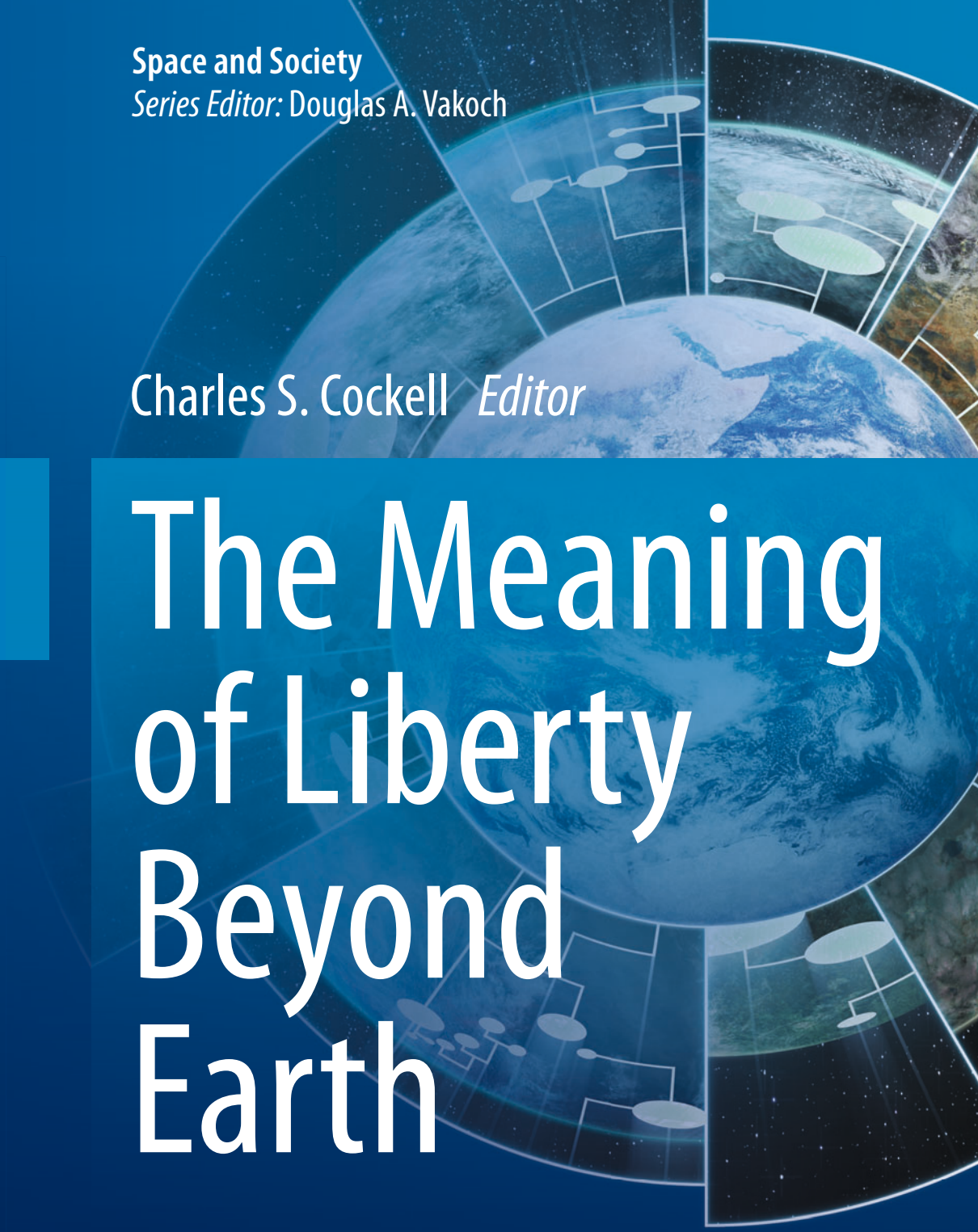
Space and Society
Series Editor: Douglas A. Vakoch

Charles S. Cockell *Editor*

The Meaning of Liberty Beyond Earth



Springer

Space and Society

Series editor

Douglas A. Vakoch, SETI Institute, Mountain View, CA, USA
and California Institute of Integral Studies, San Francisco, CA, USA

More information about this series at http://www.springer.com/series/11929

Charles S. Cockell
Editor

The Meaning of Liberty Beyond Earth

Springer

Editor
Charles S. Cockell
School of Physics and Astronomy
University of Edinburgh
Edinburgh
UK

ISSN 2199-3882 ISSN 2199-3890 (electronic)
ISBN 978-3-319-09566-0 ISBN 978-3-319-09567-7 (eBook)
DOI 10.1007/978-3-319-09567-7

Library of Congress Control Number: 2014950051

Springer Cham Heidelberg New York Dordrecht London

Printed on acid-free paper

Springer is part of Springer Science+Business Media (www.springer.com)

Preface

In an age where geographical boundaries are weakening through electronic communications, but strengthening in places where groups of people feel a new found confidence to express their national and ethnic identity; in an age where surveillance has become technologically easier and its means more pervasive; and in an age where environmental concerns have forced us to begin to cooperate on an international level not seen before, the meaning of the word 'liberty' and the place of individual freedom, has become a topic once more of concern to all human beings.

However, alongside these Earth-bound concerns, there is emerging an entirely new playing field on which intellects and governments will decide the fate of human freedom—outer space.

As more national governments develop expansive space programmes and more private companies design and build spaceships with the capacity to launch satellites, robots and humans into space, the number of organisations in space is growing. With this expansion comes the inevitable consequence of an expanding number of interests to protect and so with that, the chance for a clash of ownership, rules and regulations which together define the environment for individual freedom.

There are not, at the time of writing, a large number of humans in space to argue about their liberty, but this will surely change. And this small band of extraterrestrial settlers, whenever they take root on the space frontier, will exert an influence on terrestrial liberty. Having oversight and control over the geopolitically important places above the Earth's gravity well, their view of freedom will be as significant for the people that sit at the bottom of the gravity well into which they peer as it will be for them. It will not take many people in space to make a discussion of extraterrestrial liberty relevant.

