Chapter 2

Basic Methodology for Space Ethics

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Additional information is available at the end of the chapter

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Abstract

The introduction sets out a standard concern that space ethics may be unduly constraining upon state and private sector activities in space. As a counter-picture, Section 2 sets up a distinction between 'standard space ethics' and 'special space ethics' which will allow us to explore ways in which space ethics enables as well as constrains. A case is then made in Section 3 for pragmatic constraints upon space ethics itself. Space ethics should be either 'policy apt' (able to directly shape space policy within a liberal democratic social context) or 'precursor apt' (able to contribute productively to broader, precursor discussions which may feed into policy apt deliberations). What makes any ethic satisfy either of these conditions will depend upon a range of factors. The ethic should have stability (dealt with in Section 3.1). It should not merely track transitory voting trends or the ebbs and flows of electoral politics. Secondly, it should have a high degree of political realizability (dealt with in Section 3.2). Finally, the ethic should be psychologically available. Section 4 then shows the usefulness of these basic constraints upon space ethics through a contrast between the emerging US and European agendas in astrobiology.

Keywords: astrobiology, ethics, liberal democracy, availability, realizability

1. Introduction

The past decade has seen a considerable shift in the volume and quality of work on space ethics [1–4]. Key standpoints have been articulated more clearly over arguments for and against the 'inherent value' of microbial life; over the just distribution of limited space resources; over the ethical issues of risk (and the distribution of risks and benefits); and over the connection between terrestrial environmental ethics and planetary protection elsewhere. Ethical considerations are, however, still sometimes regarded as constraints of an unhelpful, and possibly

arbitrary if politically necessary, sort. Unhelpful, because they often tell us what we should not do, rather than what we have a duty to do, and arbitrary, because of suspicions that ethics in general does not answer to how the world is. Politically necessary, because a strict libertarian approach toward the world seems to fit poorly with a functioning liberal democratic society where there are requirements of 'solidarity' and some conception of a 'common good'.

Ethical constraining is, thus, part of any functioning society and, in the case of liberal democratic societies, obviously so. It is tempting, however, in some contexts (such as human activities in space), to include such constraints only as side considerations, pushed out to the margins, and linked perhaps to philosophical or metaphysical commitments of a peculiar sort. Here, we might think again about theories of inherent value or about ethics formed as an extension of some or other set of religious commitments.

To some extent, this is where ethics is placed in NASA's *Astrobiology Strategy* [5], i.e. on the margins, securing only 13 lines in a 256 page text. By contrast, at the time of writing, Working Group 5 of the COST Action TD1308 is finalizing a White Paper *Astrobiology and Society in Europe Today* (2018) where ethics is situated firmly within the humanities and the humanities firmly within astrobiology [6]. Of course, due allowances must be made here for NASA's statutory remit: it may be their business to support constructive reflection upon the societal aspects of Astrobiology, but it is not their business to tell us the difference between right and wrong. (Although, in fairness, the WG5 document also does not seek to do that.) Even so, the marginal positioning of ethics within the NASA document looks like more than statutory compliance. It looks like awkwardness and perhaps also caution about the constraints that ethics might introduce.

At the same time, NASA has helped to fund work on astrobiology and society (such as the recent project with the Princeton Centre for Theological Inquiry, 'Inquiry on the Societal Implications of Astrobiology' which ran from 2015 to 2017. Within such 'societal implications' work, ethics is more obviously central. Compliance with international space law (which *is* within NASA's remit) is also entangled with a range of ethical considerations, as are attempts to justify funding on space research. These reach beyond prudential considerations such as the generation of commercial spin-offs. My suggestion, then, is not that NASA or any other body might be seeking to evade the problems of ethics, but rather that the marginalization of ethics within the above document is both understandable and symptomatic. Ethics can be difficult to place, and particularly so at present, given the emergence of private sector space activity in combination with state-funded programs. It is an important and (given the context of liberal democratic societies) reasonable concern that ethical considerations should not *unduly* constrain either scientific exploration or the development of commerce. It is also a reasonable assumption that these two must find an accommodation with one another, and that ethics should not get in the way of their doing so unless the *way* in which it is done happens to be particularly objectionable (e.g. through the strict subordination of science to commerce—an unlikely scenario).

