relations. This is abundantly clear when we consider the legal rights being demanded by those attempting to own part of the Moon or Mars. Individuals and institutions are straightforwardly attempting to protect their investments. These values are contested by social movements such as the Global Network Against Weapons and Nuclear Power in Space, which, as its name implies, is perfectly clear where its priorities lie. Like this movement, we should return to the Earthly world of political economy if we are to get a more accurate picture of what lies behind the privatization and colonization of outer space. This is not to say that the humanization of outer space is an inherently bad thing. It depends on which interests are doing the humanizing. Perhaps there are some lessons here from Earth to outer space. Privatizing outer space would only enhance the power of the already powerful.

This brings us back to our conceptual starting points: Harvey's notion of 'spatial fixes' as solutions to capital's continuing crises of accumulation, and Gramsci's notion of hegemony, or rule by consent. Current and future forms of outer space humanization are, under current political and social arrangements, no more and no less than attempts at saving capitalism. But success is not guaranteed. Whether cosmic socio-spatial fixes are profitable or necessary will depend not only on environmental degradation or social crisis on Earth but on making the resources of outer space into a series of successful primary circuits of capital. Such a project could well be made a future hegemonic project, one led by a dominant social and economic bloc. Such 'fixes' would offer another promise of staving off capitalism's tendency towards crisis formation, suitably packaged as a boon to the Earth's population. At the same time, it is far from clear when and how such fixes will be seriously attempted, what forms they would take and how successful they would be. Needless to say, there is no clear indication that they will resolve the crises of unemployment, poverty and environmental degradation on Earth. If the 'risk society' thesis is taken seriously, there is every possibility that such interventions may make matters even worse. But how is the development of space made a 'common sense' enterprise?

Space exploration and popular culture

Space travel has long been a central feature of science fiction. Science fiction and popular science writers (whom Kilgore (2003) calls collectively 'astrofuturists') making long-term predictions about space travel and its uses have long influenced public opinion. At the same time, astrofuturism reflects ongoing social, economic and political developments in outer space. There are three often interconnected themes in astrofuturism.

Paradise, Putropia and the cosmos

Throughout human history, the reaches of outer space have been construed as pure, even heavenly, realms of existence. By extension, travelling into outer space can be envisaged as journeying into some form of utopian paradise (Williams 1988). Launius (2003) argues that pro-space activism, inspired by astrofuturism, has always had a utopian impulse. Certainly Bernal (1969) and Lasser (1931), early advocates of space exploration and settlement, saw new societies in space as part of the future of a new utopian society. Alternatively, if people think that paradise is already in existence in some parts of Earth, ventures into outer space are a means of ensuring that paradise is extended indefinitely. The particular paradise involved is a matter of political inclination. Gerard K. O'Neill was a leading 'astrofuturist', a physicist with a high reputation for his work at MIT, Princeton University and NASA. At the same time, he was fully engaged in promoting the humanization of outer space as a way of expanding and enhancing what he believed to be the best kind of society, that of the United States. He firmly believed that the American way of life 'could only be guaranteed by plenty of elbow room' (Kilgore 2003: 159). A similar extension of the American way of life is present in the *Star Trek* TV series and films (Goulding 1985).

Kilgore also notes that the utopian paintings of Don Davis and the descriptions given by O'Neill contain model Americans basking in 24-hour Californian sun, a libertarian dreamworld in which 'only your bank balance matters' (2003: 176). For Kilgore, O'Neill's model of a multitude of different colonies that people could elect to join is about intolerance as much as it is freedom. If a rapidly growing population is to continue seeking the American way of life, then expansion into an infinite outer space is an obvious solution.

Alternatively, the novels of Ben Bova promoted travel into outer space as a means of overcoming racial divides on Earth. If space travel into a future, better, life is led by minorities such as Native American Indians these divides start to be obliterated. Travel into outer space therefore represents an opportunity to start a socially just, perhaps even socialist, society. Kim Stanley Robinson, another astrofuturist, made his space fiction into a critique of capitalism. In *Red Mars* (1993), a capitalist mining colony provokes a revolution from settlers, who form new socialist groups. Similarly in the film *Total Recall* (Verhoeven 1990, based on Phillip K. Dick's *We Can Remember it for You Wholesale*), a mutant underclass organizes itself against capitalist interests controlling the production of clean air on the planet. As

noted in Chapter 2, Kilgore (2003) sees the astrofuturist literature as containing both narratives that extend the status quo into space and explore the possibility for space colonies to be founded on radically different socialist solutions.

Space fiction can of course also point to the dilemmas of contemporary social life through portraying dystopian as well as utopian futures. Williams (1988) refers to 'Putropia' as a type of twentieth-century science fiction literature in which utopias have become corrupted.

Cosmos and catastrophe

As well as sometimes portraying space colonization as a positive step, science fiction often portrays it is a necessary development in the light of various future doomsday scenarios (Williams 1988). Astrofuturism often employs, for example, the 'limits to growth' hypothesis, as outlined by the Club of Rome (Meadows *et al*. 1972; see also Meadows *et al*. 2005). O'Neill and Ben Bova were amongst those influenced in this way. As explained earlier, *The Limits to Growth* argued that the Earth's ecological systems and resources were under increasing pressure from a rapidly growing population. Whole ecosystems were threatened as well as the resources needed to feed this growing population and its rapidly increasing levels of consumption. Crisis and catastrophe are therefore at hand. Other fears relate to a nuclear winter on Earth or some viral outbreak (see Carl Sagan's son's *Idlewild*, Sagan 2004), asteroid impact (as portrayed in the film *Deep Impact*, Leder 1998) or the death of the Sun (*Sunshine*, Boyle 2007). This kind of existential anxiety (to use Giddens' (1991) term) and desire to escape is translated into a psychoanalytic framework by Lasch as a consequence of the 'culture of narcissism', and this is used to explain people's interest in colonizing space (1979: 49, 1984: 87–90). Laing (1965) observes that ontologically insecure people often face 'anxiety about obliteration, of being engulfed, crushed or overwhelmed by externally impinging events' (in Giddens 1991: 53). Smelser (1962: 90) argues that mass anxiety underlies fear of asteroid impact. One obvious step is escape into the bolthole of outer space, making happier lives in new kinds of society beyond Earth. It should be noted that, although present, anxiety themes are less prominent amongst pro-space advocates than the more positive and self-affirming reasons for development and settlement (Ormrod 2007).

Shocks from cosmic entities

A final theme concerns encounters in outer space bringing lessons for human society. These lessons can be a corrective to society or they can confirm that human society, at least in its most modern, capitalist form, remains optimal. What Williams (1988) calls 'space anthropology' entails encountering new kinds of tribe or entities in outer space. Since at least the seventeenth century, the Moon, Mercury, Venus and Mars have been envisaged as the homes of alternative societies, often populated by beings with exceptionally high intelligence. In the mid-nineteenth century Mars was envisaged by Percival Lowell and others as a

zone of criss-crossing canals, the product of a highly intelligent master civilization desperately channelling water supplies in order to survive. Around the same time H.G. Wells also used Martian invaders to deliver a stinging critique of capitalism and imperialism on Earth (Wells 1968).

More comforting lessons can also be learnt from outer space aliens invading society. *Independence Day* (Emmerich 1996) is one of the best-known examples of cosmic entities confirming the excellence of Earthly society. An unknown ship about one-quarter the mass of the Moon enters the world's orbit and deploys several smaller ships. These destroy many of the world's great cities, though Houston is the site of the movie itself. Millions of people are killed and conventional weapons, including even nuclear missiles, are unable to deal with the alien entities. They are protected by impenetrable force fields. The fightback is led by the American President, a veteran fighter pilot. But it is a lone American volunteer pilot who saves the day. He sacrifices himself by flying his jet into the alien mothership, this generating a chain reaction and the ship's destruction. The aliens are destroyed and the supremacy of American civilization is confirmed. The aliens' unwelcome presence in society and their defeat demonstrate, as Mair puts it, 'the impregnability of American supremacy and its rightful leadership of the globe' (2002: 34). The film unashamedly elevates American ideology as the last bastion of universal independence, so that in one swift move America becomes both 'globo cop' and 'interstellar guardian'. In Chapter 3 we gave some more examples of how alien 'Others' have served to illustrate and strengthen what it is to be human, or, more specifically, Western (Sardar and Cubbitt 2002).

These different themes in space fiction are a useful starting point for exploring popular culture, but underestimate the extent to which the genre as a whole represents a hegemonic worldview. They need combining, as we have hinted, with critical perspectives of the kind advanced by Gramsci. These latter perspectives and other theories in the social science literature focus more on the objective conditions, relations and processes underpinning popular culture. Hegemony depends, however, on the widescale adoption of certain ideas as 'common sense', and popular culture of this kind has an important role in maintaining this form of cultural domination.

As argued in Chapter 2, authors such as Sharratt (1980) and Goulding (1985) offer classic Frankfurt School arguments that mass consumption of (especially TV) science fiction dupes a passive audience, distracting them from any attempt to change their real material conditions or simply to confirm that the existing social order is for the best. This leads us to the question of power and hegemony. For feminist scholars the illusion of control over the world, or the fantasy of mastery, is especially important in a world in which people actually have little control. Goulding argues that series like *Star Trek* give the illusion of a freely chosen future, whereas the only option it really presents is again an indefinite extension of the status quo. This is perhaps the most important feature of these movies. Not only do they create escapes and reveries but they present historical and contemporary social relations as inevitable and legitimate. Social cohesion, as Gramsci argued,

depends on consent as well as outright physical coercion. Science fiction and space fiction movies are one way in which popular consent is forged.