This book is a collection of essays on extraterrestrial liberty. The bulk of them is the intellectual progeny of a meeting we held in London in June 2013 co-organised by the UK Centre for Astrobiology and British Interplanetary Society to consider what freedom is beyond the Earth.

We would like to thank the British Interplanetary Society for supporting this discussion, which has led to this collection. We would also like to thank Springer, in particular Ramon Khanna, Charlotte Fladt and Doug Vakoch at the SETI Institute for bringing this book into fruition.

Edinburgh, 2014 Charles S. Cockell

Contents

Chapter 1
Introduction: The Meaning of Liberty Beyond the Earth

Charles S. Cockell

Abstract The environments of space are lethal, mandating a variety of control and safety structures, some of which will be much more pervasive, and potentially intrusive, than on the Earth. Protecting, and even defining freedom, in these environments constitutes an important development in political philosophy. In this volume of essays, we discuss a set of ideas that range from the philosophical foundations to the policy implications of extraterrestrial liberty. The breadth of discussion is by no means exhaustive, but it does reveal the potential for a long and controversial discussion on freedom that is likely to follow humans into space and remain with them for as long as they attempt to settle the space frontier.

Keywords Liberty · Freedom · Extraterrestrial · Tyranny · Political philosophy

Since humans first assembled themselves into complex societies, and with great vigour during the Enlightenment, people have wondered: 'What is freedom?'

To date there has been no successful resolution, probably because the word itself, freedom, defies accurate description. 'Liberty', usually used interchangeably with freedom, is similarly nebulous. No matter how much the question remains unsolvable on account of its inextricable link with human definitions, it nevertheless strikes at the heart of very fundamental and real concerns. The question can perhaps, ironically, be made clearer with a set of more wordy questions such as: 'To what extent can I be independent from other people?', 'How much does my ability to express my own ideas and potential depend on being a member of society?' and 'To what extent does my freedom encompass freedom from the state?'

During the last 400 years, the breadth and depth of this study has been impressive: Hobbes, Locke, Mandeville, Mills, Filmer, Kant, Berlin, Popper, Marx, Paine, Rawls, Skinner—and the list goes on. It is not the purpose of this Introduction to review the arguments and counter-arguments of which this plethora of literature is comprised. However, there is something remarkable about all of these

C.S. Cockell (✉)
UK Centre for Astrobiology, School of Physics and Astronomy, James Clerk Maxwell Building, Edinburgh EH10 4EP, UK
e-mail: c.s.cockell@ed.ac.uk

C.S. Cockell (ed.), *The Meaning of Liberty Beyond Earth*,
Space and Society, DOI 10.1007/978-3-319-09567-7_1

tomes—that none of them addresses how the precepts of freedom and individual liberty might develop or change beyond the Earth. Philosophers such as Hannah Arendt have taken intellectual excursions to consider the effects of the space frontier on the human outlook, but extraterrestrial freedom per se remains an unexplored issue.

Any author before the beginnings of 1950s science fiction and the birth of the space age in the first flicker of Sputnik's 1957 communication might be forgiven for ignoring this topic. However, it is surprising that the future of liberty beyond the Earth has failed to capture the interest of political philosophers since then. It certainly has not been ignored by science fiction writers, as Stephen Baxter, in this volume, explains. Independence movements have been a popular trope, for example explored by Robert Heinlein in his novel, 'The Moon is a Harsh Mistress'. Underpinning these stories there still lurks the question of what freedom is beyond the Earth. Science fiction provides a backdrop with which to explore questions about social development in space, but it is difficult in the context of fictional narratives to drill into a subject with academic purpose. Extraterrestrial liberty has so far eluded the formal, and very extensive, line of thinking on liberty. Nevertheless, science fiction provides a rich source of concepts that might be mined.

The question demands our attention because it is not clear that it is a problem restricted to the future inhabitants of the space frontier. If our hopes for settlement come to fruition, then resources, energy supplies and less enticing, the threat of kinetic weapons, will redound to the people of Earth. It is in the interests of both the terrestrial population and space explorers to understand the origins of tyranny and therefore the nature of freedom beyond Earth.

For a long time to come, the population of Earth will exceed that of space, but nevertheless, Earth is spatially small compared to the infinite recesses of the Universe. From a geographical point of view, any species that has ambitions ultimately to leave its home world and expand into space, must, by default, have an interest in expanding the various social questions that have occupied it on its planet of origin.

So far the space environment is one of the most extreme environments explored by humanity. The lack of atmospheres with a composition similar to that on Earth and the very different fate of volatiles, such as water, lead universally to environments that lack readily available indigenous supplies of three commodities crucial to human existence: breathable air, liquid water and food. The paucity of these basic requisites cannot be described as a denial of any form of liberty. Like the inability for a human individual to fly without technology on Earth, they are a fact of Nature, an unassailable result of the extraterrestrial physical environment. However, their want puts into motion human social arrangements that will influence the character of liberty in very profound ways. In this book, John Cain explores how the constraints of living and working in space, and the health issues that result from being an astronaut, directly affect the type of freedom that can be experienced in space.

In this view we find strains of Montesquieu, who, in the 'Spirit of the Laws' (de Montesquieu 1748), so thoroughly linked human societies to their climatic conditions. Although few today would agree with his emphasis on environmental conditions as determinants of human character, and we would probably accept that core

human behaviours are not so readily fashioned by climate as he supposed, the sheer extremity of space makes the impact of the environment on human social institutions, and thereby indirectly on human behaviour, surely unavoidable.

Tony Milligan brings a much needed view of reality into the debate, reminding us that all the romantic views of space exploration, from which a utopian view of extraterrestrial liberty might emerge, must be balanced by an understanding of our human vulnerabilities. He draws on Ballard's and Arendt's space scepticism to fashion a view of how, whatever does become of liberty beyond Earth, it must be constrained by the true nature of the human character. Charles Peterson explores how the human experience will shape our view of liberty and points out that when, and if, we find another planet to colonise that is similar to the Earth the types of liberty experienced there will be familiar to us. However, in the expanses of interstellar space, an environment very different to the Earth in which we have not yet permanently lived, we cannot readily imagine how people will conceive of liberty.