And so we have a picture of ethics as troubling and potentially constraining what is problematic about this picture is that it is a little one-sided. There are important respects in which

ethics does constrain, but in the context of space it also enables. Indeed, it has a track record of doing so. This will be explored in Section 2 below. However, ethics can only do this if it itself is reasonably constrained or 'fit for purpose,' although what counts as 'reasonable' constraint, and what is 'fit for purpose' (hence *not* arbitrary) in relation to human activities in space, will need a little cashing out. Section 3 will attempt to make some headway on these matters. Overall, the chapter is about the shape that space ethics needs to have if it is to be appropriately situated. It is about basic methodology, 'basic' in the sense of 'rudimentary' rather than 'foundational.' There is no presumption that knowledge in this domain has a foundational structure. Rather, the chapter specifies requirements that any ethic should meet, irrespective of its preference for a terminology of rights, duties, consequences, integrity, or virtue.

The implications of the relevant, rudimentary, methodological considerations will be explored in Section 4. As an exemplar, in the light of these considerations, we may be better placed to make sense of the differences between the above, emerging, European and NASA agendas in astrobiology: as competing players in a zero-sum game (ethical constraint and regulation versus their marginalization), or as contributory responses, each playing a useful role within a much larger conversation. The primary concern of what follows is, however, basic methodology rather than any comprehensive untangling of the differences between these agendas.

2. Space ethics as enabling as well as constraining

Space ethics may be broken down into subdivisions in multiple ways. For convenience, the subdivisions appealed to here will be 'standard ethical considerations' and 'special ethical considerations' with the latter particularly (although not exclusively) associated with space. Issues of safety, risk and its disclosure belong within the standard ethical considerations. They apply equally to a broad range of other terrestrial human activities. By contrast, the ethics of SETI and at least some considerations of planetary protection (such as the avoidance of forward contamination) involve considerations which are peculiar to space, or at least to space together with a relatively small number of special terrestrial contexts. For the moment, I will simply assume that planetary protection, e.g. matters such as forward contamination, really is entangled with ethics, although this is an assumption which may seem more obvious to ethicists than to policy theorists or the developers of protocols. The entanglement of SETI with ethics is, by contrast, non-controversial: Do we have a duty to search for life? Do we have a responsibility to try to discover intelligent life before we signal our own presence? And so on.

My suggestion is not that this broad contrast between standard and special ethical considerations is a rigid dichotomy, but merely that it holds *up to a point* and is useful for present purposes. With regard to both sides of the division, I want to suggest that ethical considerations often play an enabling as well as constraining role. Even so, some caution

is warranted. *Often*, is not *always*. Also, such an enabling role may seem suspiciously fortuitous. There is, however, a reason why ethics is often enabling. A large class of ethical problems in space involve issues of justice, and justice is readily recognizable as an enabler for agents. It entrenches both special entitlements and approximations to various kinds of equality of access and opportunity. Of course, not all matters of space ethics involve justice. And in those cases whether or not there is an enabling dimension to ethics may involve a more mixed story. For example, the more metaphysical arguments about inherent microbial value may offer little in the way of enabling to any agents. Or, if enabling, they may merely be so in the sense that they back up actions (e.g. forms of microbial protection) which enable science in contexts where we also have more straightforward prudential reasons for the same protective measures.

2.1. Standard space ethics as enabling

The enabling aspects of various standard ethical considerations are easily seen. As a point of standard ethics, space exploration should not reproduce familiar forms of gender bias, with rank upon rank of white, male (and for public purposes, heterosexual) astronauts traveling into space. When, for example, Senator Louie Gohment stood up in the US House of Representatives on May 26 2016, and insisted that there will be no gay space colonies, reasonable ethical concerns about gender bias were raised [7]. Nor should the safety of humans sent into space, or working on the ground with dangerous rocket fuels, be unreasonably compromised or put at risk without appropriate disclosure of these risks. Pressures to speed up the frustratingly slow pace of Virgin Galactic's space tourism program should not end up with lives lost and debris on the floor of the Mojave Desert. Reasonable precautions ought to be taken to avoid any repetition of their test crash in October 2014, and their rocket fuel accident of 2007 in which three people were killed on the ground. This is not, of course, a defense of risk aversion. Aviation kills, but so does road traffic, in appallingly larger numbers, in tens of thousands across the USA each year. Death by road accident in Tel Aviv is consistently higher than death by terrorism across the whole of Israel. In the UK, more than a quarter of a million people have died on the roads since the 1950s. In each case, the response of introducing constraints has not collapsed into a position of preventing movement, but rather has been geared to enable safety. Reasonable caution is not, therefore, the same as risk aversion. There are, admittedly, also prudential reasons for such caution in the case of space tourism, i.e. the publicity sensitivity of a high investment business. Yet the ethical side of these matters is also built in and accepted by Virgin Galactic.