Subjectivities: towards a cosmic individualism

As we have seen, the possibilities for 'mining the sky', using outer space for human purposes, are now being examined by private enterprise, particularly as public funds from NASA and other sources start to decline. It is being very much envisaged as an object for human use. An indication of how seriously the idea is being taken is given by the statements of ProSpace, a citizens' lobby group (see Box 6.1).

In the previous chapter, we outlined the form of 'cosmic narcissism' present in the fantasies of pro-space activists about taking trips into Earth orbit. However, this narcissism is also manifest in grandiose fantasies about omnipotence being exercised through the conquest and colonization of space. Previous research (Ormrod 2007) revealed activists with fantasies about bouncing up and down on the Moon, playing a round of golf there, mining asteroids or creating their own small colonies on Mars. These particular human beings, far from being oppressed by or subjected to forces in the heavens, are now being reconstituted as all-powerful individuals expressing a control over the external world, which might be likened to that experienced in the earliest years of childhood. The fantasy of life in a spacefaring civilization protects the narcissistic idea that the whole universe revolves around him/her and that the whole cosmos is there to be consumed. It is a universe that promises that the power and limitless freedom of the Western individual can be guaranteed. Reality of course dictates that pursuit of such a relationship with the universe will necessarily result in conflict with others and between the different needs of the individual.

Humanizing outer space: the ideology of the pro-space movement

Historically, the pro-space movement has had associations with both the political left and the right (Kilgore 2003; Ormrod 2006). However, coinciding with the rise of private space development projects, the movement appears to have associated itself increasingly with the libertarian right (which, according to Launius (2003), has been there since the start). Activists are not simply slaves to their narcissistic space fantasies, but rationalize their cause and are able to argue for the value of space development and settlement using well-established political discourses. Here we mention just a few relevant aspects of their ideology.

The frontier

The story of the frontier has provoked a great deal of reflection and passion within the pro-space movement (Bereinstein 2002: 12). The portrayal of parallels between humanity's expansion into space and historical frontiers is widespread in pro-space circles, no less than in science fiction, where it is made explicitly present

Box 6.1 Publicity material from ProSpace. Source: ProSpace.

WHO WE ARE

The members of ProSpace are private citizens from all walks of life and from all across the United States

Each March for the past ten years we have come to Washington at our own expense to speak directly to the leaders of our nation.

We do so because of strong beliefs about the direction of our country's efforts in space – in the past, present and future.

Our Mission:

To expand human access to space;
To facilitate the development of commercial space enterprise;
To identify and eliminate barriers hindering that development;
To promote space exploration that provides real, relevant measurable benefit to the American people.

What we Believe:

The American Perception of Space Must Change

Above all, space is a place, and not just a program.
Space holds the promise of vast new opportunities and untapped resources.
We can unlock those opportunities by expanding the human presence in space.
The economic development of space will facilitate exploration that is more effective and less expensive.
The United States must encourage and accelerate the economic development of space.

EXPLORATION: THINK PURPOSE, NOT DESTINATION

Why Do We Explore?

What Has Driven Exploration in the Past?
From Columbus to Lewis & Clark,
the drive for discovery fuelled the original effort.
Economic opportunity led others to follow.

WHY HAVE GOVERNMENTS SUPPORTED PAST EXPLORATION?

"The object of your mission is to explore…for the purposes of commerce."
Thomas Jefferson. Instructions to Lewis and Clark, August 1803

from Robert Heinlein's novels to *Star Trek*'s famous opening line, 'Space, the final frontier'.

Gerard O'Neill first popularized the frontier discourse in the pro-space movement, making *The High Frontier* the title of his seminal book (1989). The term is now as popular as ever. The 2004 International Space Development Conference was subtitled 'settling the space frontier' and the Space Frontier Foundation has become a major pro-space organization. Even in the UK, advocates draw historical colonial parallels (Sivier 2003a,b). In 2004 both the Mars Society (intent on settling Mars) and ProSpace (an organization that lobbies congress in support of private sector space development) used the US Western frontier analogy as part of their lobbying process. They even used an image that juxtaposed Lewis and Clarke with future Martian colonizers. Meriwether Lewis and William Clark were commissioned by Thomas Jefferson to undertake an expedition across Western North America, an area then unknown to everyone except the native Indians. Lewis and Clark's mission was to map rivers, to look for a North-West passage, to open up the West to trade and to make friends with the natives. Though there are no known 'natives' in outer space, the drive to subjugate the Moon, Mars and the asteroids is also made to appeal to a brave and rugged individualism. President Bush used the same historical precedent in January 2004 when unveiling his Moon–Mars Initiative. The reworking of an imagined past confronting and conquering a frontier is therefore central to this future-oriented social movement.

This imagined past has long been associated with making an essential American national character. Without such a frontier, American culture will, it is believed, stagnate. This oft-reinvented tradition of a toughened individual forged by making a new frontier has its roots in Frederick Jackson Turner's 1893 *The Significance of the Frontier in American History* (see Turner 1962). He argued that the challenges of the frontier fostered an individualist survivalism based on risk-taking and hostility towards centralized power. This in turn leads, he believed, to American democracy and the American entrepreneurial spirit. These are key values of the libertarian right. Modern space advocates have adopted this understanding of the frontier, along with the imagery, character types and settings it evokes, in order to justify the colonization of space. Zubrin and Wagner cite Turner and argue that 'without a frontier from which to breathe life, the spirit that gave rise to the progressive humanistic culture that America has offered to the world for the past several centuries is fading' (Zubrin and Wagner 1996: 297).

There is, of course, a well-established counter-hegemonic critique of the frontier, in which the destruction caused by the American Western expansion is highlighted (Launius 2003: 345). Pro-space activists are frequently reflexive about the fact that the needs of capitalism drive the frontier but they simply do not apply critical apparatus to their thinking about the necessity and desirability of capitalist development. The frontier is a transposable myth and ideological rendering of the past, present and future.

Freedom and the individual

One pro-space activist introduced himself at the 2004 ProSpace March Storm (a lobbying event held by ProSpace each year in March) in the following way:

> This will be my 8th March Storm, and I come to the March Storm because of love. Love for people, love for freedom and love of opportunity. I have 7 kids, I'd like to leave them the kind of world where they're safe and have the opportunity for prosperity. I love my fellow man, I like to see them happy and prosperous and having a good time. Without the kind of opportunity that comes from the resources and materials of space I don't see that opportunity being as wide as it could be otherwise. I love freedom. I love the possibility that they can go off into the Universe and make their own kind of lives in their own ways without interference by any quantity of other folks who have decided what is best for them.
>
> (quoted in Ormrod 2006: 209)

'Freedom' is a ubiquitous concept, one understood very differently in different social and historical contexts (Marcuse 1970). What Berlin (1969) called 'negative' freedom is a founding principle of neo-liberal societies. Here it is related to the emphasis on the individual as opposed to the collective or the state. It refers to freedom from interference by the state or by other individuals who might limit a person's choices or 'opportunity for action'. Libertarian politics reject any attempt to limit the freedom of individuals, whom they see as having sole responsibility for their own well-being. This philosophy is represented in, and draws from, free market economics. The pro-space movement has long advocated this philosophy and has made it its central focus in recent years.

There are a number of ways in which expanding human society into space can be seen as representing freedom. First, it means access to increased and potentially infinite resources. Because resources on Earth such as minerals, fuel and land are understood to be becoming increasingly scarce, there is a fear of increasingly restrictive controls on individual freedoms to appropriate these resources. As Rick Tumlinson, head of the Space Frontier Foundation, has said:

> Ultimately, nearly everything you want to do in a sustainable world will be something someone else cannot – and that will mean limits. Limits to when and where and how you travel, how much you consume, the size of your home, the foods you eat, the job where you work, even how long you are allowed to live. If the rest of the world is to become more wealthy in such a system, consuming more, you will be forced to consume less. Equilibrium will be the goal of the state and individual freedoms will become ever more expendable.
>
> (cited in Launius 2003: 343)

If outer space were opened up like the early homestead races, those with the necessary ability would have, it is believed, the freedom to appropriate as much as they possibly could.

The second way in which expansion into outer space represents freedom is the liberty from state control, outer space supposedly not being subject to national appropriation. Third, advocates argue that individuals should have the choice to visit, live, work and play anywhere they want. One of our pro-space interviewees says quite simply that 'people can stay at home if they want, but others must be allowed a different choice, we have the right to do that'. Gerard O'Neill also claimed that our ultimate right was the right to leave (Kilgore 2003). Both the National Space Society and ProSpace lobbied for the removal of government red tape and safety restrictions for private spacecraft as they represented barriers to the individual freedom to choose to go into space.

The final reason is that space represents physical freedom, a release from the bonds of gravity. A bodily transcendence of the limits of the human condition is being sought. But the negative theory of freedom would not normally hold that human beings should be able to do anything and everything they wish. It is merely that the state or other individuals should not impede their choices. The narcissistic subject as represented in the pro-space movement is, however, unable to make this distinction between freedoms. The individual experiences anxiety and frustration at literally any limit to their action, and the fact that no-one is responsible for this restriction makes no difference.