Space environments will require collective efforts of enormous magnitude to extract atmospheric gases from indigenous planetary atmospheres or rocks to make breathable air, to melt ice or extract hydrogen and oxygen from rocks to make liquid water, to build plant growth units, provide them with energy and tend to them to yield food. These thoroughgoing collective efforts will create environments where individualism may appear to be a luxury. Conformity will be rife. The instantaneously lethal external conditions will similarly demand safety protocols and supervision that may sharpen the instruments of tyranny.

Individualism as we understand it today might give way to the more ancient Greek concept of freedom as the capacity to realise one's potential within the City State, the *polis* (Constant 1998). The resources and safety mechanisms generated by the extraterrestrial collective will be the very environment in which one is capable, as an individual, of living and realising one's potential. This view is one easily manipulated into an excuse for collective control—the more people are coerced, the stronger the collective, the stronger one's assurance of survival in a lethal environment and therefore the stronger one's freedom to be more expressive and ambitious in one's personal objectives.

It probably would not be too far wrong, then, to say that the environment and its influence on social policies will be one important factor influencing how liberty evolves in the extraterrestrial environment. The environment will be a crucial influence on how the ancient conflict between individualism and collectivism as the means to attaining the freedom of the individual is to be kept in check.

Flowing from this is the question of how fairness is to be achieved in the way laws and regulations are written and how they are implemented. James Schwartz provides an analysis of how the Rawlsian concept of justice could be applied in the space frontier—to planetary protection, space settlement and the more mundane near-term concern of orbital debris. His chapter underlines at least two important ideas. First, as on Earth, the character of liberty will be decided by how individuals, organisations and the regulations they draw up come together and, crucially, under what principles they come together. Second, extraterrestrial liberty is not some far-spun speculation. The liberty that states and other actors have in how they behave in

locations such as geosynchronous orbits, particularly with respect to space debris, is already a going concern. Extraterrestrial liberty has become a necessary branch of political philosophy.

This point is elaborated by Javier Martin-Torres, who discusses the implication of the detection of life, either microbial or intelligent, on planetary protection and operating guidelines for planetary missions. His chapter underscores the observation that already we are not entirely free in how we conduct ourselves in space. The discovery of life would have implications for the liberty of those operating the mission, as well as ethical consequences for our behaviour with respect to any life discovered. Even in the absence of life, we require protocols to prepare us for the possibility of its discovery alongside planetary protection protocols. The mere possibility of the discovery of extraterrestrial organisms already places constraints on extraterrestrial liberty.

One way to see the problem of extraterrestrial liberty is to reduce it to the simple conceptual question of whether the limits of individual or collective action can be tolerated within the social structure forced upon a society by the extremities of the external environment (Fig. 1.1). When an environment, such as many locations on

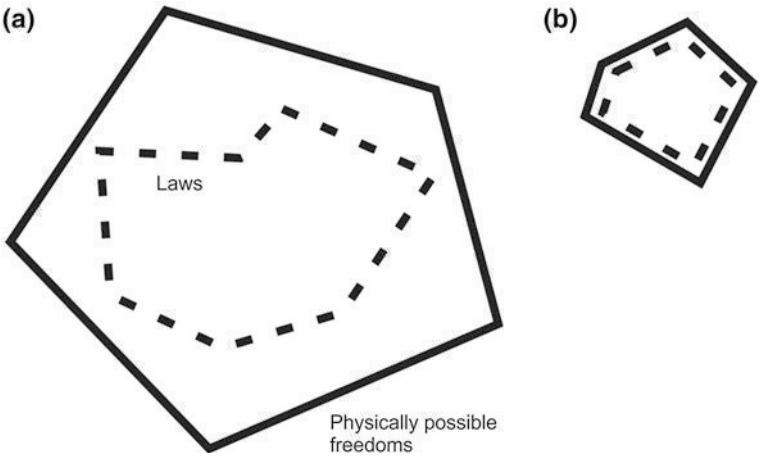


Fig. 1.1 **a** When the environment is clement, for example in many places on Earth, the range of theoretically plausible human actions (*solid line*) is often much larger than those ultimately circumscribed by state laws, edicts and social mores (*dotted line*). Indeed, most civil liberty campaigns are about pushing the dotted line outwards to the maximum extent possible. **b** However, when the environment is extreme, the state and society may be forced to adopt policies (*dotted line*) that are penned in by human capacities and the realities of existence in a lethal environment (*solid line*). Determining when edicts, laws and customs are a necessary result of the restriction unavoidably imposed by the environment, or when they are unnecessary coercion and interference, is a serious challenge in the pursuit of liberty, magnified under extraterrestrial environmental conditions. If some individuals are unaware that certain laws are absolutely required for survival, then when they compare the restrictions imposed by the state in their extraterrestrial environment (*dotted line* **b**) to those of Earth (*dotted line* **a**), they may become convinced that they are living in despotism

Earth, offers a physical space generally clement to human existence, then the boundaries of human action can be wide as few of these actions represent a direct threat to the existence of other humans, let alone the continuity of a very large number of them. A concept of liberty strongly rooted in freedom as the lack of interference and an absence of state intrusion becomes attainable.

In the extraterrestrial environment, where regulations and social coordination are needed to ensure the delivery of air, water and food, the social environment cannot so readily absorb the idiosyncrasies of wild, ambitious and expansive people; the minimum boundaries of authority may restrict many of the behaviours and ambitions regarded as quite normal expressions of individual freedom in some locations on Earth. Minimal state interference may be negligible, but apparently tyrannical nonetheless.

On Earth, this dilemma is not unknown. In polar environments, inclement conditions and sometimes lethal external conditions result in strict and often hierarchical power structures in polar stations. Few of the people that operate in these environments live there: they accept restrictions as the necessary price of doing science in extreme conditions. In environments where people do live permanently in extreme conditions, such as the Inuit of the High Arctic, their methods of collective control are well known. Fossett observed of them:

> Means of enforcing peace and harmony within communities included shaming, shunning, banishment, abandonment leading to death, and execution. Public ridicule and ostracism were the most frequently used methods of social control, and generally had the desired effect of keeping people cooperative. (Fossett 2001)

These communities are not without expressions of individualism. Inuit art is well known (von Finckenstein 2007) and these communities may provide something of a template for understanding how the collective effort required for a community to survive in lethal environments can be reconciled with the projection of individualism. Annalea Beattie looks at art and creative practices in environments on Earth, including Mars analogue environments, and asks what they might be able to tell us about art as a means to pursuing individual freedom in outer space.