More generally, research *ought* to be conducted and reported in line with appropriate sets of standards and researchers *ought* to meet the requirements of professional integrity. In both cases, these are ethical *oughts*. As an illustration of the enabling role of standard ethics, these are contexts where ethical failures tend to be entangled with missed opportunities and with technical failures. For example, we know more now about the bodily and psychological effects of prolonged stays in space than we would do if the all-male pattern of the Gemini and Apollo programs had

been endlessly repeated. Opportunities would otherwise have been missed. This is also a point where standard and special considerations meet. To date, no woman has set foot upon the Moon. This is an ethical failing of a familiar terrestrial sort. In the UK, for example, at the time of writing, although there have been 10 elected or acting Labour Prime Ministers and First Ministers of Scotland, Wales and Northern Ireland since the 1990s, none have been women. Gender-based exclusions at the top are common even with respect to organizations that protest about the very same problem. However, the fact that no woman has ever set foot upon the Moon is also a more special consideration. It spans the standard/special divide. It is both about commonplace job discrimination (a narrow ethical consideration) and also about the broader ways in which we think of space exploration as a human project. (Where humanity is not monopolized by any single gender.)

More tragically, standard ethical failures concerning risk and its disclosure were bound into the tragedies of the Columbia Space Shuttle disaster in 2003 and the Challenger disaster of 1986. The 'normalization of deviance,' i.e. the undercritical acceptance of anomaly and underperformance in one case, and poor risk assessment and disclosure of a known problem with the o-rings in the other, will both qualify as ethical failures of a serious sort, on any plausible account of the proper concerns of the ethics of risk [8]. Ethical failures and technical failures are, in this way, joined. They can be different aspect of the same problems. Ethics of this standard sort may then be constraining, even inconvenient, but constraining in ways that can sometimes increase the overall likelihood of mission success and of mission participation from across groups who might otherwise be unfairly excluded.

Again, a qualification here is that technical problems of the sort mentioned above may also be dealt with in ways which are utterly unmotivated by ethics, and focused solely upon mission success. However, this fits poorly with actual NASA practice and with the behaviours of other reputable bodies for whom professional standards *are* treated routinely as matters of good ethical practice. If anything, an unusually high level of attention is given to the safety of astronauts by contrast with those involved in other, high risk but lower profile, lines of work (construction would be an obvious example, where fatality levels are high).

2.2. Special space ethics as enabling

Will a parallel argument apply also in relation to special ethical considerations in space? There are good reasons, related to planetary protection and fair access, to believe so. Planetary protection enables science. That is the primary goal of the safeguards adopted to avoid forward contamination. It is geared to the avoidance of contamination that might corrupt indications of life elsewhere, or make their detection unreliable. Yet we may still ask 'What does this have to do with ethics?' Is such protection genuinely an ethical issue, or merely a prudential safeguard for science? Although, here again, it is not obvious that the division between prudential and ethical is a hard distinction. After all, prudential considerations appeal ultimately to some sort of good or goods, or some sort of interest or interests. In the present case, this is the interests of science and, indirectly, the interest that *we* have in science as a social good. If science were not a social good then a great deal of taxation-based expenditure would face a

major justification problem. Indeed, one of the more convincing defenses of space advocacy, in the work of James Schwartz, draws upon the value of science as the primary and most effective justification for human activities in space [9, 10].

