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An Astrosociological Perspective on Space-Capable vs. Spacefaring Societies

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Abstract

As with any academic field, astrosociology allows for an endless number of competing theoretical models and hypotheses. One possible theoretical model is presented here that starts with the premise that even the most advanced societies today are extremely far from achieving a spacefaring status. The most advanced nation states are, in fact, space-capable societies because they have the capacity to send cargo and humans into low Earth orbit and beyond. However, their social structures and cultures lack fundamental characteristics that would allow for their designation as spacefaring societies. This article describes the characteristics of a theoretical spacefaring society and argues that getting there from our current status as space-capable societies is a long and arduous process, and it is not a definite outcome whatsoever. While a continuum is offered, it represents an imprecise path that can retrograde or fall apart at any time. Thus, this theoretical model provides one possible series of an unfolding of events that result in the creation of characteristics of the social fabric that may result in movement along the continuum toward a spacefaring society. Movement along the continuum results in an accumulation of coordinated spacefaring characteristics for a given society. Simultaneously, strictly terrestrial characteristics disappear or transform themselves into hybrid forms that include spacefaring features. This exercise demonstrates that this theoretical exercise has a number of benefits for astrosociologists conducting research in the area of spacefaring theory. Moreover, it makes the case for the idea that the study of the theoretical transformation from a space-capable to a spacefaring society includes implications for current and future 1) space policy in the public sector and 2) corporate decision-making related to space in the private sector.

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1. Introduction to the Astrosociological Perspective

The definition of astrosociology has evolved to this more simplified, concise version: the scientific study of *astrosocial phenomena* (i.e., the social, cultural, and behavioral patterns related to outer space) [1]. This definition pertains to the two-way relationship between outer space and humanity/society. While the interactive effects between the two currently exist to an identifiable extent, the potential that awaits humanity in the future could render societies on Earth almost unrecognizable. This distinction between the current impact of astrosocial phenomena, and what potentially awaits humanity in the future, serves as the crux of the distinction between a space-capable society and a spacefaring society. As a neutral academic field, the astrosociological perspective itself provides several core definitions and concepts that have no political or academic agendas except for a social-scientific orientation. The exception to the rule is “applied astrosociology,” which is discussed at later points in this article.

In this article, one particular theoretical model is advanced as one possible future path. The endpoint is the establishment of a spacefaring society that is comprised of very specific characteristics. (For additional details, see [2]). Many advocates make the assumption that spacefaring societies are inevitable. However, this model – dubbed here as the *Spacefaring Society Model of Astrosocial Change*, or the “Spacefaring Model” for expediency – allows for the possibility of social forces that may result in delays of the movement toward a spacefaring society or even derail it permanently. Derailment could potentially mean that humanity will 1) find itself in a hopeless dystopia or 2) become extinct due to self-imposed destruction or from a natural source such as a large asteroid impact. Delays will occur due to a variety of reasons, and this is the more optimistic framework regarding the future of human societies. It postulates overall forward movement that at some distant future point results in the development of a spacefaring society.

In the previous dedicated work describing the relationship between space-capable and spacefaring societies, Pass and Harrison [2] focused more on some of the major characteristics of a spacefaring society, and space exploration in general. In contrast, this article focuses on the Spacefaring Model in terms of the shift from a space-capable society to a spacefaring one, and the potential practical manipulation of social change to move toward a spacefaring future. It also provides a more detailed description of the Spacefaring Model (untitled in the previous article). An important element of that more detailed description involves a more thorough discussion of accomplishments that signal progress along the spacefaring continuum.

2. Defining/Contrasting Space-Capable And Spacefaring Societies

Many individuals use the term “spacefaring society” to describe the current status of the most sophisticated nations in the world. This is an erroneous belief, as even the most sophisticated nations are “space-capable” societies. They lack fundamental characteristics that define a spacefaring society as described here and elsewhere [2]. A space-capable society differs from a pre-space society by achieving the ability to launch a rocket or vehicle into orbit or farther into space. Nations that rely on others to fly their citizens or materials into space are pre-space societies because they lack the technology to achieve spaceflight themselves. While one can identify at least four types of societies relative to flight – pre-flight, pre-space, space-capable, and spacefaring societies – the focus here is on space-capable and spacefaring societies.

A spacefaring society, in contrast to a space-capable society, involves a set of characteristics that fundamentally alter a particular society well beyond the characteristics common to space-capable societies. These different characteristics arise as a society potentially moves through a very long-term series of mileposts that span from the space-capable society epoch to that of the spacefaring society. Thus, social change is a central concept because it is inevitable and because societies must adapt or risk collapse to all forms of challenging conditions that arise. Realization of a spacefaring society is impossible without an ongoing – and prolonged – series of adaptations. Another vital assumption is that

humanity is destined to explore space and live in space ecologies, or at least it identifies with this long-term goal, continuing a pattern of expansion that has covered the entire Earth [3]. The human connection to the cosmos exists [4], and it is vital for establishing a spacefaring society. Humanity will never strive toward the development of a spacefaring society without the drive to explore new territories beyond Earth and settle there.

2.1. Space-Capable Societies

Again, many people, including those in the space business, define a spacefaring society or nation as what is defined here as a space-capable society. While these terms are often interchangeable in informal speech, they are not the same from an astrosociological perspective. The definition of a *space-capable society* involves the simple notion that a nation can reach space on its own accord [5]. This defines the most unsophisticated form of space-capable society as things can become quite advanced under this stage of development. One element involves the advancement level of technology. However, as will be explained, the most important characteristics of a spacefaring society involve much more integration between astrosocial phenomena and other elements of the social order. Many of the differences leading to advancements within space-capable societies involve new and redefined ideas built into the culture that guide behavior in ways that exhibit a preference toward a strong space policy as an increasingly important element of social life. These ideas become even more profound in true spacefaring societies.