In some of the analyses presented here, we see inherent contradictions and paradoxes in space that arise from the need for collectivism to survive and yet this is coupled with the need to find room for the individual in space. Charles Cockell explores the nature of some of these paradoxes and finds them to cut across the political, economic and cultural spectrum of extraterrestrial society. Finding ways to manage them and canalise them in positive ways will be essential if they are not to tear the extraterrestrial society apart.

It is quite possible that extraterrestrial societies may retreat into a more Stoic version of individualism—something found within and expressed through art, philosophy and other activities that do not require free physical movement, with a more subdued form of externally expressed individualism. In such an environment, it becomes irrelevant whether one takes the view that liberty is about freedom from interference or the capacity to realise one's potential. Greater interference becomes necessary and the extreme environment creates social obligations and requirements

that restrict the opportunities for individuals to pursue their own, very unique social projects.

Emphasis can be placed on how individualism might become fashioned by the environment of space, but another factor of enormous significance is the source of tyranny that will erode liberties. On Earth it might be convenient to recognise two types of tyranny, let us call them external and internal tyranny. External tyranny is tyranny imposed on a group of people from outside and is usually in the form of invading armies, international restrictions and the like. Internal tyranny is the tyranny that emerges from within a group of people, from the social conditions that develop from the way in which the community organises itself. It could come from one of their number taking control of the group, such as a dictator. It could come from the subtle appearance of a social culture and creed that emerges from the way in which a group of people adapts to the environment in which it lives.

A tantalising characteristic of outer space is the opportunity to escape external tyranny. Freed into the vast expanses of interplanetary and interstellar space, human societies are granted reprieve from the densely populated cities of Earth, afforded an extraterrestrial anonymity where they can escape persecution, pursuit and coercion. Space has always been seen as a liberating frontier from this perspective. Its boundaries are limitless and its sheer spatial scales will overwhelm even the best organised apparatus of military or law enforcement.

The possibility that space might afford individuals an escape from state regulations experienced on Earth, a type of reversion to a more natural state of nature, closer to a Lockean vision of freedom than has been possible in most modern societies, is explored by Paul Rosenberg. He compares the American wilderness frontier and cyberspace to the possible opportunities for liberty that the infinite volumes of the space frontier might allow.

The immense spatial scales of outer space offer a possibility for those who escape early enough to outrun their pursuers. As Stuart Armstrong and colleagues explain, by setting off into space at a fraction of the speed of light early, pursuers are eventually left with the impossibility of catching up. Indeed, the recognition that the laws of physics aid those seeking freedom might itself induce tyrants, and civilisations as a whole, to pre-empt these possibilities by beginning a mass colonisation effort.

Space is not without inherent limitations on tyrants. Given the immensely destructive capabilities of kinetic weapons, war may be a prohibited option for a civilisation, as Stephen Baxter and Ian Crawford discuss. A mirror image of terrestrial war and violence in space is not a forgone conclusion. It may be limited by the hard realities of physics as much as by human policy.

To escape external tyranny is not to escape internal tyranny. The extremities of space heighten the chances that despotism will emerge within a social group whether by opportunistic activities of dictators who seize upon an isolated and vulnerable group, or from the social coercion that results from even the most liberal and well-meaning attempts to organise society against the lethal external conditions. Escape from external tyranny is no prize when internal tyranny subjugates to a greater extent (Fig. 1.2).

Fig. 1.2 A trivial cartoon that surfaced widely on the internet in 2013 depicting a person released from prison into terrestrial society. However, it very succinctly raises the central question which this book explores—will the apparent freedom of escaping the Earth merely leave humans at the mercy of other forms of entrapment or tyranny in the very societies they construct, regardless of the spatial scale of the interplanetary and interstellar environment?

It is evident that finding solutions to tyrannical extraterrestrial leadership depends much on the character of constituted authority and the form of government. Ian Crawford explores the nature of federalism beyond Earth and its suitability as a means to realising collectivist needs, while maintaining the maximum amount of freedom. He shows that by drawing on the lessons learned on Earth, there is much that can be done in advance to shape a future in space where liberty is maximised.

The choices faced by extraterrestrial societies is examined by David Baker, who explores the issues they will have to contend with while deciding what sort of government they want beyond Earth—decisions that will turn on the very definitions of democracy and liberty that they choose to adopt.

The successful establishment of extraterrestrial settlements will not only depend on the manner in which rules are developed on Earth prior to settlement, but how these emerge in the extraterrestrial frontier and how they will ultimately determine the freedom of future colonists. This facet of liberty is explored by Rick Wylie.

As extraterrestrial governance evolves, what might define basic rights in space? Is it likely that in attempting to protect their right to oxygen, space settlers will end up compromising rights that on Earth would be considered fundamental? William Paley intriguingly wrote in 1785:

> Natural rights are, a man's right to his life, limbs, and liberty; his right to the produce of his personal labour; to the use, in common with others, of air, light, water. (Paley 1785)

It is not clear what Paley really meant by 'air'. Perhaps he was referring to air unadulterated with the fumes of industrialisation, but inadvertently he had written the sort of sentence that one might envisage coming from the eager minds of extraterrestrial denizens attempting to circumscribe the boundaries of their

freedoms and to protect a basic right to breathe oxygen free of coercion and tyranny. Oxygen, or air, has rarely been the subject matter of political discourse on Earth, and when, such as in Paley's case, it has found its way into the literature of liberty, it is not a reference to the possibility of being denied *any* air to breathe. The extraterrestrial environment demands of liberty seekers a newfound interest in what constitutes freedom—and a new focus on the rights and laws that are to be used to protect it.