How far we take this attitude toward planetary protection as, in some respects an ethical matter is a further, and difficult, question. The European White Paper, mentioned above, tends toward the view that it should be regarded as a form of environmental protection, thereby aligning it more closely with the broader range of ethical considerations that we now apply in relation to terrestrial sites. What ultimately justifies such terrestrial protection is, of course, also a matter of debate: human interests or something broader. Even so, clear extensions of terrestrial environmental ethics to space can be made. They include a safeguarding of the available range of human wilderness experiences in a solar system where few planets and moons are ever likely to be suitable for human habitation. Such an approach can also appeal to existing space law. The Outer Space Treaty does, after all, classify space as the 'common heritage of mankind' [11]. And even the requirement of avoiding forward contamination may be read in the light of the requirement that back contamination should also be avoided, a clear appeal to risk and the value of something: humans, or perhaps the terrestrial biosphere.

What this means at a practical level is, of course, a matter for debate. One proposed option, from Charles Cockell, which draws out the ethical dimensions of planetary protection, is that there is a case for something akin to national parks on the Moon and Mars, reserved areas protected from human *use* but not necessarily from all human activity [12]. Of course, none of this implies that the actual technical measures currently taken under the remit of planetary protection fall short. It is not to be confused with the claim that NASA and/or COSPAR are 'getting it wrong' when it comes to the protocols and the nuts and bolts of planetary landings. We are also a long way from the kind of presence that would make planetary parks at all feasible (or indeed worthwhile). This approach of treating planetary protection as a form of environmental protection is, as yet, simply about the best justifications and longer term scope of protective measures.

The view of planetary protection from NASA, and COSPAR, has admittedly tended to be more modest, with planetary protection regarded in a different light from environmental protection, as protection of a special sort, albeit with the thought of environmental protection sitting somewhere in the background [13]. In some ways, such an approach strengthens the separation between standard ethics (which includes environmental protection) and special ethics (which is distinctive). But if we soften this distinction, then a broader range of special ethical considerations can also be seen to play an enabling role, particularly in relation to the safeguarding of science, and of access to limited or scarce resources in space. There are, after all, only so many satellite niches [4]; only so many asteroids of the right type for mining that come within reasonable reach [14]; only so much ^{3}He, for energy production, in lunar and asteroid regolith [15]; only so many strategically valuable 'peaks of eternal light' on the Moon places where the chances of finding water ice and a continuous solar energy supply are unusually high [16]. There is only one Moon and one Mars. Our prospects of ever moving beyond the Solar System are unclear, and within the latter, there are serious difficulties in the face of establishing a stable presence on more than a few surface locations. Venus is too hot and the gas giants have extremely deep gravity wells, only their moons may be suitable.

Given this, even if we hold that humans are all that ultimately matters, it will still be an ethical priority to safeguard resources *and opportunities* in ways that involve constraint. Otherwise, conditions of justice will not be realized within and between generations. With regard to future generations of humans, through such constraining of our actions other humans will be enabled. And, with respect to projects that are multi-generational (which surely includes certain aspects of the development of a human presence in space) and require opportunities to be available to future humans as well as ourselves, there will also be enabling as well as constraint.

With regard to the current generation, asteroid mining in particular poses issues of claims and entitlements. Identification of good candidate asteroids for mining and the setting up infrastructure will be major investments. It will be important to private sector players, and for the investment process, that their entitlements (however judged) are secured. The very last thing that an emerging asteroid mining industry needs is exposure to the risks of some form of claim jumping or free riding, where the benefits of preliminary investment by one company are reaped by others. Considerations of justice again enter into such matters. These will, of course, be areas for future space law, but guided by considerations of policy, legal principles and standards of *equity* and *fairness*, which involve an ethical dimension. Ethics can play an enabling role (or more precisely, a dual constraining and enabling role) for stable forms of commercial space activity.

3. Constraining ethics

As a reinforcer of the point that space ethics can work in this way, and will ordinarily tend do so when matters of justice are involved, there is a case for saying that ethics in general is ordinarily constrained so that the ways in which it limits action are themselves limited.