These arguments about freedom are ultimately intricately related to the need of pro-space activists to re-experience total power centred around the self. Again, not only does the language of freedom sustain neo-liberal capitalism, with its emphasis on the individual and delight at the survival of the fittest, but it also legitimizes the wants of its subjects.

Growth

The necessity of continuing growth or expansion has been appreciated since the early political economists. As we and many others have outlined, a supposed 'solution' to crises of overproduction inherent in capitalism is often couched in terms of the mass production and consumption marked by the rapid and incessant proliferation of consumer goods. Without such a development the contradictions Marx detected within capitalism would be exposed. So, as Harvey (2003), Lefebvre (1976) and others argue, economic growth, as well as imperial expansion and territorial colonization, has become a concept fundamental to the continued survival of Western societies.

But for pro-space activists, by contrast, economic growth is a wholly benign process. Even Eric Lerner (1991: 379), whom we encountered in Chapter 1, believes expanding into the universe is necessary if we are to grow, and without growth, he argues, 'an evolving system will die'. Here, one enthusiast for space exploration as a means of further economic development puts forward his views:

> What was that when the guy said that greed is good? Who was that? I would like to turn that . . . maybe rephrase that to say that *growth* is good because it's been the growth of, let's say, human knowledge, acquisition . . . growth of acquisition of resources, growth in terms of the range of products that are available to us that has led to the continual improvement in the quality of life of the human species. And all good capitalists are always looking for new markets and new ways in which to grow, and it seems to me that in terms of long term economic reasons, that is a natural progression of the direction that the human species has been going in since day one. And I would suggest that there are going to be many more long term economic reasons that we can't even begin to imagine what those might be today, because growth leads you into entirely new arenas of endeavour. We cannot envision that, but I think it's pretty certain that if we stop growing we're doomed.
>
> (quoted in Ormrod 2006: 211)

The pro-space movement often links growth with freedom. But it does not recognize that freedom is actually experienced by only some members of humanity as a result of growth. Historically, growth and expansion has often had devastating effects on the freedoms of many groups of people, but pro-space activists seem blind to this possibility.

Resources and prosperity

Pro-space advocates closely relate the consumption of resources to concepts of freedom and growth. As one activist puts it:

> At the minimum we would like to raise the standard of living of the human race as a whole up to where we [the industrialized world] are, not to mention the implications of the additional population growth and the fact that we all want to increase our standard of living as well, that means you're going to have enormous additional resources. And given the constraints that we have on energy and pollution and the environment on Earth, that's a tall order, but using the resources you have in space in the long run, once you develop the appropriate technology then maybe you can solve that problem.
>
> (quoted in Ormrod 2006: 214)

Most contemporary concerns over resources re-emerged with the Club of Rome's 'limits to growth' hypothesis. As outlined earlier, here it was predicted that society's exponentially growing population would soon outgrow the Earth's resources. Pro-space writers like Gerard O'Neill (1989) have attempted to demonstrate mathematically that space resources can be used to support increasing human resource demands. These include, as indicated earlier, raw materials from asteroids, Mars and the Moon, fuel for space colonization trips and solar power. One of our interviewees, a space advocacy veteran and economist who

worked on some of the original economics for space colonies, has made his own calculations:

> If you look at the asteroids and ask the question what would happen if you converted these into sort of O'Neill space habitats? How much land area could you create? And the answer is about 3000 times the land surface area of the Earth, which is a lot of land. . . . So there's a lot of energy, a lot of materials, you could really expand like crazy in space.
>
> (quoted in Ormrod 2006: 314)

The economics of these solutions have inevitably been debated *ad infinitum* amongst pro-space activists, economists and politicians. Many suggest that the large costs involved will never allow this exploitation of resources to become profitable. But, for those who believe that this will become a reality, this prognosis represents a great deal of comfort and both a sense of omnipotence and a legitimization for pursuing fantasies of omnipotent consumption. This is an ideological shield against the reality principle. It reflects, and, according to Kilgore, feeds, 'our culture's faith that science and technology can be used to solve all Earthly problems' (1997: 104).

Inspiration

Since the end of the golden age of space exploration in the 1960s and 1970s, there has been a growing sentiment amongst pro-space activists that apathy and social disintegration increasingly characterize our society. Their 'progressive' and utopian ideals have been threatened by a decline in faith in progress, social disintegration, introspection, present-time orientation and an emphasis on simulation rather than real projects on nature (Benjamin 2003). Space development and colonization represents to the pro-space activists a project that will remedy this sad situation, inspiring youth and giving meaning to people's lives. At the Mars Society UK conference we heard one man cite Bertrand Russell, saying that all societies need a non-destructive adventure in order to survive. The pro-space intellectual Frederick Turner puts this in the following way:

> We live at a time when . . . there is a widespread sense of a loss of value, dignity, and grandeur in our vision of ourselves and our cosmos. Nothing brings us together as the great religions, and even great wars, once did. The young, especially, seem to suffer the lack of a grand societal project, a vision (and perhaps turn to drugs as a substitute). The existence of a Martian enterprise would create a general improvement in morale, as the peoples of the world realize that they are working for something worthy of human attention, not just for personal wealth or national prestige.
>
> (Turner 1990: 34)

Turner sees a world lacking in meaning, with people crying out for social integration and a sense of grandeur of the human condition. One of our pro-space activists offered a nationalistic lamentation on the loss of American cultural self-confidence:

> It seems to me that this Western civilization has now reached the point of decadence and decay in that, and you can see this in the war with radical Islam right now, there is this large leading element, intellectual element in the society that questions whether we deserve to win and whether we're any better than anybody else. There is not that healthy self-confidence and self-esteem that says yes damn it we do deserve to win, our culture is a good culture.
>
> (quoted in Ormrod 2006: 216)

To most of the rest of the world, loss of cultural confidence would not be associated with United States foreign policy, but to this activist more imperialistic self-confidence is what is needed.

As witnessed in the Turner quotation, social fears are articulated especially in relation to young people. Rather than seeing socio-economic problems as the root of delinquency, many pro-space activists attribute the problem to a lack of grand inspirational vision or fantasy resulting in apathy. Quite rightly realizing that space holds special appeal to children, activists believe that renewed space activity is vital to inspiring kids and encouraging them to take an active part in society, ideally in science and technology-related careers.

Part of inspiring children, it is argued by many pro-space advocates, is convincing them that they or their children can live on other planets. The effect of their attempt to inspire youngsters in this way is of course to give them more unrealistic dreams. Rather than see youth depression and alienation as stemming from their prospects of unemployment, they blame it on our lack of a grand societal project. Rather than change the work situation of inner-city youth, or helping these children live longer by reducing gun crime, their solution is to offer them the dream of going into space. At the same time, of course, this legitimizes their own fantasies by suggesting that fulfilment of them is open to everybody. It is the disparity between the experience of the urban youth and the dreams imposed on them by bourgeois culture that results in their depression in the first place. Space colonization is framed as a remedy to strengthen the hegemonic values of growth and aspirations of consumption, when they could be replaced with those that offer genuine hopes to youth.

Genetics

One argument often made by pro-space activists is that colonization is in human beings' nature. People are inherently curious and minded to explore. The point was well made during a speech heard at the International Space Development Conference 2004:

> I'm a big believer in exploration and investigation and adventure. It's part of us. It's innate. Our babies, even before they can crawl, start to investigate, explore. And once they can crawl they become mobile investigating machines. And this is an important part of us and it's an important part of our motivation and I think it will be a good point for us to win support for what we're doing and for something like the Mars mission it'll be part of our program.
>
> (quoted in Ormrod 2006: 222)

The myth that exploration is embedded within human nature can be articulated with the frontier narrative by pro-space activists. They recognize, or claim to recognize, that humans have a natural inborn tendency to explore the outer space frontier. And, as our discussions indicated, they are often extremely proud to be amongst the few chosen to lead society to the next level.

> D: I really think I'm the kind of personality that if I was born in 1840 I'd have been saying 'gee ma I'm going to get the next wagon train out west'. It's there, it's adventure, it's excitement, it's a frontier. I think humanity always has people who are naturally drawn to the frontier even though it's probably going to get them killed.
> J: Not necessarily everyone
> D: Not everyone, there's always a certain percentage of people and within the next six days you will see a very large percentage of people in this organization are of that type. Some are into space for other reasons, I think you'll find a lot of latent frontiersmen here.
> [. . .]
> C: I suspect that the adventure gene in humanity is a minority gene, like a real significant minority gene and always has been and always will be.
>
> (quoted in Ormrod 2006: 222)

There is of course a long history of philosophizing about human nature (see, for example, Betzig 1997). Political theorists, Marx no less than anyone, have based their political agenda on a concept of human nature. However, the discourse on human nature most prevalent in the pro-space movement stems from sociobiology, a historically specific discourse which has inherently political implications (Rose *et al*. 1984).