There can be little hesitation in saying that the nature of liberty beyond the Earth, and its future, will depend on the education of the people subjected to it. Just as our own concepts and expectations about what freedoms we have is fashioned by our societies and our education, so the way in which education develops in space will surely frame the view that extraterrestrial settlers have of the space frontier and its limitations and possibilities for the expression of individual freedom? In a chapter exploring this problem, Janet de Vigne investigates how education will be pivotal in the trajectory that extraterrestrial freedom ultimately takes. We can presume as well, that even if it is a while before people are born in space, it will always be the case that terrestrial education will have a strong influence on how people travelling into space expect others to behave towards them in recognising their liberties and rights. Maybe extraterrestrial liberty should be a point of discussion in terrestrial curricula as well as for those children eventually born beyond the Earth? If space settlements ultimately influence the Solar System economy and the political and economic conditions on Earth, it might be wise for the Earthbound to take more than a passing interest in understanding the history of liberty and its application to the far-flung and seemingly remote societies in space.

The question 'Freedom, more or less than on Earth?' is one way to study liberty in space. It sets the problem up as a comparison. With a wide array of literature on liberty spanning millennia, perhaps it seems sensible that an approach to understanding liberty in space is to compare it with what we know on Earth. Most of the essays in this volume deliberately, or without obvious intention, ultimately make reference to our experiences on Earth.

To some extent the differences between liberty on Earth and in space are a matter of degree. Water and food in most countries on Earth are subject to strict state guidelines on safety. Most of us no longer acquire these commodities from the natural environment. In that sense, many of us are part of an enormous urban life-support system. Perhaps in a very large extraterrestrial settlement many facets of authority and regulation will be no more overt or visible to the population than they are for many people on Earth. However, aspects of liberty in space would seem to be categorically different from those on Earth. The permanent lack of freely breathable atmosphere must surely influence the sense of freedom experienced? The isolation of communities, the delays in communications with other planetary bodies caused by the finite speed of light, that in some ways throws extraterrestrial colonies back to a type of delayed pre-telegraph state of communication, must together act to create a society with a unique feel, a unique sense of what freedom is, what collective ambitions are and what the place of the individual is.

We probably cannot successfully predict the culture of an extraterrestrial society, but it may not be impossible to predict those characteristics of the extraterrestrial environment and of human character that will exert the greatest influence on liberty.

On June 13 and 14, 2013, we organised the first academic workshop to consider the question of liberty in space. 'Extraterrestrial Liberty: What is Freedom Beyond the Earth?' brought together speakers from around the world to the British Interplanetary Society, London, England to present, debate and discuss ideas. From this workshop emerged the idea for a book to explore some of these ideas and provide a lasting record of some of these deliberations.

We made no prescription of what we actually meant by liberty and left it instead to the speakers to explore their own interpretation. Liberty has been interpreted in a plenitude of ways: freedom as the satisfaction of basic everyday needs; freedom as lack of interference; freedom as self-realisation; freedom as the ability to choose one's government; freedom as the protection of basic rights. Aspects of all these versions of freedom are to be found in the chapters that follow.

This book is intended not just as a contribution to present-day discussions on extraterrestrial liberty, but in some sense as a historical record of what people in the 21st century thought about the future of liberty beyond Earth. It might provide a means for future space settlers to reflect on their situation against the backdrop of ancient thoughts. It might merely provide a volume of amusing ideas rooted in prejudices and perspectives long since dissipated. Whatever it is, we offer this book as one contribution to an undeniably and enormously important question for the branch of human society that inhabits outer space: The Meaning of Liberty Beyond the Earth.

References

Constant, B. (1998). The liberty of the ancients compared to that of the moderns. In B. Constant (Ed.), *Political writings* (pp. 307–328). Cambridge: Cambridge University Press.

de Montesquieu, B. (1748). *The Spirit of the Laws*. Amsterdam: Chatelain.

Fossett, R. (2001). *In order to live untroubled: Inuit of the Central Arctic, 1550–1940*. Manitoba: University of Manitoba Press.

Paley, W. (1785). *The principles of moral and political philosophy*. Indianapolis: Liberty Fund.

von Finckenstein, M. (2007). *Celebrating inuit art*. Toronto: Key Porter Books.

Part I
The Philosophical Basis of Extraterrestrial Liberty

Chapter 2
The Cold Equations: Extraterrestrial Liberty in Science Fiction

Stephen Baxter

Abstract This chapter is about explorations of extraterrestrial liberty in science fiction. Depictions of colonies beyond the Earth, either in space or on other worlds, date back at least as far as Hale's 'The Brick Moon' (1869). Many such works have explored the social and anthropological implications of off-Earth colonies, and as such have anticipated in fictional form much of the discussion elsewhere in this volume. These works of fiction, the result of more than a century's constructive speculation, serve as thought experiments on the subject. And by focussing on human characters, fiction may breathe fire into abstract theories of politics and society.

Keywords Science fiction · Extraterrestrial liberty · Space colonisation · Terraforming · Extraterrestrial life

2.1 Introduction

> It would not be inaccurate to say simply that children born in space will be the first humans to be reared in cages Cockell (2008).

This chapter is about explorations of extraterrestrial liberty in science fiction (SF).

Quasi-realistic depictions of colonies beyond the Earth, either in space or on other worlds, date back at least as far as Hale's 'The Brick Moon' (1869), which described life on an Earth-orbiting space station. Stories of space colonies were written during the development of the modern genre in the 20th century by Asimov (1952), Clarke (1951), Heinlein (1966) and many others, and this continues today in works by the likes of McAuley (2008), Reynolds (2012), Robinson (2012), and the author (Baxter 2013). Many such works have explored the social and anthropological implications

S. Baxter (✉)
British Interplanetary Society, 27–29 South Lambeth Road, SW8 1SZ London, UK
e-mail: sbaxter100@aol.com

C.S. Cockell (ed.), *The Meaning of Liberty Beyond Earth*,
Space and Society, DOI 10.1007/978-3-319-09567-7_2

of off-Earth colonies, and as such have anticipated in fictional form much of the discussion in Cockell (2013) and elsewhere in this volume.

These works of fiction, the result of more than a century's constructive speculation, serve as thought experiments on the subject. They may serve as a source of ideas, and an examination of issues raised; SF has always been an arena for debate. And by focussing on human characters, fiction may breathe fire into abstract theories of politics and society.