This is not, however, a case of arbitrarily rigging ethical deliberation in 'subjective' ways so that whatever projects we happen to prefer are then licensed. Rather, the social dimension of ethics draws it away from anything of this sort and calls instead upon an answer to the question: 'What is an ethic for?' And here, the issue is 'an answer' rather than 'the answer.' There are, after all, multiple kinds of ethics and it is far from clear that they all play exactly the same functional roles. The ethics of personal friendship is very different from the ethics of technology (even if there are areas of overlap). In the context of space, what we are dealing with is also a social ethic and not just an individual one. This means that we are in the territory of the kind of ethics that can feed into policy and legislation, rather than an ethic geared to the duties of love and friendship or to balance out the human need for solitude with the dangers of loneliness. I will also take it, as a background assumption already hinted at above, that the kind of social ethics we *ought* to be interested in presupposes something like liberal democracy. More strictly, it presupposes political organization that preserves the good features of the latter although, at present, the only political organization known to do so *is* liberal democracy.

In line with this, we can begin to set up a series of *adequacy conditions* that any plausible approach toward ethics in space should satisfy. This will not be guaranteed to yield a single outcome, a single correct ethical theory, with only one approach satisfying the conditions.

Rather, it is more likely to narrow down the field of plausible candidates. As a first pass, I will suggest that any such candidate ethic should satisfy at least one of the following two conditions:

1. It should be 'policy apt' in the sense of being able to directly shape space policy within a liberal democratic social context.
2. It should be 'precursor apt' in the sense of being able to contribute productively to broader, precursor, discussions which may then feed into 'policy apt' deliberations.

The second condition is less constraining than the first, and is geared toward some form of multiculturalism and the inclusion of religious perspectives and varying metaphysical perspectives within discussions. This will not violate any church/state division, or what liberals refer to as 'state neutrality over conceptions of the Good.' It will not require the privileging of one philosophical metaphysic over another because it is only at a precursor level. Although, in practice, the imperfections and pragmatism of liberal democracy as well as the periodic emergence of a broad consensus, will mean that the two sorts of discussions are likely to remain distinct only *up to a point*. Key religious commitments might, for example, turn out to have practical implications which are identical to those of the best secular discourses and may then be captured in a more neutral language that is also more 'policy apt' and does not give the impression that state policy is an endorsement of a particular denomination.

The point applies also to metaphysical disputes. (By which I mean disputes about moral ontology, the nature of truth in the domain of the moral, and disputes about what it is that ethical claims ultimately attempt to track.) Within this class of concerns, we may include disputes and theories about 'inherent value'. Disputes that might well run deep but still converge upon similar practical outcomes. This has been the case in the European discussions. Cockell [17, 18] and Milligan [3] have tended to be sympathetic toward extending notions of inherent value to microbial life; Persson [19] has tended to link such value more exclusively to sentience. Smith [20], a contributor form the US side, has considered structured complexity as a rival to sentience. Yet these positions converge over regarding microbial protection as an ethical requirement and, hence, planetary protection as, properly, a form of environmental protection. Strong pragmatists would no doubt say that 'there is no difference that makes no difference', and because of agreement about ways of proceeding, that these metaphysical disputes are empty. The claim here is a rather different one. It allows room for such disputes to be substantial and bring matters of importance to light, albeit at a precursor level. In fact, the presence of multiple ways of reaching similar practical conclusions will be a positive virtue from the standpoint of consensus building.

An upshot of the above is that the distinction between policy-apt discussions and precursor-apt discussions ensures that a place can be found for religious and metaphysical deliberation, but it does not try to run policy considerations directly from the latter. In this respect, it tackles a problem that has repeatedly emerged in other forms of ethical discussion about the non-human (e.g. within animal rights discussions and ecology) where the connection between metaphysical and practical has often been overly direct. Human moral

psychology and any sense of political constraints have sometimes been set aside in favor of claims based upon special theories of inherent value. In other words, what is again being upheld here is a broadly liberal democratic standpoint and pragmatism about space ethics.

What makes any ethic satisfy one of the above conditions of policy aptness or precursor aptness will itself be a complex matter. However, the following three features can be set out.