Astrosociologists and others interested in space issues should be careful to distinguish between a space-capable society and a spacefaring society. We should not confuse the two concepts.

Why recommend this approach? Consider the rough comparison of a contemporary space-capable nation's level of space exploration to that of a European nation at a similar stage of sea exploration (long preceding its glory days of discovery). Such a nation would be floating in slow leaky boats near the shoreline where it is relatively safe and assistance remains readily available.⁶ It is not a seafaring society because its crude technologies, inadequate resources, and underdeveloped sailing skills make it extremely hazardous to move further out into the vast unknown oceans. Until substantially improving such conditions, land-based social phenomena dominate everyday life. Similarly, space capable societies possess only a rudimentary space exploration capability. Earth-based social phenomena dominate as the hazards of space travel currently overwhelm our abilities to move very far away from *our shores* (*i.e.*, the Earth) ([5]:15-16).

The social conditions characteristic of a sea-capable or space-capable society are quite different from those of a seafaring or spacefaring society. The transition from one to the other in either case is a profound one, though the transformation into a spacefaring society involves the most intense set of societal transitions. For the United States, it would mean a social reality unlike any humans have experienced even while many around the world already live in the early formative years of space-capable societies.

Thus, there are no spacefaring societies on the face of the Earth at the current time, and they will not exist for a very long time to come, according to the definitions provided here. Even the space programs associated with the United States, China, the ESA, and the Soviet Union/Russia represent space-capable societies, and rather crude ones at that. They are dependent on chemical rockets that require a high delta- v to reach even low Earth orbit. Technology at this level characterizes a space-capable society because it is rather primitive and thus space has a limited effect on society as a whole. What we experience in current society reflects just an infinitesimal level of influence from astrosocial phenomena. The fact that we can reach the space environment defines a space-capable society at its minimum level of development. Modern societies have advanced since the first Apollo launch, but its rate has not moved them very far toward the spacefaring ideal.

Today, we are still debating about whether the space program in the United States is worthwhile. The fact that NASA receives less than one percent of the entire federal budget speaks volumes for the priority of space exploration and related activities. For the 2009 fiscal year, NASA's budget was only 17.2 billion

dollars or 0.55 of the total federal budget [6]. This low priority characterizes the social conditions in an early space-capable society.

Advancements in technology will occur in space-capable societies, of course, as change toward greater complexity characterizes the probable course of events. Nevertheless, deciding where to draw the line between a space-capable and spacefaring society is a difficult task. Which one or two breakthroughs or seminal events will shift the description of a particular society from one epoch to the next? It seems likely that a middle ground requires definition that will add sophistication to the current bifurcated version of the final two stages of the model. This area will require additional research beyond the scope of this article. However, it is possible to glean insights from a discussion such as this one, even though this exercise will probably result in conclusions that paint a fuzzy picture about the epoch(s) that lie between the space-capable stage and the spacefaring ideal.

The foregoing discussion should not disparage the fact that many nations have reached the space-capable status. It represents a monumental advancement for the human species. One must take into consideration the fact that nearly all of human existence on Earth was characterized by a pre-space-capable status except for scarcely more than the last fifty years. In fact, modern humans lived in a pre-flight-capable status for over 200,000 years – which is their estimated time on Earth [7]. Thus, human beings have been planted firmly on the ground for all of their existence except for the briefest of periods starting in the early twentieth century.

2.2. Spacefaring Societies

A spacefaring society is defined as a social order in which its social structures (including major institutions), culture, and everyday aspects of social life are heavily influenced by astrosocial phenomena [2].

...general parameters provide an initial insight that a spacefaring society possesses a fundamental character different from anything witnessed in the past. That is, a unique set of social conditions typify a spacefaring society. Every major institution is highly involved in some way with carrying out space policy as a high priority, and thus space law is well developed. A space-based economy flourishes, for example. Astrosocial phenomena are highly pervasive and vital for the society's survival. Space issues are intertwined in a multitude of ways into the everyday social interactions taking place in subcultures, social groups, organizations, and institutions. The larger culture reflects the importance of astrosocial phenomena through their incorporation as highly important values, strong norms protecting them, and their omnipresence in a space-dominated material culture ([5]:17-18).

Spacefaring societies will exhibit barely recognizable social and cultural patterns found in space-capable societies, so they will be extremely different. The examples above such as the development of space law and a spacefaring economy illustrate this point. Another example of this is the construction of a completely new transportation system that is almost devoid of automobiles as we know them. Beyond these types of transformations, new forms of astrosocial phenomena also occur. An example of this is the simple notion of a greater access to space. Social class will mean less because outer space will no longer be the playground for elites. A much greater percentage of the population of a spacefaring society will be able to afford space travel. Additionally, it is predicted that a greater level of social justice will exist if any society reaches this form of social order. There are no guarantees, however. It is not too difficult to imagine a society run by corporations that favors profit over democracy. Such a society would not match the ideal type that includes democratic governance, however.

Another element of the definition above requires clarification. *Material culture* is defined as the physical manifestations produced by the ideas found in a society's culture. Along with the ideas that comprise culture, the physical parts of culture also exist and reflect those ideas. Transformative technology – a part of material culture – is a key element that allows for the transition to social epochs that more and more resemble the ideal type describing a theoretical spacefaring society. Moreover, a spacefaring material culture will increasingly reflect fundamental connections between society and space

in the guise of increasingly sophisticated technology. However, technology is not the most fundamental component. It is not the cause of social change but rather a reflection of increasingly sophisticated ideas about the intrinsic connections between humanity and the cosmos – or, put another way, the importance of astrosocial phenomena to human progress. Ideas drive technology, and not the reverse, although there is an interaction effect. Social change is the enabler that makes this possible because movement toward a spacefaring future is impossible unless cultural and social forces drive it forward in that specific direction.