It would be inaccurate to call this essay a survey of the field. Any work which seeks to depict realistically a human community away from the here and now must necessarily deal with social and other issues, however superficially. It is clear that the most relevant works for our purposes will have been written with the *intent* to deal with such issues, but the boundary is not easy to draw. General surveys of the SF field include the classic work by Aldiss (1986) and a more recent history by Roberts (2006). The online SF Encyclopaedia (Clute 2013), is a fine, free and up to date resource.

This essay will consider first issues of liberty arising from the confinement and centralisation of extraterrestrial communities, as summarised by the Cockell quote given above, led by a discussion of the classic story from which the essay's title is derived. The essay moves on to a survey of revolutions and society-building in off-Earth contexts, before closing with a brief survey of issues relevant to the further future.

2.2 The Cold Equations: Liberty on the Space Frontier

> 'The door opened and the stowaway stepped through it, smiling. "All right – I give up. Now what?" It was a girl…' Godwin, 'The Cold Equations' (Godwin 1954).

Godwin's well-known short story 'The Cold Equations' (1954) is a stark illustration of the curtailment of human freedom of choice in the constrained environment of the 'space frontier', and since its first publication it has served as a focus for debate in the SF field about the implication of such constraints.

The story first appeared in the August 1954 issue of *Astounding Science Fiction*, edited by John W. Campbell. In terms of historical context (Aldiss 1986), SF, having been pioneered in the nineteenth century with works of great quality by Verne, Wells and others, had by the 1920s become a popular literature of more questionable quality published in the so-called 'pulp' magazines, especially in the US. Campbell (1910–1971), largely through his editorship of *Astounding*, did much to improve standards of literary quality and intellectual rigour in the field, and during SF's so-called 'Golden Age' (roughly the 1940s) nurtured such talents as Asimov, Clarke, Heinlein, Sturgeon and Van Vogt. Yet Campbell himself was a conservative American, arguably a libertarian, and this could be reflected in his editorial policies. Godwin (1915–1980), meanwhile, had worked as a prospector in the harsh environment of the Mojave Desert: a frontier of its age. Many of his

works explored the theme of nature's indifference to humanity—such as 'The Cold Equations'.

As is indicated in Campbell's original preface to the story, 'The Cold Equations' is a tale of the space frontier: 'The Frontier is a strange place—and a frontier is not always easy to recognize. It may lie on the other side of a simple door marked "No admittance"—but it is always deadly dangerous.'

The story is set on an Emergency Despatch Ship (EDS). In Godwin's future, passenger-carrying starships use such vessels as a rapid response to emergencies—in this case, to deliver medical supplies to a plague-stricken planetary colony. The ships have very tight fuel and mass budgets, to the extent that the extra mass of a stowaway will imperil the mission. Yet a passenger on the starship, a girl intent on visiting a brother on the target planet, has stowed away anyhow. And from early in the story the situation is presented starkly: the girl has to be ejected, voluntarily or otherwise.

'It was the law, stated very bluntly and definitely in grim Paragraph L, Section 8, of Interstellar Regulations: "Any stowaway discovered in an EDS shall be jettisoned immediately following discovery…"' There are no options, we are told; even the self-sacrifice of the pilot would result in the loss of the ship altogether. 'To [the pilot] and her brother and parents she was a sweet-faced girl in her teens; to the laws of nature she was x, the unwanted factor in a cold equation.' The girl had had no idea of the penalty: '"You still haven't told me," she said. "I'm guilty, so what happens to me now? Do I pay a fine, or what?"… In a way, she could not be blamed for her ignorance of the law; she was of Earth and had not realized that the laws of the space frontier must, of necessity, be as hard and relentless as the environment that gave them birth.'

Much of the story is presented with the stowaway trying to come to terms with this death sentence. Godwin piles on the sentiment: '"Yet I remember [my brother] more for what he did the night my kitten got run over in the street. I was only 6 years old and he held me in his arms and wiped away my tears and told me not to cry…"' The girl expects the pilot or his commanders to come up with some solution—and so do we readers, raised on a diet of softer-edged wish-fulfilment stories. Yet release never comes; the story stays true to its logic, and is pitiless.

In the end the girl walks voluntarily into the airlock, still baffled: '"I didn't do anything to die for… I didn't do anything…"'

Across six decades this brief story has remained famous, regularly anthologised and adapted for TV and radio. And yet it has also been the focus of intense debate within the SF community, especially over the last decade or so, according to critic Kincaid (2012). On the one hand some advocate the story as symbolising the core values of SF, or at least a certain kind of SF. According to scholar Gunn (2002), 'If the reader doesn't understand [the story] or appreciate its environment, then that reader isn't likely to appreciate science fiction'. Conversely Kincaid has attacked it bitterly: 'To protest that the story is sexist…is to miss the real fundamental problem… The death of the girl is directly traceable back to human agency, not to the law of the universe' (2012).

The debate is between those who argue for the virtues of frontier life—the idea that scarcity and a harsh environment is good for the individual, for society as a whole and perhaps even for the evolution of the human species—and those who argue for, if not utopian forms of stable societies, at least the protection of the vulnerable, the innocent, the weak, from nature's harshness. It can be seen that in Godwin's story this debate is framed in terms of an American sensibility; such was America's commercial dominance of SF during the 'Golden Age' at least that American themes, such as the folk memory of the 'frontier' days of the western expansion of the US, were regularly translated into SF forms. But other dichotomies can be mapped onto this tension: political right versus left, for example.

Kincaid alludes to specific criticisms of Godwin's story such as that it can be seen, retrospectively at least, as sexist, with competent men being contrasted to a foolish girl. But he identifies a deeper problem. In any situation it is not the physical environment that constrains human liberty—that provides an inviolable framework which none can escape—but human choices, laws, agency within that environment. To blur this distinction is to open oneself to an accusation of authoritarianism: *Because there is vacuum beyond that bulkhead, you must do as I say.* And 'The Cold Equations,' sadly, does blur that distinction. The 'competent men' who run the EDS system are really not terribly competent at all; any modern engineer would be appalled by the fact that the *only* deterrent to stowaways is a 'Do Not Enter' sign. It is not nature's indifference that causes the girl to die, but the inadequate design and control of human systems. Because of this flaw, the story cannot bear the weight of debate that has been loaded into it.