3.1. Stability

While an ethic may be adapted to liberal democracy, it should not track the ebbs and flows of electoral fortunes, at least not in a close way. Any standpoint in space ethics, especially with regard to its special features (and the way that they often involve large questions about humanity) will be subverted by a preoccupation with 5 year terms of office. Developing a human presence in space is a multi-generational project and should be recognized as such. This is, of course, a familiar difficulty. Robert Zubrin (although I do not sympathize with his particular approach toward Mars settlement) has made the point repeatedly and well [21]. One of the main problems about getting a workable and ambitious US space program for a Mars landing is the fact that the government keeps on changing. Getting humans to Mars is a project that is likely to require at least two decades (the launch windows alone are a significant limitation). During that time, multiple changes of political priorities, personnel and party ascendancy, may occur. This may seem like, but is not, directed against the party that is currently ascendant. A space ethic that deliberately tracked President Obama's social attitudes, without special reasons to believe that the latter would endure, would have been as counterproductive as one which tracks President Trump's social attitudes. A viable space ethic has to accept the political constraints of a working liberal democracy, but must have greater stability than voting trends.

3.2. Political realizability

Even given its stability, a sense of realpolitik should incline us to reject a belief which is familiar within various protest movements, such as sections of environmentalism and the animal rights movement (movements with which I happen to sympathize): the belief that the great considerations of humanity's future, or the Earth's future, or the future of sentient life forms are capable of trumping political divisions because of their importance and moral depth. The latter do not license some kind of exceptional politics, set apart from our flawed democratic processes. Even given the assumption that global warming does threaten to be a disaster for humanity and for other creatures, this alone does not imply that there is a way to work around the party systems and regular divisions of liberal democracy, rather than working through them in the search for some stable form of consensus building or bipartisan co-operation. Similarly, the horrors of animal harm within the food chain may be every bit as terrible as suggested on the strongest animal rights critique, but the exceptional nature of the harms does not make an exceptional politics any more viable. Such causes will succeed within the bounds of what is politically realizable under liberal democracy, or else they will not succeed. This is a completely general, and pragmatic, consideration and applies as readily to space ethics as it does to ethics of other sorts. The fact that we are talking about humanity's future does not imply that we can set aside the regular constraints of politics.

3.3. Psychological availability

Finally, an ethic should not be so idiosyncratic or metaphysically laden that its practical implications could only be accepted by a small number of humans at any given time. Such an ethic would not only fail to meet the requirement of policy aptness, it would also fail to meet the requirements of precursor aptness because no one outside of the limited group could come to share the same vision of what is to be done. On its own, however, this constraint would only provide a minimal account of psychological availability. I will suggest a stronger version that involves two additional constraints although, under analysis, these may turn out to be aspects of a single consideration.

Firstly, the ethic should be of a sort that psychologically normal humans could live by as opposed to merely defending in public fora. I will take it that this will rule out any form of strict consequentialism, or any ethic that is built around the overriding importance of a single consideration even if that consideration happens to be an extension of humanity's survival. We are, naturally, pluralists about ethical norms and one of the strongest and best features of liberal democracy is that it draws this out: many things matter to us. So, for example, an overriding preoccupation with the manifest destiny of humanity should not lead us to regard tragic accidents as merely technical setbacks in a greater cause rather than regarding them as occasions for reflection upon issues of safety, responsibility and harm. In extremis, and contra Werner Von Braun, a single-minded ethical commitment to a human future in space cannot override the ethical issues of whether or not the labor force used in a space program is free or forced, protected by adequate safety measures or exposed to excessive risk, punishments and harms. The ethic should not be monomaniacal or otherwise fanatical. Neither of these is a good fit for liberal democracy.

Secondly, and perhaps more controversially, the ethic should be of a sort that does not conceal our real motivations behind forms of public justification. It should allow us to be honest about what actually drives our attitudes. For example, if we tend to support environmental protection because of a sense of the value of places in their own right, then we should not have to pretend that the real reasons for environmental protection always turn out to be a concern for humans. Public justifications and real motivations may never fully align, we are too dissonant for that, but they should not be forced apart in ways that make them radically distinct and lead to concealment. Our ethical theory for space should not force us into what has been called 'moral schizophrenia' where the real motivations are hidden [22]. The policy-apt/precursor-discussion apt distinction may be understood as geared toward this consideration, with the latter retaining ample opportunities to set out what it is that really motivates our concern.