3. Spacefaring Society vs. Space Society

It is important to remember that spacefaring societies exist on Earth. While they involve humans working and living in space as well, these settlements or space societies represent only one important criterion for the definition of spacefaring societies, and thus they do not fully define them. This important distinction requires a brief mention as confusion sometimes occurs. In contrast, a space society is a space settlement that exists off the Earth's surface, whether in space or on a celestial body such as a planet or moon [8].

The number of people in space on a permanent basis will increase as more societies on Earth move closer and closer to the spacefaring ideal. It is one of the indicators that 1) societies exhibit spacefaring characteristics and 2) humanity is moving closer toward becoming a spacefaring species. In general, space will increasingly become omnipresent in the lives of citizens' on an everyday basis. It will be completely interwoven in a society's social institutions and culture. The interactions between spacefaring and space societies will develop as they both change internally and in their interactions with one another. Both societal forms are important to humanity once they establish themselves, but their movement toward those ideal types are also important.

4. Spacefaring Society vs. Spacefaring Species

Contrary to popular thought, then, a spacefaring society as defined here resides on Earth. It does not involve a crew journeying to the stars or permanent space settlements. Instead, spacefaring societies bring space closer to Earth by embracing astrosocial phenomena into all aspects of social life. While a spacefaring society resembles nothing in existence today, it is nevertheless possible to imagine many of the features that may exist in such a social system, as discussed throughout this article.

In contrast to a spacefaring society, a spacefaring species refers to the idea that humanity travels regularly in space and integrates astrosocial phenomena into everyday life as an entire species whether living on Earth or elsewhere in the solar system or beyond. Even a space-capable society includes characteristics of a spacefaring species, especially as it develops. However, many levels of advancement theoretically exist between a space-capable society and a spacefaring society that will increasingly characterize a spacefaring species. Such changes relate to the movement toward a spacefaring society and simultaneously the movement toward a spacefaring species. The later is a matter of degree.

The connection between spacefaring societies and a spacefaring species lies in their relationship, and potentially the coalescence of social institutions such as their economies and political systems [2]. As several nation-states acquire additional spacefaring characteristics, they may join together by forming a larger entity. This may occur to an extent that a single world government and economy exists at some point. If all nation-states eventually join this global social system at a significant level of integration, then a true spacefaring species emerges. Under this scenario, all societies eventually acquire spacefaring characteristics, work together in multiple facets, and regularly travel in space and utilize space resources. In the process of development, a spacefaring species has created a spacefaring civilization.

5. The Spacefaring Society as an Ideal Type

The concept of ideal type is useful for defining a theoretical or potential social structure. Sociologist Max Weber used the concept of ideal type to define a “perfect” bureaucracy [9, 10]. By comparing an existing organization to the ideal type, he argued that one could determine how bureaucratic a specific organization actually is. The more the organization resembles the ideal type, the more bureaucratic its characteristics. Thus, the ideal type represents an important tool for comparative analysis between an existing real social structure and an unrealized theoretical one. In this case, it serves as a benchmark for comparing present social conditions in a particular society to the ideal set of spacefaring conditions that comprise the ideal type [2].

One may utilize the concept of ideal type to compare existing societies with the theoretical spacefaring society. What remains to be accomplished, and falls outside the scope of this exercise, is to articulate specific characteristics of the theoretical spacefaring society. Discussion of major clues at a macroscopic level exist in the present discussion, but the identification and articulation of more detail at the micro level of analysis represents a fundamental task for the future. As with Weber’s analysis of the bureaucratic structure, a fully articulated spacefaring society – that is, one that matches all of the characteristics of the ideal type – will probably never exist. Nevertheless, the ideal type provides researchers with a yardstick to which to compare changing societies, and therefore social changes that reflect either increasing or decreasing similarities to the ideal type are identifiable.

These conditions, in the case of a spacefaring society ideal type, consist of theoretical social conditions based on extrapolation from current conditions. Some aspects of this informed conjecture may not prove correct, but such deviations will become evident based on the comparison between the ideal type and real social conditions at various points toward a spacefaring future. This is the purpose of constructing an ideal type theoretical model. Surprises will undoubtedly occur, but they are quantifiable.

The ideal type can also provide another important function. Unlike the ideal type of bureaucracy that Weber analyzed, which is good for the organization but harmful to workers, realization of the ideal type of spacefaring society can theoretically result in greater prosperity for humankind. The particular ideal type identified here assumes that greater levels of social justice will exist as a society moves along the continuum toward that spacefaring ideal (see Figure 1), though this is by no means guaranteed in the real world. Thus, policy makers may wish to attempt creating social realities that institute spacefaring-like social patterns. While not a perfect undertaking, a straighter line toward the realization of a spacefaring society is possible. In this way, a spacefaring society can become a self-fulfilling prophesy due to purposeful intervention. This could become an excellent example of the use of an applied astrosociology strategy [11]. Further discussion about this matter exists in a later section.

6. Forsaking Utopian Dreams

One must always remain wary of the distinction between an ideal type of spacefaring society and a utopian vision of a future society. Unlike a spacefaring society, which will have its own collection of social problems and other negative social patterns, a utopian society theoretically approaches perfection in a variety of ways. In the present case, one may mistakenly view a utopia as the realization of the ideal type. This situation is not expected and thus one should take a more realistic view of what to anticipate. In fact, certain social problems may persist even as social change occurs that further moves development of a society closer to the ideal type. Social problems may improve or they may become worse, but they persist from one epoch to the next. Various forms of social inequality may well prove difficult to eradicate fully.

As mentioned earlier, one should not expect to achieve all of the characteristics of the ideal type even if realizing a spacefaring society. There will be differences, and the reality will be less “perfect” than any utopian dream would imagine. Even advocates of a spacefaring future must forsake utopian dreams in favor of a more achievable approximation of a spacefaring society that can itself solve many

contemporary problems, though by no means all of them. One may conjecture, in fact, that spacefaring societies will produce their own brand of social problems that contemporary thinkers cannot even contemplate. Thus, a spacefaring society is not equivalent to a perfect society.