Sociobiology was built on the Darwinian theory of evolution and is associated with Edward Wilson (1980) and Richard Dawkins (1976). Sociobiology posits that the origin of all human social behaviour, like animal behaviour and physical characteristics, is the result of natural selection. Behaviours that survive do so because they represent a selective advantage. Whereas some see the inheritance of certain behaviours as a genetic process others see it as a product of 'memes', of ideas competing for survival in a way analogous to genes (Dawkins 1976). And, along these latter lines, some pro-space activists argue that the desire to explore

space is a meme, an information pattern that influences the person to pass the meme on to others (Henson 1985).

Biological reductionism entails importing ideas about human social life from the behaviour of other species. During a panel discussion at the International Space Development Conference, for example, one pro-space activist asserted that:

> Life at any level, whether it be an individual organism, bacteria or an animal or a plant or a species or a tribe of people or an ecosystem, at any level life tends to expand to fill whatever niches around it, whatever niches are nearby. This is drilled into us through evolution.
>
> (quoted in Ormrod 2006: 220)

Sociobiological arguments often reflect broadly accepted, even hegemonic, 'common sense' perceptions about human nature and human behaviour. Much of the foundation for the argument that it is in humanity's nature to explore comes from grossly selective extrapolations from historical evidence. Columbus, the Pilgrim Fathers, Lewis and Clarke and Neil Armstrong are all examples of idols worshipped by the Western culture of exploration and imperialism. The familiarity of these tales precludes the telling of alternative stories. To pro-space activists growing up in contemporary America, the history of the world is largely understood as the history of exploration. It is easy to see how to these people exploration would appear to be human nature. It has characterized the whole of human history.

The argument that curiosity and exploration are an adaptive survival trait for the human species is well-rehearsed, and has been discussed by Dawkins himself (1998). Some pro-space activists frame their discussion of human nature directly in relation to Dawkins' sociobiological arguments, many of which have become popular reading in the movement. It is believed that, when resources become scarce, some or all humans are pre-programmed to explore their surroundings for more resources. In this way human society is not limited to one 'ecological niche' but can expand and grow to other niches. For many pro-space activists, outer space represents the next 'ecological niche' for mankind. To explore and develop space for them is to act according to human nature, this being a positive attribute. Conversely, to fight the exploration and development of space is to fight against human nature.

For some time now there have been extensive criticisms of sociobiology (see, for example, Sahlins 1972; Lewontin 1993). Sociologists and social anthropologists tend not be persuaded by this discipline because it disregards the importance of agency, meaning, culture and contingency in human social life. Society, including psychic structure, is reduced to the biological level (Pinker 1997; Rose and Rose 2000). An intense focus on genes means that the interaction between organisms as a whole, their relations to their environment and their development during their lifetimes goes largely missing from the sociobiology enterprise (Dickens 2000). On the other hand, sociobiology forces sociology to recognize the biological foundations of human behaviour and development. Indeed, in line with our critical realist

standpoint as outlined in Chapter 1, biology should be seen as offering important insights into the causal powers underlying the growth and development of humans and other species. But these combine with other causal powers operating within society to generate biological development and forms of subjectivity. Biology is clearly important but it is overlaid or 'over-determined' by social relations and social processes of many kinds (Dickens 2000).

One of the key points about a critical realism is that it points to the way in which certain kinds of science are used to ideological and political ends. Gene-based biology used to justify further space exploration and the increasing humanization of the universe is an excellent case in point.

Peace

The final argument made by pro-space activists discussed here is that space exploration can help generate world peace. This position was made by two of our interviewees in the following ways:

> An animal that's cornered will do things that under normal circumstances, when it has the freedom Bob talked about, is pretty passive, but you corner that animal, it starts to react in a very negative way. Our world is becoming increasingly cornered to a lot of people.
>
> The world situation has never been really stable, it's becoming more unstable again as it was back in the early sixties again and I think we really need to keep the human race alive. I think turning outside of our small environment on Earth and opening up these possibilities of the world, the Universe, to kids will take a lot of stress off these . . . I know to the people that are fighting them they do not seem petty wars, but over land, over religion.
>
> (both quoted in Ormrod 2006: 223)

This argument exemplifies two points. First, the discourses of social movements can change over time. An emphasis on the importance of space for peace on Earth has really come to prominence post 9/11. Second, it shows how seemingly universal and apolitical values (for example 'peace') are articulated by a movement with other concepts and priorities central to the discourse. Social relations have again gone largely missing. The argument rests on an assertion that wars are the product of people competing for limited resources and that humans will inevitably fight for survival under such circumstances. Humans, like other animals, will fight to survive, especially when 'cornered'. These arguments stem from human ethology, one of the precursors to sociobiology and also unpopular with sociologists (Ardrey 1967; Lorenz 1966). Framing the problem in this way leads to a prognosis in which opening up outer space combined with individual freedom, more space and increased resources will lead to social harmony. Perhaps needless to say, this is another argument unpopular with sociologists and political scientists. A more critical analyst would examine the way that this argument diverts attention from

the real, underlying causes of war. These, as we have tried to argue in Chapter 2, revolve around power and private property. Expansion into outer space is as likely to undermine peace as to bring it about.

Finally, we should note that many of the values held by pro-space activists are precisely those now informing Earthly 'accumulation by dispossession'. At the time of writing, non-Western societies are being invaded in the cause of 'freedom', 'individualism', 'economic growth' and, most paradoxically of all, 'peace'.

Humanizing outer space: popular opinion

The ideologies and beliefs of the pro-space activists are in considerable contrast to the opinions registered by the MO respondents, many of whom are opposed to such developments. But the picture is quite mixed, and indeed some of the MO respondents even shared the common sense ideologies of the pro-space activists, the idea that space travel is in 'man's nature' being an example.

In Chapter 2 we discussed MO writers' views on the possibility of developing space resources and settling space. Evidence suggested that the majority did not hold critical opinions about the possibility, but instead discussed the mere practicality of it. However, there were some who did formulate an opinion one way or the other. Amongst those who did express an opinion on the desirability of space settlement and exploitation, those who were in favour formed a very small minority, again suggesting that it is amongst the more powerful members of society that the desire to conquer and colonize the universe is strongest. One retired woman noted that probably only America could afford to exploit space resources, but expressed a weak optimism, saying, 'but I expect we will all benefit in the long run' [B2605]. Another woman said she felt we *needed* to go into space because 'as a society we have become too inward looking' [B3014]. This sentiment crops up in the pro-space movement a fair amount, but it was a lone voice amongst the MO writers.

One of the concerns most often expressed about humanity expanding into the universe was that war and conflict experienced on Earth would continue in space:

> If we found and populated some other lovely life-supporting planet(s) years from now will there be any guarantee that all classes, colors and creeds will by then have learned to live in harmony? We have had 2000 years and more to find global peace and all we have achieved is a catalogue of endless conflict and misery. It doesn't bode well for those citizens of the future centuries unless by some miracle they can be made to accept that survival depends entirely upon understanding and unity.
>
> [B1654]

Many recognized that the existence of resources in space would exacerbate conflict between individuals and nations [D3157].

One point that respondents seemed aware of was that, if space development

continues, the gap between those able to participate and the rest of the world would grow:

> Were we able to exploit the resources of outer space now, it would be a case of the nation with the capability to do so (probably the USA) benefiting accordingly and becoming more dominant and affluent in the process.
>
> [G3126]

The power that private companies might accrue as developers of space resources was an issue of concern for a number of respondents. Some seemed optimistic, however, that the United Nations could resolve some issues regarding access to and conflict over the distribution of space resources.

The other common sentiment was that using space resources in a similar way to that in which Earthly resources had been abused was unethical. Amongst those taking an ethical stance were men and women who likened the mining of asteroids to rape [B3010, C3167], using outer space merely as an object for the fulfilment of human desires. As one middle-aged single parent says, it 'seems like violation for companies to use other planets and asteroids for resources to maintain lifestyles on Earth' [C41]. She goes on to say that the prospect horrifies her and she believes that 'man [sic] has such potential for destruction and likes to leave behind such a mess'. Leaving debris and litter is a major concern for several respondents. Clearly these people do not take a Baconian stance towards the universe.

Implicit or explicit in many of these arguments is the idea that it is particularly important that outer space, in contrast to Earth, is left uncontaminated by human activity.

> I'm torn between feeling that we shouldn't interfere with space and yet I am curious to know about it. It would lose its magic for me if I thought people were living out there and I get infuriated when I hear about the fact that we've already left debris floating around. I would hate to think that one day there might be a hotel on the Moon.
>
> [H1705]

This kind of sentiment may well be anchored in the residual feeling that space is a realm of purity and godliness (this has certainly been mirrored in recent debates about leaving at least some parts of space as pristine sites (Williamson 2003; Spennemann 2004)). One respondent predicted that religious groups would join environmentalists in opposing mining in space.

Of course, there is a counter-argument, mentioned by one respondent [D156], that it is better to mine in space than it is on Earth, on account of the absence of life there. The dilemma is acknowledged by some respondents: 'I think that this will raise interesting ethical issues: is it acceptable to disturb the ecology of a planet where there is no life, if it means we can take resources which will help humans?' [F3137]. Others couched their ecological critique in less ethical terms, arguing that history shows that we cannot rely on natural resources because they

are finite: 'Haven't we learnt what happens when we mine natural resources? We run out! Why are we so obsessed with taking materials from our universe rather than creating energy from what the Earth has provided us with?' [C3210]. Another writer talked in similar terms about the specific historical example of coal mining in Wales, and the problems caused when pits were closed and coal ran out [C1713]. As one young man notes, 'even the most cursory glance at human history suggests we are unlikely to be good stellar citizens' [C3167].