4. Implications for ethical agendas in astrobiology

Given these adequacy conditions, how then do the contrasting NASA and WG5 astrobiology agendas fare? I will take it that both meet all three requirements, but doing so is not exactly a binary matter. One approach may meet any one of these conditions more strongly or more effectively than another. Neither the NASA approach nor the WG5 approach obviously wins out

across the board. In terms of **political realizability**, the middling-constraint approach of NASA has the clear advantage of actually being linked to a robust program of activities in space. It has not only realizability but demonstrated realizability. More generally, given a certain degree of reluctance on the part of liberal democratic states to strongly constrain the actions of private agents, unless activities in space pose some clear *and immediate* threat to human interests, this is always likely to be an area where a more modest set of restrictions scores high.

By contrast, the WG5 approach is likely to score more strongly on both **stability** and, perhaps surprisingly, **psychological availability**. Indeed, there is a case for saying that if it scores higher on one, it is also likely to score higher on the other. In terms of stability, there are long-term socio-economic pressures in the USA toward a more robust inclusion of ethical considerations in policy formation. Ethical considerations have tended to spread through public sphere activity, and have also tended to spill beyond concern for the human alone. Other pressures are more bound up with the peculiar conditions of space. Firstly, middling regulation is all well and good for the USA while it is the dominant player. As that ceases to be true, or becomes heavily qualified, the pressures to secure position through regulation (through informal norms or international agreements) will tend to increase. Given the growing recognition that key, accessible, space resources (water, ^{3}He, orbital niches, accessible metallic asteroids) are scarce or at least limited, the commercial and scientific pressures toward regulation to ensure continuity/sustainability of access will increase over the course of time. Astrobiological research will then fit into a broader environment where issues of just distribution of opportunities and access claims are normal.

Secondly, there is an interesting and much-commented upon feature of domestic politics in the USA. At least notionally, protestant evangelism has political influence upon Republican politics and this denomination records an unusually high level of skepticism about the search for, and likelihood of finding, life elsewhere. This is partly because of a perceived connection with evolutionary theory. However, this skepticism need not imply that a crisis of faith would result from the discovery of life. Its presence varies enormously depending upon the pattern of local pastoral care, and it sits side by side with the emergence of a more robust environmental ethical commitment within the same denomination (on something close to classic Christian 'stewardship' grounds). If issues of planetary protection were reframed as matters of the latter sort, i.e. as matters of environmental protection, this would carry some obvious advantages in terms of winning over sympathies for a protection agenda. An ethical agenda based upon a strong conception of environmental duties (inclusive of a form of respect for life, and perhaps also for the integrity of places) might turn out to have greater stability than one based upon a lack of space-frontier constraint.

Finally, in terms of **psychological availability**, the WG5 approach may be slightly better placed to accommodate the fact that we do not (perhaps cannot) simply concern ourselves with human interests. Whatever our theories, what we actually value always tends to spill over these bounds. This does not, of course, require us to commit to peculiar doctrines, e.g. the quite different metaphysical claim that microbial life has *equal value* with human life, or with sentient life, or anything of that sort. Value egalitarianism would not itself be psychologically available in the relevant sense. It would be unlivable. Its practical implications would not then be either *policy apt* or *precursor apt*. Whether we speak about inherent value or about human practices of

valuing, our natural pluralism should not be confused with an inability to recognize that we often have more reasons for protecting and valuing one thing rather than another. For many practical purposes, talk about 'inherent value' will translate into 'reasons for action,' and these can vary significantly from object to object in ways that can be difficult to connect to any such version of value egalitarianism. Nonetheless, we do value places, things and other creatures in ways that are more in line with thinking of planetary protection as a variety of environmental protection. The latter is a more readily available attitude than a stricter attempt to limit concern to the human, even if doing so currently remains close to a statutory requirement for NASA.

What this mixed picture also suggests is that the model of the 'one correct approach' toward space ethics within astrobiology will be a poor fit. Rather, even where two differing agendas both meet the basic adequacy conditions set out above, they are still likely to fare better by some criteria and less well by others. Given this, the appropriate model for ethical deliberation, within which we can situate the WG5 approach and the NASA Astrobiology Roadmap, is best thought of as a dialog rather than a zero-sum game. There is, of course, a great deal more to say about this dialog, and these particular contributions to it. Even so, the little that has been said illustrates the practical guiding role of the basic constraints set out above.

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