One must be careful to distinguish between utopian models and spacefaring models, then, whether in space or on Earth, because the latter are not defined in the same way. Spacefaring societies represent a new form of social organization. However, they will not emerge as future panaceas for the problems faced in contemporary societies. Astrosociologists and others who elect to study the Spacefaring Model must keep in mind that the transformation from feudal societies to capitalist societies resulted in many positive developments yet they also created their own unique forms of misery and hardship as well. Transition to a spacefaring society will prove to be quite similar.

7. Spacefaring Society Model of Astrosocial Change

Space-capable societies exhibit certain features that distinguish them from spacefaring societies. However, as time advances, space-capable societies will adopt more spacefaring characteristics. These developing and new forms of social change will alter social life as we experienced them during previous periods. The very fact that such profound social change may occur makes it an important area of study.

Despite various social forces that may operate against its development, the spacefaring *mode of production* [12] – or more generally, the spacefaring *mode of subsistence* – remains a serious possibility for the *moderate to distant* future. Hence, construction of a new model is required to characterize the stages of development along a continuum starting from the simplest societies (Earth[-]centric forms) to an end point characterized by one or more categories of spacefaring societies (space[-]centric forms) ([5]:17).

This last idea allows for the possibility of more than one type of spacefaring society. A well-defined model of a spacefaring society represents an important exercise for the future work in this area of astrosociology despite the fact that many of the general parameters are discussed here. It is not difficult to imagine several models of spacefaring societies that differ in terms of political and economic systems, as well as in terms of their cultures. At this point in the research process, the main focus is on some of the generalities of the spacefaring ideal that differentiate it from the various types of existing space-capable societies and theoretical future versions of them.

Astrosocial change is a subset of social change that involves astrosocial phenomena. Nevertheless, there exists a relationship between the two forms of change [5]. Thus, in the present context, the discussion of any social change potentially includes astrosocial change. The two can interact in ways that accelerate overall social change in ways that favor or disfavor space development.

Once again, one axiom regarding human societies is that social change is inevitable. In the present context, astrosocial change can produce physical, social, and cultural manifestations that transform a society in small increments or, less commonly, in major ways that disrupt and significantly alter social life on a grand scale. However, the nature of any type of social change, at a given moment, is often not predictable. Thus, the Spacefaring Model of Astrosocial Change provides but one possible scenario among a myriad of possibilities. However, as will be discussed later, it is possible to guide social change in a rather crude way, although the outcome is often unintended and sometimes unfathomable. Still, in the end, certain events must come about in order for a particular society to reach its spacefaring potential.

Is it an evolutionary model or cyclical model? From a sociological background, one might expect the spacefaring continuum to depict an evolutionary model in which the only outcome is the eventual establishment of a spacefaring society. This is not the case, however. It is a type of cyclical model in which setbacks and even failure are just as possible as moving forward toward the successful achievement of a spacefaring outcome. For example, the United States may find itself stuck in low Earth orbit or it may even lose that technical ability for some yet unknown reason. No potential future outcome is impossible or inevitable.

7.1. The Spacefaring Continuum

The *spacefaring continuum* that is part of the Spacefaring Model represents a theoretical path from a space-capable society starting point (the present) to a spacefaring society potential (the intermediate or distant future). It is possible to map the progress along the spacefaring continuum based on recognition of specific accomplishments or mileposts that characterize a particular nation state. The Spacefaring Model is in its infancy, though its current low level of popularity fails to indicate its importance. As will become clear, the spacefaring continuum is helpful for a number of reasons. The mileposts along the continuum provide a list of indicators that mark the transition from a space-capable society to a spacefaring society, with the actual transition occurring gradually for the most part throughout its course. If there is a full transformation at some point, it will not occur overnight.

A society may never reach its spacefaring potential, and each society will move along the continuum at its own rate. Moreover, each society will encounter its own unique potential obstacles along the way. Some obstacles will seem trivial at one extreme while others may establish social conditions that slow down, stop, or derail its progress.

8. Mileposts along the Continuum

If nothing devastatingly disruptive occurs, social change within a particular society may well contribute to a path of social change that consists of a series of mileposts resembling those depicted in Table 1. As history unfolds, future researchers will unquestionably discover many additional mileposts. For now, although Table 1 represents a rather crude list of mileposts, it does illustrate many major events.

Table 1. Mileposts Leading to a Spacefaring Society (United States)¹

Milepost Realized	Description [pre-flight stage (99.9% of human history)]
x	01. Achievement of sustainable human flight
x	02. First successful unmanned satellite
x	03. First human occupied satellite
x	04. Robotic missions to moon and nearby planets
x	05. Scientific search for extraterrestrial life
x	06. Human mission to Moon
x	07. Human space station
x	08. Space tourism for elites
	09. Permanently occupied space station (by a core of the same residents)
	10. First true robotic interstellar mission
	11. Limited production characterized by special benefits unique to space manufacturing
	12. Discovery of extraterrestrial life (micro organisms)
	13. Human mission to Mars
	14. Detection of signal from Extraterrestrial Intelligence
	15. Commercially viable space tourism
	16. Asteroid mining
	17. Permanent presence on Moon
	18. Space advocacy groups/individual advocates establish an unprecedentedly strong interest lobby in Washington, DC
	19. Permanent presence on Mars
	20. People commit to "life time" (one way) space missions
	21. Private sector involvement in space surpasses public sector involvement; governments lead exploration efforts while private interests follow for the most part
	22. Spaceports and spaceport/airport hybrids outnumber traditional airports
	23. Political system is adapted for outer space constituencies
	24. Center of economy moves from Earth to a space ecology
	25. Off-world population becomes political majority
	26. Human interstellar travel

- 27. Humans in space become a numerical majority
- 28. New government centers establish themselves off Earth while, on Earth, a single world government is formed (reflecting a single global spacefaring civilization)

¹Modified from Pass and Harrison ([2]:8).