With a sympathetic reading the story does, however, work in its own terms. If one takes the story's inner logic at face value, one receives a chilling sense of the frontier's pitiless rigour: in defiance of the conventions of storytelling, there will be situations beyond human control, there will be situations where not everybody can be saved. And it is this natural rigour of the extraterrestrial environment that creates boundaries to human liberty.

2.3 The Quintessential Cages: Long-Duration Space Missions

> The narrow crack traced a high, four sided figure in the face of the rock. It was a door!
> Harrison, *Captive Universe* (1969) (p. 51).

Stories of lives spent in extraterrestrial environments for extended periods have been written by generations of SF authors. Cockell (2013) identifies the challenges to liberty in such environments as arising from perpetual confinement and a reliance on central communal technological systems, factors which encourage tyrannous regimes, and make rebellion difficult or impossible.

Perhaps the purest form of extraterrestrial 'cage' is the long-duration space mission, from which there is no possibility of escape. Even compared to an enclosure on Mars, say, the confinement imposed in such missions is brutally strict.

The author's own *Ark* (Baxter 2009) is about a group of around 80 young people fleeing a dying Earth of the near future, and travelling to the habitable world of a distant star, a journey that will last 37 years. There would presumably be little argument about the ethical choices made by parents giving up their children to a lifeboat of this sort, and indeed the crew candidates compete intensely for places. But little thought is given to the evolution of the crew's society once the mission is underway, and the young people have to find their own solution. One inspiration for what follows was Golding's *The Lord of the Flies* (1954).

At first, especially while contact is maintained with Earth, a military command structure persists: 'Holle, they offered me the role of commander of the trans-Jupiter phase! That's a mission in itself. Then I'll be in prime position to become captain of the interstellar phase' (p. 166).

Later, the crew's limited training encourages them to try a kind of participative democracy: 'But I don't need, and shouldn't have, the absolute authority of a captain of a ship at sea… I want to govern by consensus… If there's a dispute, we'll just talk it out as long as it takes' (pp. 260–261). However this early solution breaks down over arguments about a drastic punishment (a maiming) imposed on a crewman guilty of a crime of passion; his crewmates are not yet ready to accept such authority.

An election results in the emergence of a new leader. Wilson is as competent as the rest in terms of running the ship's systems, but he and his gang retain rule for decades through sheer physical strength, and the manipulation of the ship's internal politics. Here is the most primitive form of human society, the shadow of the chimp, re-emerging light years from Earth. But Wilson becomes bored and corrupt, and begins to prey on the crew: 'Look at me. I'm the most powerful man on the ship. Have been for 10 years… So what's in it for me? I'll tell you. Only the sweetest commodity on the ship. I'm talking about young flesh…' (p. 365).

The new generations, however, have their own issues. No preparation has been made for their raising or education, or to integrate them into the ship's overall purpose. In the resulting social vacuum they have evolved their own subculture: 'Steel looked up along the length of the hull… What she looked for was other shippers like her, shipborn, where they clustered in their little territories, marked by scratchy graffiti signatures on the walls… Nobody much older than Steel even saw any of this going on' (p. 387). Ultimately, enraged by abuse by Wilson's cadre—and fuelled by a comforting myth that perhaps the ship's confinement is not real, that the mission is a cruel Earthbound delusion—the young organise, rebel, and attempt to break out of the hull, with disastrous consequences.

In the aftermath one of the original crew, Holle, with control of the life support systems, assumes total control over the survivors, and particularly over the young. Now the ethic of the lifeboat is imposed, with room for little or no liberty. And Steel, the young leader, is sentenced to death: 'I don't want leadership… Not among the shipborn. I don't want vision, or idealism, or curiosity, or initiative. I don't want courage. All I want is obedience. It's all I can afford, until we're down on Earth III and the day comes when we can crack open the domes and let the kids just walk away. Yes, she's the best of her generation, and that's why she's such a

terrible danger. That's why Steel has to die' (p. 417). The book's essential argument is that the social design of such a mission, and particularly the challenge of managing the education and aspirations of the younger generations, is as important as the ship's technical design, if breakdowns are to be avoided.

Other explorations of the 'generation starship' trope include Heinlein's 'Universe' (1941), Aldiss's *Non-Stop* (1958), and the author's own 'Mayflower II' (2004). Many such stories span a much larger timescale than *Ark*. As the generations pass, typically the mission goals are lost or forgotten, the ship's internal society breaks down, the crew's descendants may forget they are on a ship, and ultimately even the evolution of the shipboard inhabitants may be compromised. In Aldiss's novel, on the ecological island that is the starship, the crew's descendants are dwarfed—as if the ship is ultimately crewed by the 'hobbits' of Indonesia.

Possibly one solution to the challenge of crewing a generation starship might be to reach back to the social forms of the 'traditional societies' of humanity's past on Earth (Diamond 2012): the pre-farming age when humans lived in small, relatively isolated bands, with the integration of children from birth into a limited number of social roles. Such societies may seem alien and constricting to modern-day city-dwellers, but they were clearly enduring forms, dominating for some 90 % of human history, and indeed continuing in a minority of cases today. And in their isolation and self-reliance traditional societies may be closer in their social frame to the starship future than are modern urban social groupings.

One work of SF which explicitly explores this kind of solution is Harrison's *Captive Universe* (1969)—but a significant ethical challenge is presented, for a pre-existing traditional culture is scooped up without its consent or knowledge and used to crew a starship.

For a 500-year mission to Proxima Centauri, the asteroid Eros is spun up and carved into a hollow world with an artificial sky (p. 108). People Harrison calls 'Aztecs', from isolated subsistence-farming communities in Mesoamerica, are taken on board and allowed to believe they are in a closed valley on Earth: 'The Aztecs, chosen after due consideration of all the primitive tribes of Earth. Simple people, self-sufficient people, rich in gods, poor in wealth…[living] as they did when the Spaniards first arrived hundreds and hundreds of years earlier… Taken, unchanged, and set down in this valley in a mountain in space. Unchanged in all details, for who can guarantee what gives a culture adhesion—and what, if taken away, will bring it down?' (p. 109).