The above line of thinking leads most of these people to the conclusion that it is desirable that we use Earthly resources better rather than to seek solutions to our problems in space.

> I am far more concerned that our planet remains hospitable and viable for the vast majority of people who remain here on Earth . . . We should spend the money and effort in developing new resources on Earth and making more effective use of those we already have.
>
> [C2256]

Some focus on the suggestion that we put more money into finding new sustainable sources of energy on Earth [B3010], whereas others point to the sufficiency of existing resources if only they were distributed more evenly, and greed and consumption were curtailed [B1509].

Greed and consumption are realized to be the major problems with Earthly society that also underlie the suggestion that we explore and develop space, an idea put very lucidly by this female recruitment advisor:

> We exploit and destroy planet Earth, which would supply everyone's needs in abundance if only we could work in harmony with it and control our tendencies to hoard and covet. 'Developed' nations crave ever more novelty and sense gratification while the Third World suffers and, sadly, aspires to our meaningless lifestyle. 'They are surrounded by jewels but seek to sit on broken glass'. We soil our own nest yet have the audacity to believe we have the wit to play God and conquer other planets. Its toys for boys on a grand scale and tainted by nationalism and politics.
>
> [B1218]

This respondent clearly recognizes the narcissistic nature of our desire to conquer space. Many other respondents reflected on human nature as represented in this desire, supporting our argument that the relationship we have with the universe has intimate ties with human nature. One woman said that 'man [sic] seems unable to see anything without wanting it', another statement of the insatiable nature of the late modern personality, echoing Fromm and others. There was some hope amongst these writers that this insatiability might be curtailed, though there was a rather resigned quality to one man's romanticism about pre-narcissistic man. Having seen a feature on Stone Age tribes on TV, he concluded that they had seemed to be happy and he would be content to still be living in the

Stone Age. Yet, again, though many writers expressed dismay at the greed behind space development plans, they too conceded that to fight against it was to fight human nature.

Summary

It seems clear that society will be made increasingly 'cosmic'. A powerful coalition of financiers, industrialists, states and pro-space activists is beginning to make outer space into an extension of Earthly society. This process seems destined to be made into a hegemonic project, a form of 'common sense' with investments into an infinite outer space supposedly bringing great benefits to the whole of society. Tragically, however, such a project also seems likely to make outer space in the image of the Earth itself, with all its power relations and consequent social injustices. A 'risk society', this time on a cosmic scale, will be created. Under current social and political arrangements, the socially, economically and politically powerful will continue to make themselves even more potent via the humanization of the cosmos. If a cosmic society is to genuinely benefit the dispossessed it will have to be organized around radically different priorities. An alternative hegemonic project will have to be made.

Conclusion

Cosmic imperialism and social resistance

About this chapter

This concluding chapter looks backwards and forwards. First, it summarizes the main themes of this book, which has been arguing for a 'cosmic sociology' focussed on dialectical relationships between the universe and society on Earth. Placing society in its cosmic context helps us understand that the cosmos has long been central to social order. This is true both of societies in the past, whose relationship with the cosmos has largely been imaginative, and of the present era of global economic, cultural and political expansion. But it is also key to the next phase of imperialist expansion: that of humanizing outer space. Second, this conclusion also attempts to draw out some future implications for the politics of cosmic imperialism. It examines briefly the roles of social movements and of intellectuals in contesting how we understand and interact with the universe, and establishing new counter-hegemonic ideologies. This leads to a discussion of a 'public' sociology of the universe and its responsibility to oppose the use of the universe by powerful vested interests. Understanding and explaining the causal powers underlying cosmic imperialism is a first step towards opening up alternative, socially more enlightened, ways of humanizing the cosmos.

Cosmic society and the constructed universe

In Chapter 1, our focus was more historical and on our purely imaginative relationship with the universe. All societies, we argued, are 'cosmic' in that they exist and interact with a cosmos that has been socially constructed. However, social constructions, we have often stressed, need not be *only* social constructions. Scientific constructions of the universe, for example, can refer to real causal entities. We also argued for the existence of a second, reverse, process. The cosmos constructed by elites in turn reflects back on society. Society, its social divisions, elites and power relations are simultaneously a product of the way in which the cosmos has been constructed. The cosmos has been used to cement and justify the social order.

One of our key points was that a cosmic elite of scientists, priests and others has

been to the fore in making these constructions. Their construals not only reflected the political and social circumstances in which they were written, but came to be used as an ideological justification for the social order of which they were a privileged part, and, in so doing, the cosmic elite retained their own special status.

This model applies in different ways in different societies. Before the European Enlightenment the way in which the cosmos was construed was rarely grounded in empirical observation and made little attempt to describe real causal processes. It was often described by religious authorities and their patrons as a zone of purity and godliness to which only the most religious people and highest social orders could realistically aspire. Since the period of the Enlightenment this situation has started to change. But remnants of the old religious relations with the cosmos certainly still exist, with religious elites still claiming a proximity or connection to a god-given universe. Indeed, it could be argued that these religious and mystical construals are on the increase again. Yet these older elites are being joined by scientists claiming abstract knowledge of the material reality of the universe, its laws and processes. These people are still widely considered 'special'. They are the makers and retainers of a specialized knowledge, one not readily accessible to the rest of the population. It can seem as if the less accessible it is, the more scientists' and cosmologists' status and rewards are ensured. Bookshops are replete with popular science, but our MO correspondents show that the universe as described by Stephen Hawking and many other contemporary cosmologists remains an almost complete mystery.

What has our study of cosmic society, one based on critical realism, shown in these terms? First, as mentioned above, for over two millennia elites and their supporters have used their construals of the universe as a means of ideological and physical domination. Elites have used their specialized knowledge to legitimize and reproduce fundamental social divisions, including that between mental and manual labour. But it would be wrong to suggest that all abstract knowledge is an ideology promoted to benefit certain groups. Contemporary science is certainly capable of uncovering real, underlying, processes. Rather, the problem is that these highly intellectualized understandings are detached from the practical knowledge gained by lay people through everyday experience.

We also began our discussion of the dialectical relationship between the universe and the human psyche. We argued that our relationship with the universe has reflected, and been reflected in, particular forms of subjectivity. One of the most important of these changes in subjectivity has been a transition to an individualized form of consciousness. This is particularly true of social elites, whose relationship with the universe changed dramatically at the time of the Renaissance 'universal man' and is now manifest in the narcissistic relationship that pro-space activists and others experience with the universe. For them, the universe has been demystified and exists as an object for the realization of their own personal desires. Subordinate populations, for their part, still often see the universe as a subject dominating their lives, and remain in a state of awe and estrangement not much dissimilar to that experienced under traditional cosmologies.

Cosmic society and the outer spatial fix

The main theme running through the later chapters of this book is that imperialism is now entering into a new phase, and that the humanized cosmos is central to this transition. The global market is proving increasingly unable to contain the many contradictions of capitalism. Global society is in social, political, economic and environmental upheaval. The emergent form of cosmic society makes sense only when placed in this context of Earthly chaos. On the one hand, the most powerful classes of modern society are using the cosmos as a means of managing and controlling this chaos, attempting to 'fix' it by military, economic and cultural means. But in the meantime, further crisis and risk are being generated. These 'fixes' may be organized by dominant economic and military powers such as the US, but they are almost certainly making the world more dangerous. Meszaros, writing of the growth of armaments in the late twentieth century, wrote 'we have entered the most dangerous phase of imperialism in all history' (2001: 37). This danger is now being increased by its spread into outer space.

On the one hand, as we have outlined in Chapters 4, 5 and 6, the cosmos is being increasingly used to regulate social relations, culture and military adventures on Earth. It is being used to manage the 'third stage' of imperialism, including the economic and military demands of competing geopolitical powers. But Chapters 7 and 8 suggest that the cosmos is also integral to an imminent fourth stage: capitalism being extended by the most powerful, again competing, elites and nations into outer space. The humanization of outer space is therefore being used to control or manage an earlier phase of imperialist expansion while ushering in a new one.

Here again, the universe is conceived as an object that those with political and economic power can utilize to retain and extend social power. The result is the further development of narcissism, even to the point of what Ernest Jones (1913) describes as the 'God complex', amongst those with access to the heavens. For other, subaltern, populations, the increasing use of the cosmos for military and surveillance purposes increases their distance from it. At the same time, hegemonic messages are being asserted by this technology, technology which itself forms part of capitalism's hegemonic resolution to its own inherent crises.

Contesting the future of the universe

But this new form of imperialism is not quite 'accumulation by dispossession' in the classic sense outlined by Harvey and, before him, Luxemburg and Lenin. At the moment, at least, cosmic imperialism is not directly dispossessing anybody of anything. There are no people or societies out there protesting or rising up against this latest stage of domination and capital accumulation. But, of course, as and when elements of nearby outer space are legally subdivided and exploited by different private or state interests, this precludes public and private investments in probably more worthwhile projects on Earth. Furthermore, such imperialism also opens up the possibility of wars between those powers gaining access to the Moon or other nearby parts of the cosmos. This form of imperialism and capital

expansion may seem particularly attractive to ruling elites, given the contradictions and increasingly evident social and environmental crises of Earthly society. But the fact remains that this fourth stage of imperialism may in the long term simply reproduce Earthly conflicts, Earthly sociopolitical coalitions and environmental degradation into the cosmos.