The mileposts found in Table 1 include some of the largest types of achievements expected along the path toward a spacefaring society. Undoubtedly, other changes – usually less dramatic forms – will occur as well. The purpose here is to present a series of signs to look for in order to determine if a society is still on course toward a spacefaring outcome. This is not a timeline, as no expected intervals exist and because the order of these achievements may vary from that offered here. The point is that, if a particular society moves toward a spacefaring future, certain indicators will accumulate that demonstrate this movement into the future. A dearth of such mileposts could indicate a slow rate of movement, no movement at all, or movement in another direction.

Table 1 focuses on the United States as an example based on its past development as a space-capable society. Other societies will probably exhibit similar mileposts. However, they will not occur precisely in the same order since their governments and corporate leaders may focus on different priorities that affect future development. The same mileposts will feature some – probably key characteristics – but they will differ somewhat. A counterbalance to creating entirely different mileposts will likely exist among those nations that cooperate on space missions and share similar ideas, which will contribute to development of a similar space vision and therefore a similar pattern of movement along the spacefaring continuum.

Another issue regarding Table 1 relates to when a society transforms itself from a space-capable society to a spacefaring society. The transition from one entity into the other occurs as an evolutionary process (referring to a slow pace rather than a type of social change model), and thus there is no “magic moment” in which the transformation occurs. Nevertheless, it is possible to isolate and identify a set of mileposts within which the shift to a spacefaring society may in fact occur. Though it may occur a bit sooner, a reasonable starting milepost is the beginning of asteroid mining (milepost 16). By mileposts 21–23, the terrestrial connection to space has become quite strong. Certainly by milepost 24, when the Earth becomes a secondary economic power, the spacefaring transformation has occurred. Mileposts 25–28 solidify the standing of terrestrial societies as spacefaring, and it is quite likely that a portion or the entirety of nation-states have merged into one spacefaring civilization as indicated in milepost 28.

The gap between the occurrence of the first fifteen mileposts and the latter thirteen mileposts can be extremely long, and long gaps may exist anywhere along the continuum. Thus, this part of the continuum requires additional theoretical work to determine additional mileposts to bridge this gap. Nevertheless, based on the space-capable stage that humanity is at today, this chart serves as a good tool for monitoring social change toward a spacefaring society.

8.1. Institutional Change

Social institutions are relatively stable structures consisting of statuses and roles. The mission of social institutions is to meet the basic needs of people in a society [13]. As those needs change, institutions adapt to cater to them. Newly established needs that require a new level of attention to space or spacefaring issues may arise at any point. This attention to new needs would cause institutions to change over time by creating new social patterns that incorporate meeting them. As a society moves along the continuum depicted in Figure 1 (below), the social change involved will bring about effects that dramatically alter the larger social structures and their objectives. Cultural change, which also occurs simultaneously, is discussed in the next section.

Thus, assuming that a particular society moves along the continuum without too much deviation, social institutions will change as a society reaches various mileposts. An important area of study will involve change in existing institutions that addresses new attention to astrosocial phenomena. Potentially, it may also involve the creation of one or more new institutions that focus more directly on astrosocial

phenomena. Pre-existing institutions that fail to adapt to changing conditions have withered away throughout the course of human history. Successful types of social change would need to approximate general expectations along the continuum toward a spacefaring society if forward progress were to continue.

Pass and Harrison [2] describe some of the specific characteristics of institutions predicted to exist in a spacefaring society. Movement toward the spacefaring ideal type results in a reality in which space becomes the central unifying element in all institutions including the economy, the government, education, the family, religion, and the military. They all become oriented toward space and astrosocial phenomena. This new orientation results in transformative change that alters the social order into something previously never witnessed by human beings. As will become clear, such social change involves implications for how societies interact with one another.

8.2. Cultural Change

The larger culture exists to provide guidance for defining acceptable and unacceptable behavior. It also reflects the important ideas. In the present context, this includes the “importance of astrosocial phenomena through their incorporation as highly important values, strong norms protecting them, and their omnipresence in a space-dominated material culture” ([2]:4). Should such cultural change occur, it would place great pressure on the operations of social institutions to adopt space-friendly orientations. Additionally, institutions that adopt such a new orientation are likely to influence others to do the same, especially if they strongly interact with one another. In this way, they are more likely to contribute to the movement along the continuum toward a spacefaring society.

Overall, social change occurs haphazardly because subcultural change is uneven, especially in heterogeneous societies. Some geographic areas, categories of people, or subcultures adopt ideas and technology, as well as other forms of material culture, at varying rates based on a complex combination of potential criteria. Thus, each one tends to resist change at first, so it adopts change at its own pace. It may even disagree so strongly with a particular form of change that it rejects it altogether. Rejection may simply involve the failure to adopt change or it may escalate to actions favorable to its withdrawal at the societal level. The term for uneven cultural change is “cultural lag” [14]. Cultural lag adds unpredictability into the equation when attempting to predict a society’s future development.

Thus, cultural change leading to the spacefaring ideal is never straightforward. Space advocates in various circles would probably support and attempt to initiate change that moves more quickly toward a spacefaring society, for example, while others may favor other terrestrially-based priorities that may prove to be supportive, neutral, or contrary to such reform. Many in the United States and elsewhere favor solving terrestrial social problems before making a substantial commitment to a space-oriented society. This type of position slows movement along the continuum and thus delays the types of achievements indicated by the various mileposts along the way.

On the other hand, part of moving forward with meeting mileposts along the continuum may involve a series of tipping points. One such tipping point may involve the realization by the leadership in a society that space resources are necessary in order to meet the survival requirements of their citizens. The same shift in priorities may occur if ideas advocated by members of various subcultures in its favor begin putting pressure on the leadership. Over time, this could lead to changes in the larger culture. In fact, this process could result in reaching milepost 16, or asteroid mining. This set of social conditions would represent a big step toward establishing a greater orientation to astrosocial phenomena.