And to further ensure stability, the Aztecs have been genetically engineered for low intelligence during the voyage: 'They did take genius. And they tied it down to stupidity. Dimness, Subnormality, Passivity, Prison it in slightly different ways in two different groups of people and keep them apart… Then, some day, the right day, let the two groups meet and mingle and marry… The children [will be]… genius children' (p. 110).

The story concerns a break-out by a young Aztec man, Chimal. The accidental product of a premature rule-breaking coupling between the separated communities, he is over-intelligent and restless. At last, in a scene of classic 'conceptual breakthrough' (a moment in a story when everything a character thinks he or she knows

about the universe is inverted), Chimal finds a way out into the machinery, through a door in a rock face (p. 51).

This book examines the ethics of removing the liberty of generations of unborn for the purpose of such a mission. Chimal himself is enraged by the truth: 'This is no wonder—but a crime. Children…were taught superstitious nonsense and bundled off into this prison of rock to die without hope. And, even worse, to raise their children in their own imbecilic image for generation after generation of blunted, wasted lives.' (p. 148).

The only justification is that the unpleasant choices made in this case have worked, in delivering the long cultural stability required of a generation starship.

2.4 Extraterrestrial Revolutions

> The progressives…believe that in the long run Man has got to explore and master the material universe, or else he'll stagnate… But this sort of argument is no use with the taxpayers. Clarke *The Sands of Mars* (1951) (p. 184).

What if extraterrestrial colonies prosper and, following historical precedent, seek independence? This section looks further into the future and considers SF accounts of a quest for liberty by extraterrestrial colonists revolting against the centre. In an American-dominated genre, many have been inspired by the example of the American Revolution.

One classic example is Heinlein's novel *The Moon is a Harsh Mistress* (1966), a compelling, densely written saga of a revolution by a near-future lunar colony. It was written when Heinlein was 59 years old, at a time in his career when he allowed his personal political views to be expressed in his fiction.

In 2076 Luna City is a colony of convicts from Earth, along with some citizens freed having ended their sentences, and freeborn descendants of convicts. The book is told from the point of view of 'Mannie', one of the colonists, in an argot that is a compound of American English, Russian, Australian. In an economic scenario that looks unlikely to modern eyes, the colonists make a living by mining lunar water and growing wheat, which is exported—using a 'catapult', a mass driver—to an overpopulated Earth run by the 'Federated Nations', a stronger version of the UN. A Lunar Authority, under a Warden, controls the colonists' lives, including the central engineering that provides air, food and water. The Warden even controls the terms of sale of the wheat.

The colonists are confined by the Authority but are not policed internally, and Heinlein depicts a kind of natural morality arising from the very lethality of the lunar frontier: 'Zero pressure was place for good manners. Bad-tempered straw boss didn't manage many shifts' (p. 21); 'Could say our customs are natural laws because are way people have to behave to stay alive' (p. 123). The operation of this 'natural law' includes ad hoc citizens' tribunals with the power to impose the death penalty (Chap. 11).

A revolution foments under the tutelage of Professor Bernado de La Paz, a well informed scholar of history—and a mouthpiece for Heinlein. The proximate cause

of the revolt is the inevitable depletion of lunar resources in a few years: 'Luna must be self-sufficient' (p. 26). With 1776 as a conscious precedent, La Paz prepares for the rebellion carefully: 'Revolution…depends on correct organisation and, above all, communication. Then, at the proper moment in history, they strike' (p. 57). The 'Loonies' are more patriotic to their homelands on Earth than to the moon, so incendiary incidents with Authority guards are stage-managed: 'Easier to get people to hate than to get them to love' (p. 87).

The rebellion itself is difficult to achieve. It is suicidal to strike against the infrastructure itself: 'The woman had been in The Rock almost all her life…yet could think of something as new-choomish as wrecking engineering controls' (p. 44). Meanwhile the Warden controls essential systems from his isolated and heavily guarded complex. In the end Heinlein resolves these problems rather easily by giving the colonists a crucial ally in 'Mike', the colony's central computer, which happens to become sentient, and decides to become an ally of the rebels. This does illustrate however the necessity, and the difficulty, of seizing control of central life-supporting functions. For instance the Warden's Complex is ultimately disabled by Mike cutting its oxygen supply.

War follows as Earth tries to regain control, illustrating a further hazard to extraterrestrial rebellion: the sheer lethality of interplanetary war (see the essay by Baxter and Crawford elsewhere in this volume). On the one hand the colonists, lacking dedicated weapons, improvise by 'throw[ing] rocks at them' (p. 80): the catapult is used to hurl massive loads of moon rocks at Earth. Uninhabited areas are targeted but collateral casualties are inevitable. It is a war of terror, with 3 million 'loonies', able to strike at will against 11 billion Earth inhabitants (p. 126). On the other hand it is easy for Earth troops to crack open even underground pressurised lunar shelters with hydrogen bombs (p. 205). In the end, as with the American War of Independence, the conflict is ended through exhaustion on both sides—and before mutual destruction is achieved—and the moon is free.

In American-dominated mid-twentieth-century SF, 1776-style rebellions of near-future space colonies against the centre were represented as something of a default, a theme picked up by authors from a surprising array of backgrounds. Typically an inner human instinct for expansion was shown to be in conflict with the centre's desire for control—or just for a return on its investment.

Even Dick wrote of war with rebellious planetary colonies. In the novel *Time Out of Joint* (1959), the protagonist Ragle Gumm is the centre of a false reality set in the year 1959, his only occupation being to solve daily newspaper puzzles. In fact the year is 1998 and the US is at war with a lunar colony. The few thousand 'lunatics', safe in their underground bunkers on the moon, terrorise Earth with random attacks: 'It worries them because they can never tell if it's a full-size transport with a full-size H-warhead, or only a little fellow. It disrupts their lives' (p. 173). Gumm has a pattern-recognition skill that enables him to predict the lunar attacks, disguised as his puzzle-solving; he is kept in '1959' because he would have chosen to go over to the moon's side as isolationist tendencies deepened. In this book at least Dick expresses a Heinleinian dream of inevitable migration: '[There was] a deep restless yearning under the surface, always there in him, throughout his