This raises the question of what kinds of counter-hegemonic politics can be created to resist or at least modify these processes. How are social movements resisting these developments to be understood?

New social movements and counter-hegemony

Marxist theories are generally found wanting in the era of the new social movements. These struggles are widely seen as composed of heterogeneous actors who do not represent a particular social stratum with identifiable interests. As Scott writes:

> At least in the conventional Marxist analysis, social movements which define themselves without reference to class are a category puzzle, neither fish nor fowl. They have some of the characteristics ascribed to real – that is, class – movements (for example mass mobilization) but they appeal to 'illusory collective identities such as nation, gender, locality or even, most disturbing of all, to abstractions such as "the public" or "humanity" '.
>
> (Scott 1995: 3)

Here Scott is describing the problem traditional Marxists have had in explaining the constituency of new social movements. Often, as he notes, this has meant explaining away new social movement identities as forms of false consciousness. In addition, new social movements initially appear unconcerned with material politics at all, turning their attention to issues such as peace, the environment and sexuality. This has been heralded by some theorists as a radical new era of post-material (Inglehart 1981) or post-emancipatory (Giddens 1991) politics. Mirroring the psychologist Maslow's (1971) 'hierarchy of needs', these theorists believed that when human material needs were satisfied they would turn their attention to 'higher' cultural goals.

The supposed separation from material politics by the new movements has inspired 'post-Marxist' developments in social movement theory. The diversity of people's material positions is emphasized here, even to the extent of denying links between political identity and the material world. In this respect, two of the most influential political writers on global politics in recent years have been Laclau and Mouffe (2001). Influenced by Michel Foucault and 'post-structuralist' thought, these authors oppose any notion of general or 'universal' propositions such as the working class or class struggle being the principal generator of social change.

Laclau and Mouffe agree that Gramsci offered major insights into the role of ideology and 'common sense' as a means of holding society together. But they are addressing themselves to the question of how counter-hegemony can be formed at

a time when 'the ruling class' seems to be on the wane. They agree that forms of consciousness and identity nowadays no longer stem primarily from the factory or the sphere of production. Like many other writers on contemporary social protest, Laclau and Mouffe urge us to only look around to observe what they call 'the new antagonisms'.

> The unsatisfactory term 'new social movements' groups together a series of highly diverse struggles: urban, ecological, anti-authoritarian, anti-institutional, feminist, racist, ethnic, regional or that of sexual minorities. The common denominator of all of them would be their differentiation from workers' struggles, considered as 'class' struggles.
>
> (Laclau and Mouffe 2001: 159)

Whereas Laclau and Mouffe respond to the emergence of new social movements by removing material struggles from their analysis, other theorists have attempted to retain an emphasis on fundamental antagonisms at the heart of the social order, albeit with a less direct connection to class interests.

Habermas argued a quarter of a century ago that new social movement conflicts are carried on between those involved in production, and with interests in maintaining it in its current state, and those who are not and who are therefore 'more sensitive to the self-destructive consequences of the growth in complexity, or who are more seriously affected by them. The bond that unifies these heterogenous groups is the critique of growth' (1981: 33). The new social movements are constituted by groups often removed not just from industrial production but from its values and priorities. As a number of authors other than Habermas argue, this latter group deliberately and consistently challenges modern concepts of progress, prosperity, economic growth and scientific rationality (see also, for example, Beck 1992).

The multitude

Hardt and Negri (2000, 2005) also ground their analysis in material politics but, for them, the constitution of social movements is even more diffuse and removed from specific interests. These authors believe that old-style imperialism has come to a halt. A global market has developed. Hardt and Negri believe they can detect a new kind of society emerging out of capital's remorseless global expansion.

On the one hand, a 'global elite' still represents the interests of financial and corporate capital and, working with political leaders, exercises power throughout the whole of global society. But resistance is now coming from what Hardt and Negri call 'the multitude'. This is conceived by these authors as a great mass of people subordinated to global capital and global power, especially those who have suffered from capital investment, privatization and commodification disrupting their lives. 'The multitude' is the new counter-hegemonic force that will overthrow the existing social order.

Hardt and Negri argue that, despite its many deprivations, the diversity of the

multitude is its very strength. Organizing themselves like capital itself, particularly via electronic networks and channels of information flows, the multitude is coming to represent a powerful counter-force resisting and eventually overcoming capitalist imperialism. It is a force that the dominant social bloc must overcome if it is to remain intact. 'The multitude' in this picture is therefore envisaged as the modern version of the international proletariat which Marx, Lenin, Luxemburg and many others earlier believed was capable of creating its own hegemonic worldview and overthrowing the social order. Like Laclau and Mouffe, Hardt and Negri argue that resistance is no longer forged in the factory. It is the product of the new social and technological era.

The Global Network Against Weapons and Nuclear Power in Space

An example of a new social movement we have often encountered in this study is the campaign to keep outer space free from weapons and nuclear power (and to a lesser extent to resist commodification and prevent the creation of space debris). The Global Network Against Weapons and Nuclear Power in Space is an organization central to this movement. Governments and industry are often targets for the new social movements, these often being seen as a large part of the social and political problem rather than part of any progressive solution (Melucci 1989). This movement articulates a challenge to technical rationality, progress and growth in just the way that Habermas and others have identified.

It might be suggested that the conflict that both this movement and the pro-space movement address is one between late modern capitalism's continuation of modern patterns of reification, commodification and imperialism, and a postmodern cultural critique of progress. Outer space becomes an arena in which such contradictions can be contested. The pro-space movement represents a demographic of educated, technical, white, quasi-routine workers very much at the heart of the former, 'modern' orientation, who see in a generally declining space programme the triumph of 'postmodern' values, though they may not use this term themselves. Their policies and ideology aim to preserve their world in the context of social, cultural and political change. Further empirical work would be necessary in order to identify the demographics and histories of Global Network activists but, in accordance with Habermas, we might expect them to be more removed from productive interests and therefore more sensitive to the destructive consequences of the extension of human society into space (as outlined during this book). What is quickly apparent is that these organizations have connections with other social movements also contesting the infiltration of the government, the military and capital into other areas of social life; these movements include peace groups, women's groups and environmental campaigns. Even religious groups such as the Quakers have become involved (Figure C.1). Explaining such involvement means we must also turn to the subjective as well as the objective dimensions of such movements.

However, the space-specific focus of these space movements cannot be explained straightforwardly by the existence of structural social trends. It fails to

Figure C.1 Keep Space for Peace poster. Source: Religious Society of Friends. Photo: Nick Greenall.

explain how it is that certain actors get drawn to space advocacy in particular and, importantly, why thousands of people would be motivated to dedicate their lives to the defence of such a diffuse structural contradiction. Psychoanalytic theory can help to fill in these gaps, as has been suggested throughout the last few chapters.

The global and the local

Perhaps surprisingly for such a universal movement, the Global Network Against Weapons and Nuclear Power in Space is a good example of how new social movements operate on local and global levels (Eschle and Stammers 2004). Struggles and coalitions are typically organized at both the regional and the global scales. Furthermore, these two scales interact, with local struggles informing those at the global scale and vice versa. Resistance at the global level tends to have what Eschel and Stammers call an 'instrumental' form. The interests of the movement are pursued by any possible means and particularly via rational, more scientific argument. Certainly the movement to keep space for peace has engaged with

international political arguments about the legality and desirability of legislation relating to outer space militarization.

Resistance at the local level, however, is typically of a more 'expressive' or emotional kind; with people articulating who they are, what they care about and *why* they are challenging the institutions of power. As Eyerman and Jamison (1998) argue, music can have an important role in this (Box C.1). Institutions for global surveillance and defence such as the Echelon surveillance system and the so-called 'star wars' US missile defence system depend on interceptor missiles and tracking devices located in different regions throughout the globe. Resistance to such developments can again, therefore, have a strong regional or local basis. Members of the Yorkshire CND have been conducting weekly protests (see Yorkshire CND 2007). A programme of local events constitute the Global Network's annual 'Keep Space for Peace' week. As Castells (2000a) describes, the new social movements are made via loose-knit global and local networks, with the internet having a central role to play in making the links between the different scales. There is most definitely an affective bridge between GN activists on a global as well as a local scale. Psychoanalytic theory could certainly provide additional insights into the workings of this expressive dimension of movement activity, though the ways in which the unconscious is implicated must be the subject of further research.

The role of intellectuals

Throughout this book we have given special emphasis to the role of elites and intellectuals in making coalitions and in creating visions of the cosmos and visions of society. Especially in Chapter 1, we encountered a number of supposedly detached 'traditional' intellectuals whose ideas were compatible with different notions of how society is and should be organized. Newton's universe, for example,

Box C.1 The first verse of 'The Best Things in Space Ain't Free' (to the tune of 'The Best Things in Life Are Free') by B.G. DeSylva, L. Brown and R. Henderson.

The Moon belongs to billionaires –
The best things in space ain't free.
The stars are toys for zillionaires
They're not there for you and me.
There'll soon be a place
Way out there in space
Where lasers can zap
The whole damn map
The sky's our brand new battleground –
The best things in space ain't free.