9. Potential Derailments From The Spacefaring Continuum

The future is not yet written, so the fate of humanity and its societies remains open to conjecture and debate. The spacefaring continuum represents one possible map toward a future outcome, but there are many more that result in less favorable outcomes regarding the reaching a spacefaring future. Moreover,

some possibilities leave humanity in very poor states of existence. The spacefaring continuum does not represent an evolutionary path.

Because evolution has been such a fruitful concept in biology, it is tempting to think in terms of “societal evolution.” But from the sociological perspective, social change tends to be cyclical – maintaining forward momentum, stalling, falling into reverse gear, resuming progress and so forth relative to any anticipated end state. In fact, no guarantee exists for continuation of progress or the resumption of progress once it is lost. Only with the benefit of hindsight is it possible to identify with reasonable certainty the length of a given cycle, plateaus, and inflection points ([2]:2).

Thus, in some cases, identification of mileposts along the way may not be possible at the time they come about due to social upheavals and other events that may obscure their formation and development. The biological evolution analogy does not apply because social change is difficult to predict and never straightforward. Often, it is difficult to understand as well. Moreover, the straight line indicated in Figure 1 below fails to illustrate fully the often-turbulent upheavals, cyclical delays, and frequent loses of interest in spacefaring advancements. Although the Spacefaring Model predicts a fair likelihood of successful movement toward a spacefaring society, it also predicts temporary delays along the way as well as a permanent exit from the continuum.

As depicted in Figure 1, the “ideal path” or perfect track from a space-capable society to a spacefaring society is a straight line. Each of the mileposts becomes realized as history moves forward. The achievement of the ideal type occurs upon achieving all of the mileposts along the way. There are only minor deviations from the ideal path. A permanent exit from the continuum is not possible in this ideal scenario. Mileposts are easily identifiable. Prediction of the next development is rather easy to accomplish, and this makes it possible to plan space policy in a more straightforward way.

This “perfect” future is possible, though it is the ideal type of development and therefore not highly probable at all. This path is highly unlikely given the fits and starts, and general unpredictability, of social change experienced in contemporary societies. Most probably, an uneven and potentially convoluted path lies before space-capable societies. Two potential outcomes may occur. “Delays in spacefaring progress” will inevitably occur, as space exploration becomes a lower priority due to a number of possible reasons. Even ebbs and flows in the public opinion regarding space exploration can result in periodic delays and optimizations in the progress along the spacefaring continuum.

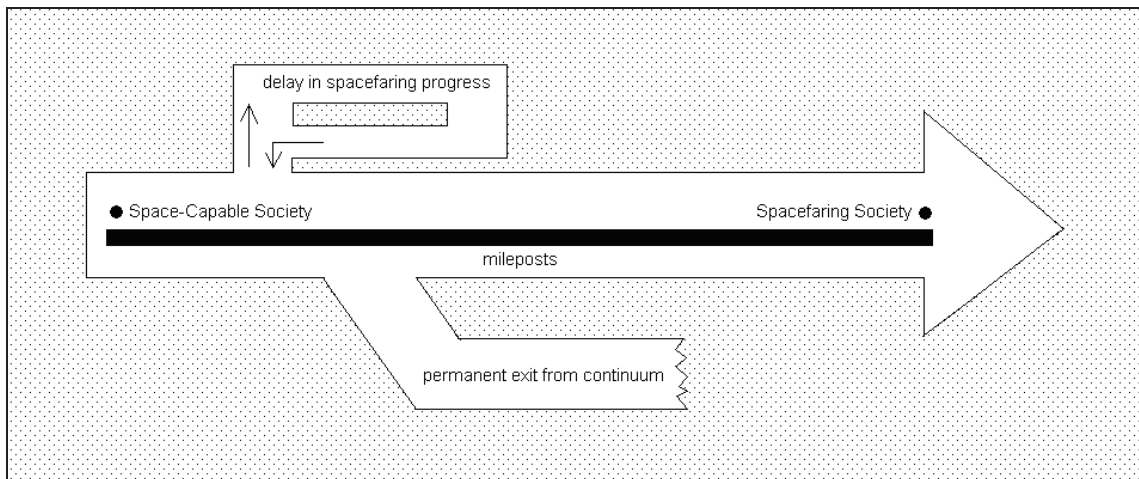


Figure 1. Spacefaring Continuum

On the other hand, a “permanent exit from the continuum” is also possible. It may occur because space becomes an uninteresting topic for some reason or because a spacefaring outcome was never a high probability. More likely, a highly tragic event or series of events would need to knock humanity into some sort of a condition in which technology becomes extremely primitive. A nuclear war or bombardment by a massive asteroid represents two such examples. Humans may become extinct which, of course, would end any movement toward a spacefaring future.

Less extreme events or trends are more likely to manifest themselves, if they occur.

...countervailing pressures include numerous possibilities such as political turmoil, simple neglect of space issues, anthropocentrism resulting in deliberate isolation, and chaos due to a variety of social forces. A space-capable society would have to avoid tragic negative trends that could result in a dystopia in which all major areas of social life became harsh and spacefaring objectives became unimportant compared to survival objectives. Overwhelming social problems could escalate to levels capable of derailing a society’s course toward a spacefaring future. Astrosocial phenomena would become relatively unimportant under these circumstances. Astrosociologists must study the social conditions and forces contributing to a spacefaring future as well as those delaying or even denying such a future ([5]:16).

The path toward a spacefaring future will exhibit a series of positive and negative developments. There is no way to be sure whether social forces favorable or unfavorable to the development of a spacefaring society ultimately achieve precedence. Nevertheless, the study of both types of forces will provide a better understanding of social change in future societies. Such knowledge involves practical or applied methods of data collection and analysis.

10. Movement Toward A Spacefaring Civilization

Assuming that a society eventually moves successfully along the spacefaring continuum and ultimately reaches the status of a spacefaring society, this outcome also involves another important potential change for humanity. A single society’s successful transformation is unlikely to exist in isolation. Other societies are likely to make similar advancements as well. If this is indeed the case, then what types of relationships will these societies forge with one another? It is possible that a group of spacefaring societies will eventually merge. On a global scale, this would represent the establishment of a spacefaring civilization.

Robert Zubrin [15] has proposed a typology that depicts three eras of civilization,

1. Type I: Completing a global civilization;
2. Type II: Creating a spacefaring civilization;
3. Type III: Entering a galactic civilization,

that cover one extrapolation from present and two future possibilities.

This particular typology is logical. It makes sense that humanity transitions from a Type I civilization to a Type II civilization, and then to a Type III civilization. Focusing on the first two types, a global civilization is necessary to make the transition to a spacefaring civilization possible. However, this is a necessary condition, and not a sufficient condition. Hence, one vital step seems to be missing. The hypothesis proposed here is that the most advanced individual societies still must establish themselves as spacefaring social systems before all of humanity can form a spacefaring civilization.

Nation-states still exist, and they will still endeavor to handle their own affairs internally to a large extent. Over time, however, the Westphalian system of nation-states may well be replaced by a transnational state centered around space, as Dudley-Flores and Gangale [16] predict. A tipping point may occur that actually accelerates humanity’s advancement to a Type II spacefaring civilization. As spacefaring societies form, they could very well cause a chain of events in which other societies reorient themselves in ways that accelerate their own transitions to spacefaring societies. Existing spacefaring societies may assist space-capable societies in moving more quickly along the spacefaring continuum.

Over time, this process could theoretically result in the establishment of a spacefaring civilization. The discussions in previous sections are consistent with the thesis that the formation of spacefaring societies constitutes a vital step in the process of establishing a planetary-wide spacefaring civilization.

Assuming that nation-states move along the spacefaring continuum, they will begin to interact and rely upon one another in order to achieve large space-related projects. This trend has already begun at the space-capable stage, or prior to Zubrin's Type I stage, that characterize several contemporary societies. The member-states of the European Space Agency have already formed a consortium centered about space-related activities. It is quite possible that these societies will become spacefaring as a group rather than as individual nation-states, so they present a possible exception to the single-society model that serves as the focus in this article. Nevertheless, if one treats them as a single social and cultural entity, with member states in transition, the same arguments directed at individual societies still apply. After all, each society still retains its larger culture and identity. It takes time to relinquish traditional ideas, beliefs, and folklore, or to allow their absorption into a larger transnational entity. Still, this process began with the establishment of the European Union, which includes both transnational and national characteristics among its member states. Whether they reach the spacefaring stage as individual nation-states or as a single social system, they or it will still exhibit the same characteristics of the ideal type. In summary, then, they do not present an exception to the Spacefaring Model.

In general, cooperation is more conducive to reaching the spacefaring civilization ideal type than conflict. The International Space Station (ISS) is a fine example of the former in which individual nations cooperate on a single space project. This type of trend may occur to an increasing extent into the future. If cooperation triumphs over conflict in terms of how nations interact with one another in space ecologies, then it is quite possible that several individual spacefaring societies will form at the same time. Moreover, this cooperation will contribute toward the realization of a spacefaring civilization, and do so in a more expeditious manner. Humanity will be more likely to organize itself into a single social system largely oriented toward a lifestyle influenced by astrosocial phenomena. However, it is important to remember that much underlying conflict also exists [17]. Cooperation and conflict normally exist together in often very complex ways. Thus, while it is easy to image a high level of cooperation in the future, achieving it may well prove difficult.

As more societies and consortiums reach their spacefaring potential in the possible intermediate or distant future, the contemporary nation-state may wither away as humanity reorganizes itself as a planetary-wide spacefaring civilization. At this point, a single spacefaring-oriented entity will form. If this occurs, all of humanity will view itself as belonging to a single social order. It will share a single larger culture. It would view itself as one species rather than as a collection of disparate categories that include various ethnicities, races, and nations. This emerging social reality would epitomize a spacefaring civilization. There would be no need for individual spacefaring societies under these circumstances even though their initial formations into such societies would have set the stage for them to participate eventually in their collective transformation into a spacefaring civilization.

10.1. Managing Social Change and a Possible Self-Fulfilling Prophecy

The will to create a particular outcome thought to be beneficial to humankind may, in fact, prove to be the factor that tips the fate of humanity in favor of that outcome. In the present case, it is postulated that movement toward a spacefaring society is that desired outcome. Serious attempts to manage the future in ways favorable to developing a spacefaring future can initiate a self-fulfilling prophecy. The patterns that emerge can gain momentum so that movement along the spacefaring continuum accelerates. On the other hand, contrarian patterns can result in a self-fulfilling prophecy that creates a different future altogether.

11. Managing Social Change

Beyond monitoring the progress of social change along the spacefaring continuum, this exercise also provides specific objectives that move a particular society toward a spacefaring future. Manipulation of social change is a worthy undertaking according to Karl Marx, for example, as long as it benefits society and its citizens. While Marx's proletariat revolution has never materialized, his insights about influencing social change are extremely valuable to consider.

Sociology and the other social sciences exist not only to understand how societies and their cultures operate, but also to apply this social knowledge toward useful practical outcomes. Karl Marx called this *praxis* or the translation of an idea or set of ideas into action [12]. Marx argued that people can make their own history...[despite] their susceptibility to material and social conditions. He referred most directly to the possibility of human beings overcoming the alienation they experienced and thereby ridding the world of oppression, but the concept of praxis may be expanded to the general idea of applied sociology ([18]:16).

In the present context, then, praxis can be related to applied astrosociology [18]. Recognition of various forms of social change can result in advantages. Thus, this is more than just an academic exercise. It involves practical benefits and the potential avoidance of negative outcomes.