Source: Global Network (www.space4peace.org).

has been argued as one dialectically related to an increasingly atomistic English society, an idea very favourable to those emerging with social power. Alfven's plasma universe, on the other hand, seems full of potential for recognizing the relationships, interactions and changes to the universe over time. And, whereas Alfven's universe is one that, in theory at least, opens itself up to popular empirical observation, the universe of Hawking and others closes itself to outsiders, and limits understanding to an elite of mathematicians and physicists. As Gramsci argued, though they might attempt to define themselves as a detached group, even traditional intellectuals cannot escape politics.

When examining issues surrounding the humanization of the universe, supposedly 'objective' sociological work can also become political, as can be recognized in the case of Diane Vaughan's study of the *Challenger* disaster (Vaughan 1996, 2005). Using a Durkheimian concept of 'normalized deviance' to understand what had happened, Vaughan conducted detailed ethnographic work on the decision-making process within NASA. This work established that they knew full well that there were risks involved. They had received warnings that the 'O rings' in a solid fuel booster could erode and could even disastrously break on a cold day. Yet they went ahead and allowed their 'deviance' to become part of their normal working culture. The known risk was ignored, not least because they were under financial and political pressure to make the launch go ahead. The result is well known. An O ring broke, flame reached a propellant tank, *Challenger* was destroyed and seven astronauts were killed. Vaughan warned that a similar problem could recur given NASA's working culture and this actually happened on 1 February 2003 when the *Columbia* shuttle crashed.

From that point on Vaughan had to deal with constant demands from the media. And her detailed work was so impressive that she was actually made a consultant to the government-appointed *Columbia* Accident Investigation Board (CAIB) (Vaughan 2005). Vaughan was drawn on because her original work was relatively detached from the social and political circumstances of outer space humanization. Values regarding these matters were not considered and her work was used to simply avert future disasters. As Burawoy puts it: 'Vaughan was not taking a position on whether money should be invested in the space programme or not, she was concerned to prevent technological catastrophes' (Burawoy 2005a: 422). Yet others tried to use her work in more political ways.

Organic intellectuals

Pursuing this emphasis further, it is important to identify the intellectuals working more directly on the side of the commercial and military development of space and those fighting against it. Gramsci's concern is not simply with the traditional intelligentsia, but with those within every class who emerge to articulate their ideas and concerns. As Gramsci says, 'every social group, coming into existence . . . creates together with itself, organically, one or more strata of intellectuals' (1971: 5).

One set of intellectuals in Gramsci's picture is directly and explicitly linked

to capital. It consists of the many scientists and managers working directly for industry of all kinds and for financial institutions. Their financial rewards and their values stem not only from the carefully orchestrated divisions between mental and manual work but from their close connection with private industry and its expansion. Following on from this, we see capital's intellectuals vocally supporting the development of space, and articulating ideological justifications for the project. One example would be the entrepreneurs who have contributed chapters to Hudgins's (2002) collection *Space: The Free Market Frontier*. Other examples are found amongst the advocates campaigning on behalf of the major space corporations like Boeing and Lockheed and on behalf of an elite of engineers and scientists more generally (for a discussion of the advocacy of these groups see Michaud (1986: chapter 2)). There is also a campaign in support of missile defence, the Missile Defense Advocacy Alliance, campaigning largely on behalf of corporations that stand to win contracts for such systems, but supported by 'intellectuals' like Riki Ellison, a former pro-football player and ex-employee of the National Missile Defense Company. These intellectuals justify missile defence on extremely conservative and nationalistic political grounds, arguing for its necessity in 'protecting our world, our nation, our families, our way of life'.

The rocket scientist Wernher von Braun appears to have been an organic intellectual, speaking on behalf of the interests of the group of rocket scientists to which he belonged. Yet according to many biographical accounts he was largely ambivalent about politics and merely utilized whichever rhetoric would enable him to continue his rocket science (see Peoples (2006) for a lengthier discussion). As such he became a key cultural figure in the promotion of the American space programme. The one-time Nazi scientist even ended up campaigning for ethnic minority involvement in the space programme. His leadership in collaboration with Walt Disney amongst others helped win popular consent for the space programme (Figure C.2). As Kilgore muses:

> If he could not convince the majority that space is the terrain of manifest destiny, then he would appeal to the minority interest in the attractions of an ever-expanding capitalism; if the expansion of human rights displeased, then he allowed that an insipient totalitarianism could be accommodated; if an audience was unmoved by secular rationalism, then he would deploy the gospel of space.
>
> (Kilgore 2003: 57)

Von Braun therefore spoke on behalf of the group of scientists from which he had emerged, but aligned himself with whichever interests suited him at the time. And different social groups drew on his technical expertise as and when they could.

A third set of intellectuals in Gramsci's scheme is that attached to the resisters themselves. These are the intellectuals 'organic' to the subordinated or subaltern classes. They are again the people using their abilities and knowledge towards emancipating oppressed people. In Gramsci's time and to an extent in our day they would include people attached to the labour movement and to trade unions. They

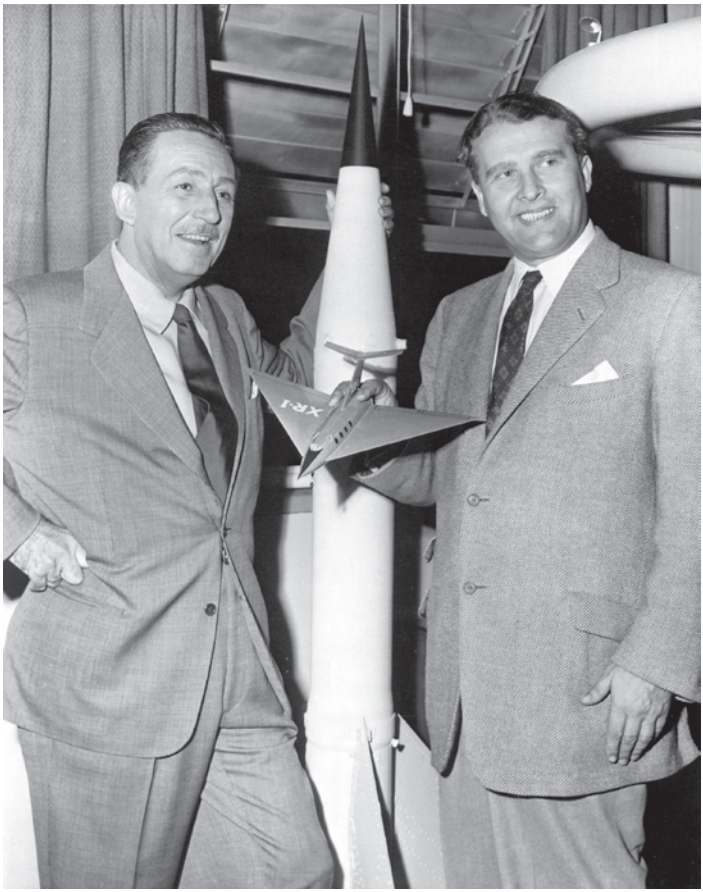

Figure C.2 Wernher von Braun with Walt Disney. Source: NASA.

are also people with high levels of cultural capital such as teachers and workers in the public sector. These are the main 'intellectuals' of the present day, 'cultural leaders', creating new trends in consumption, often including more ascetic tastes and resistances to consumerism (Savage *et al.* 1992). Here the prospects for resistance and the making of new kinds of coalition between dominant and subordinate groups are more promising. They are more likely to endorse projects not wholly devoted to further capital accumulation. They have a vested interest in their elite status, but subordinate orders, themselves low on economic capital, may find useful alliances with them.

Bruce Gagnon (Coordinator of the Global Network Against Weapons and Nuclear Power in Space), Mel Hurtig (publisher) and Loring Wirbel (journalist) are amongst the leading 'organic intellectuals' resisting the use of outer space to enhance the already powerful. It is around such people that an alternative, counter-hegemonic ideology about the future use of outer space is being formed.

Representing and articulating the demands of those who resist the current ways in which outer space is being humanized, their programme includes transforming what Harvey calls the 'primary circuit' of capital into making commodities for peaceful purposes. It is not always clear what forms of politics on Earth are to be engaged with for these purposes to come about but, as the Global Network recognizes, it entails the conversion of the armaments and aerospace businesses into producing socially useful products, in particular those that would supply renewable energy (Global Network 2006).

Towards a sociology of the universe

There have recently been renewed calls for 'a public sociology' (Burawoy 2005a,b). There are, according to Burawoy, two kinds of public sociologist. One is addressing the public at large. He or she is clarifying the link between public and private issues, as first outlined by C. Wright Mills (1959) in *The Sociological Imagination*. The other is directly linked in an 'organic' way to subordinated sections of the population such as the labour movement or immigrants. These two strategies, Burawoy suggests, are complementary to one another, with both groups informing each other. Throughout this book we have referred to and attempted to explain increasing levels of privatization, commodification and widening social inequalities. Sociology as a whole, Burawoy argues, needs to explain and help resistance to these processes. Sociologists, he argues, are also well placed to present alternative visions of future society. Where is society headed? How can this be changed?