Astrosociological research will prove necessary to determine the nature of these types of new patterns and track them against the mileposts and characteristics of the ideal type of spacefaring society over time. At any time, any particular society may shift into a spurt of exceptional growth of *astrosocial phenomena* (i.e., social and cultural patterns related to space), just as it may enter a period of stagnation or reversal. We need to remain cognizant of such changes, as societies benefit when they can recognize and manage (as best they can) potentially positive trends ([2]:9).

Managing social change can become a legitimate social movement. However, it is important to emphasize here that *most* astrosociologists should study such social phenomena if they arise rather than advocate them – or even more directly, participate in a movement to bring them about. At the same time, researchers can disseminate their findings so that decision makers in the space policy arena can take advantage of them. The emphasis must be on research rather than participation, then. Astrosociologists should seek to be neutral and unbiased in their work. The exception to this rule involves applied astrosociologists who may work with space advocates as they study their behavior.

Because societies are complex by nature, predicting any type of specific change in the short term is a very difficult task. Social scientists have a poor record of predicting social change [13]. One can only measure new forms of change in comparison to old social conditions. In the United States, which is in the beginning period of its space-capable era, it is nearly impossible to predict if or when an incipient event will trigger more rapid movement along the spacefaring continuum. Nevertheless, the attempt to manage social change mostly by non-astrosociologists in ways favorable to the development of a spacefaring society may yield the results intended.

12. Achieving a Self-Fulfilling Prophecy

Any social movement intent on establishing a new social environment is simply attempting to achieve a self-fulfilling prophecy. Once this process is initiated, the prophecy itself can create a belief system and corresponding behaviors that increase the likelihood of achieving a future social reality that closely matches the desired outcome. Thus, supporters define a set of social and cultural conditions that they would like to establish, and then they set about attempting to make it a reality at some point in the near or intermediate future. This is difficult work, however.

In the case of establishing a self-fulfilling prophecy that results in a spacefaring society, the achievement of this goal is probably possible only in the intermediate or distant future. Thus, the spacefaring continuum may serve the purpose of breaking this particular movement into smaller, more

achievable segments with each objective encompassing only part of the overall goal. The continuum, including the list of mileposts, can serve as a map of the entire journey and indicate the proper stops along the way that lead to the desired outcome of a spacefaring society – if that is, in fact, the goal.

The mileposts serve a very important purpose: knowledge about potential objectives necessary for the manipulation of contemporary social change to move social reality toward the desired goal of constructing a spacefaring society. The type of approach provided by praxis results in a desirable and somewhat controllable self-fulfilling prophesy rather than one that is based on mere luck or potentially unintended and negative. Manipulation of social change in order to achieve a positive outcome is an aspect of the Spacefaring Model that deserves its own emphasis of astrosociological inquiry. Such advocacy, guided by the mileposts, may well prove to be a central component in helping to ensure the movement toward a spacefaring ideal type, if that is the desired outcome for a culture.

13. Conclusions

So, what value does this model of astrosocial change provide for the average person, space professional, social scientist, or humanity as a whole? This exercise of contrasting space-capable societies against the ideal type of spacefaring societies provides a good tool for analyzing the progress of terrestrial nation states along the spacefaring continuum described. It also more accurately grounds the characteristics of space-capable societies to the astrosocial phenomena that actually exist. As with any theoretical discussion, practical action exists as a complementary expression to theory. Accurate knowledge about existing social conditions and the characteristics of social change can provide a framework for identification of certain types of development and thereby a means to move forward in a desired manner.

Thus, the monitoring of social change along the continuum is undoubtedly one very important aspect that arises from this exercise. This type of benefit serves to reassure proponents of this form of social change that they are moving in the correct direction. For neutral individuals, including social scientists, monitoring of the movement along the continuum allows them to better study – and to understand – the nature of social change in the context of astrosocial phenomena.

Beyond simply identifying a particular society's development, this tool – that is, the Spacefaring Model – allows for taking practical steps to move in the “correct” direction while avoiding potential offshoots and destructive events that move it away from the path toward a spacefaring future. As discussed, Marx's concept of praxis assumes that leaders and citizens possess an ethical duty to improve social conditions for humanity, thus implying that a “social engineering” process must occur. In accepting such a position, one must then select which path to take to ensure the improvement of social life for all citizens. In the present case, the author assumes that the path toward a spacefaring society is a probable course, though others may either disagree with which characteristics best typify an ideal spacefaring society or wholeheartedly reject the spacefaring continuum altogether.

In either case, this exercise provides a greater understanding of the differences between a space-capable society and a spacefaring society, which allows for a more realistic assessment of the social, technological, and scientific level of even the most sophisticated terrestrial societies in existence. In some ways, spacefaring societies will be superior to space-capable societies. They will exhibit science and technology that is more advanced, improve economic prosperity utilizing space resources, and solve or mitigate a variety of existing social problems. On the other hand, even spacefaring societies will need to contend with their own brands of social problems. Some of them will be quite familiar such as various forms of deviance, sexism, racism, and social stratification [19]. Nevertheless, the recognition of social change involving social problems and other elements of society can result in meaningful attempts to manage that change. The very study of the movement toward a spacefaring society can result in actually improving social conditions due to our acquired knowledge about these emergent social realities. Knowledge is a tool we can use to manage social change better, as it is far superior to ignorance.

An important recommendation is for others to assist in the development of this model of astrosocial change. At the present, very few people work in this area. Other recommendations exist as well. Determining more of the possible causes of derailment from the continuum is one important area requiring additional development. Perhaps advocates of a different type of future social model may work against the formation of a spacefaring society, and that requires study to identify different mileposts. Identification of additional mileposts within the spacefaring model is another area deserving of more research. Purposeful manipulation of social change to achieve the mileposts and move toward a spacefaring future is yet another important area of study. Astrosociology finally exists as an independent academic field to provide theoretical inquiry into, and empirical examination of, this important relationship between space and society. It is already past the time to take full advantage of it.

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