Sociologists should not construct themselves as detached intellectuals, but should make their political commitments clear. Their concerns should be with revealing the suffering that results from social processes that serve the interests of those in power. There is a distinct danger that some fledgling projects to explore the relationship between society and the universe, such as the field of 'astrosociology' being developed by Jim Pass (2004), do little but reproduce hegemonic common sense about the benefits of space exploration and development (Ormrod 2005). Although astrosociology may draw public attention to under-researched issues, it will offer nothing if it does not do so critically.

Some previous studies offer more hope for this kind of sociology. In 1964 Amitai Etzioni published *The Moondoggle: Domestic and International Implications of the Space Race*. It full-bloodedly criticized the space race as 'a monumental misdecision'. On the one hand, resources had been switched away from pressing Earthly needs such as improved healthcare, education and civil rights. On the other hand, it had failed in virtually all of its promises. It had not stimulated economic growth in the United States because it did not need to raise productivity 'since orbiting objects or miniaturizing atomic warheads does not have an automatic stimulant effect on consumers' (1964: 73–4). 'Spin-offs' to the economy, in the form of, for example, miniaturization and new materials, were marginal and even trivial. 'Some of the claims are safely projected into a remote and dateless future, others should never have been made; still others are exaggerated out of proportion to their real value' (ibid.: 90). One of these claims was that the structure of the

universe itself would be better understood by space travel, but this too turned out to be a chimera, a money-making device.

Meanwhile, scientific manpower and public funds had been diverted from socially more worthwhile projects such as developing cures for cancer, heart disease and muscular dystrophy. Global society had been made an even more unequal and dangerous place but the 'space race' had been made a means of denying these realities. 'Above all, the space race is used as an escape. By focusing on the Moon we delay facing ourselves, as Americans and as citizens of the Earth' (ibid.: 198).

Using his knowledge to support the dispossessed, Etzioni was raising the whole issue of whether the United States should engage in a space race at all, given the kinds of issues with which the dispossessed and the popular classes were much more concerned. Furthermore, he spelt out alternatives to the 'common sense' surrounding space travel and the militarization of outer space. As he wrote:

> One of the major duties of university people, even if there is no consensus whatsoever among them, is to keep raising issues – such as the value of fallout shelters, or the logic of sending a man to the Moon, or the logic of deterrence – *thereby extending the public debate to include new alternatives.*
>
> (Etzioni 1964: 64, original emphasis)

Etzioni's study, in short, certainly did not claim to be 'objective'. It was an explanation of reality that was demonstrating that alternatives were possible.

In this book we have aimed to go even further towards revealing 'the worm in the apple' of space humanization: outlining the capital processes which underpin it and in the process stripping away some of the hegemonic assumptions that serve to obscure them. This is what Roy Bhaskar (1986) refers to as an explanatory critique: the deliberate undermining of the false beliefs created by society based on social power and coercion. An explanatory critique exposes the causal mechanisms and elements that underlie the complexity of the social life and of the universe. Moreover, it exposes the ways in which these mechanisms are used by the powerful as a means of enhancing their authority over the rest of society.

The science of outer space is now being deployed to humanize the cosmos in ways that not only reproduce the social order, but extend this order indefinitely into the cosmos. But an explanatory critique hopefully also shows that there is nothing inevitable about this process. Social and political alliances can be, and are being, forged against this particular form of humanization. New types of common sense can be constructed. Contemporary forms of subjectivity which are alienated from the cosmos and dreaming about being part of it are not inevitable. They are the product of recent times and can certainly undergo change in a more socially progressive direction.

Space for good or ill?

Some might now argue that all forms of space humanization should be halted. The weaponization of outer space is especially dangerous and this might be the

first part of space humanization to be abandoned. As Etzioni wrote nearly half a century ago, it can be persuasively argued that the huge cost of all space activities massively detracts from public spending on much more serious social needs on Earth. There is, therefore, a strong social and economic case for abandoning *all* forms of space activity.

Alternatively, rather than being founded on the interests of capital, and individualist fantasies, the humanization of outer space could emphasize collective responsibilities on Earth and try to ensure that any gains made through space exploration were spread throughout to improve the lot of the dispossessed on Earth (as was the original aim of the United Nations Moon Agreement). To quote Etzioni, 'As we move deeper into space we should be facing Earth and allow our deprived world to set the pace' (1964: 198). In theory, so long as funds are not diverted from more socially necessary projects, this is not incompatible with scientific exploration of outer space aimed at simply discovering how the universe is structured. Earth imaging technology available freely to all can be used to track refugee populations, or chart changes in the environment caused by global warming. So long as it is not motivated by fear and panic, 'space for peace' could also include diverting risk stemming from Earth-bound asteroids: a plan under active development by NASA and the European Space Agency (Gray 2007).

As President Kennedy acknowledged in 1962, whether space science is used 'for good or ill depends on man'. He was confident himself that 'space can be explored without feeding the fires of war, without repeating the mistakes that man has made in extending his writ around this globe of ours' (Kennedy 1962). There are signs that perhaps the European space programme will cease treating the universe as an object for the exercise of power and instead ensure space technology is used for the public good (Mean and Wilsdon 2004).

Alternatively, and much more ambitiously, humanization could attempt to emulate the early twentieth-century Russian cosmists by spreading a socialist or communist society throughout the whole of nearby outer space. This is a highly human-centred project and, as such, can be criticized for simply imposing humanity's priorities, albeit communist priorities, on the cosmos as a whole. But any project is going to be 'human' or 'anthropocentric'. Is a cosmos reproducing and expanding a socialist or communist society necessarily a problem? Perhaps the significance of the utopian cosmists is that they prefigured the possibility of alternative types of space humanization.

Explanatory critique can only go so far. Philosophy and sociology are only tools for uncovering how reality is structured and for freeing up the discussion of feasible alternatives. It will take much hard work and politics on a mass scale to forge new social alliances, counter-hegemonic ideologies and space projects that benefit oppressed populations. The ultimate aim of this must be a relationship with the universe that does not further empower the already powerful.

Appendix A
Relevant websites

These websites were all accessed 14 February 2007.

Pro-space organizations

These are the websites of citizens' organizations dedicated to advancing the exploration, development and settlement of outer space.

1000 Planets
www.1000planets.com

Artemis Society International
www.asi.org/

British Interplanetary Society
www.bis-spaceflight.com/

Canadian Space Society (CSS)
http://css.ca/

Coalition for Space Exploration
www.spacecoalition.com

First Millennial Foundation/Living Universe Foundation
www.millennial.org/

Greater Earth
www.greaterearth.org

Island One Society
www.islandone.org

The Lunar Reclamation Society
www.lunar-reclamation.org

Mars Society
www.marssociety.org

Moon Society
www.moonsociety.org/

National Space Club
www.spaceclub.org

National Space Society
www.nss.org

The Planetary Society
www.planetary.org/

ProSpace
www.prospace.org

Space Access Society
www.space-access.org/

Space Association of Australia
www.space.asn.au/

Space Foundation
www.spacefoundation.org

Space Frontier Foundation
www.space-frontier.org/

Space Tourism Society
www.spacetourismsociety.org/

Students for the Exploration and Development of Space
www.seds.org/

Uranos
www.uranos.eu.org

Organizations contesting the use of outer space for military purposes

Campaign for the Accountability of American Bases
www.caab.org.uk/

Global Network Against Weapons and Nuclear Power in Space
www.space4peace.org/

Institution for Cooperation in Space
www.peaceinspace.com/

Missile Defense Advocacy Alliance
www.missiledefenseadvocacy.org/

Yorkshire CND Keep Space for Peace
http://cndyorks.gn.apc.org/yspace/

Some companies involved in space tourism and development projects

Armadillo
www.armadilloaerospace.com/

Blue Origin
http://public.blueorigin.com/

Scaled Composites
www.scaled.com/

SpaceDev
www.spacedev.com

SpaceX
www.spacex.com/

Virgin Galactic
www.virgingalactic.com/

Xcor
www.xcor.com/

Social science resources and courses relating to outer space

Astropolitics journal
www.tandf.co.uk/journals/titles/14777622.asp

Astrosociology.com
www.astrosociology.com/

Department of Space Studies, University of North Dakota
www.space.edu

International Space University
www.isunet.edu

The Space Policy Institute, The Elliott School of International Affairs, George Washington University
www.gwu.edu/~spi

Space Policy journal
www.elsevier.com/locate/spacepol

Appendix B

The Mass Observation Archive Summer 2005 Directive

Further information on the Mass Observation Archive can be found on their website: www.massobs.org.uk.

We are indebted to the Mass Observation team for including in their Summer 2005 Directive a section called 'The Universe and Outer Space.' This section took the following form:

- What interests you about outer space?
- What do you think of . . .
  - The idea that people might one day live in outer space?
  - The idea that private companies might one day mine asteroids for resources we could use on Earth?
  - The idea that there is life elsewhere in the universe. Tell us more.
  - The idea that weapons may be placed in space to attack targets on Earth or in space?
  - Government space programmes: are they a good use of money?
  - Science: can it give us all the answers to understanding the universe?
  - Scientific theories of the universe: are there any that you find particularly interesting?
- Do you check your horoscope regularly? What do you think of astrology? Do you think it's accurate? How does it work?
- Do you watch sci-fi films or TV programmes, or read books set in space? What are your favourites (please summarise them in a few sentences)? Tell us why you like them.
- Would you like to go into space? If so, what appeals most about it? What things would you like to do when you were there?

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