



Einstein's Problem¹

Trans-Planetary Societies and the Special Theory of Relativity

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Abstract

This paper focuses upon the human migratory trajectory from eons on planet Earth to slowly moving out into orbital space and whether world-systems theory must craft new theoretical frames to grasp the possible problems arising from the existence of a single social system comprised of actors distributed across terrestrial and orbital platforms, dubbed here as "Einstein's Problem."

Keywords: World-Systems Theory, Argosian State

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From the appearance of anatomically modern humanity 300,000 years ago until the middle of the twentieth century, the gravity well generated by Earth's mass kept humanity chained to the planet until the Wright brothers' first flight in 1903. Since then, the human ascent into the heavens has been rapid. By 1957, we had launched a satellite (Sputnik); by 1961, there was a man orbiting Earth (Yuri Gagarin); by 1969, men were on the Moon (Neil Armstrong, Buzz Aldrin); by 1971, a habitable space station was in orbit (Salyut 1); and since 2000, there has been a continuously inhabited International Space Station (ISS); which if decommissioned as expected in 2030, would have been in habited existence longer than some nation-states. Finally, there are plans for manned missions to Mars.

Theory on Outer Space

This ever-growing socialization of outer space has been the object of extensive social science speculation. There is Marxist literature predicting resource exploitation through asteroid mining and other activities (Dickens 2017, 2010; Dickens and Ormrod 2009, 2008); political science and international relations thinking about theoretical sovereignty in space (DeGrasse and Lang 2018; Everett 2002; Havercroft and Duvall, 2009; Duvall and Havercroft 2008); a wealth of science fiction on galactic empires utilized as hypothetical models of astropolitics (Brooks et. al, 2018; Ruane and James, 2012; Buzan 2010; Carpenter 2016; Daniel and Musgrave 2017; Taylor 2014; Grayson, Davies, and Philpott 2009); expositions on space law and concerns over the congested and contested status of space turning to militarization and weaponization (Weeden and Samson 2018); and anthropologists concerned with ethnographies of space scientists and NASA (Messer 2016; Olson 2018).

Outer Space on Theory

From the point of view of new theorizing, though, the key isn't that all sorts of social theories haven't been deployed, but that our theoretical frameworks haven't been critically examined from the distinct point of view of social relations between terrestrial and orbital actors. This, as we shall see, presents a challenge that must be seriously considered if any reasonable theoretical grasp of the human terrestrial/orbital interface is to be understood. There is much to be said and page space is limited, so I will briefly discuss three things: first, Weber's classic definition of the state as a territorial entity; second, the present widest level of analysis in sociological theory, world-systems theory in both PEWS and World Society formats (Wallerstein 1974; Meyer et. al., 1997); and third, what I will call "Einstein's Problem."

Weber's Territorial State in the Space Age

For Weber (1946), the modern state is “a human community that (successfully) claims the *monopoly of the legitimate use of physical force* within a given territory”.² Now, when we think of humanity in space we largely think of satellites, and as of 2018 there were 4,857 of them currently orbiting the planet, with 1,980 being active. Of these, 826 have commercial uses, 523 governmental uses, 399 military uses, 138 civil uses, and 278 multiple uses. Sixty-five countries currently operate satellites: the United States (859), China (250), Russia (146), Japan (72), India (55), and the UK (52) (Pixalytics 2018). Between dual use—explicitly military as well as commercial use by national companies—satellites represent an extension of political sovereignty into earth orbits (Low, Medium, and Geostationary). Between orbital military assets and responsibilities to protect commercial satellites, aspects of national sovereignty are becoming deterritorialized, yielding what could be called a new half-terrestrial/half-orbital state. Weber's territorial definition, therefore, represents only pre-orbital political history, and as such is inadequate for a growing number of twenty-first century spacefaring states. We are, in this regard, in the midst of another great transformation in political form. Not from hereditary empire to modern nation-state, but from nation-state to an emerging half territorial/half orbital sovereign polity.

The Rise of an Argosian State

For Hobbes (2016), the metaphor for the state was the Leviathan, and for Neumann (2009), the Behemoth; both Biblical Sea and Land beasts.³ Today's orbital/terrestrial state can be represented by *Argos Panoptes*, the all-seeing giant of Greek mythology symbolizing spacefaring states with spy and reconnaissance satellites constantly circling the globe. The Argosian State is all-seeing with its cameras constantly whirring; it truly never sleeps.

When Weber was writing, the totality of humanity was gravitationally tied to terrestrial territory, making territoriality a natural property of the modern state. It is only with the advent of breaking gravity's hold, creating satellites followed by habitable space stations and plans for lunar and Martian settlement, that the political found itself dispersed over two moving physical platforms (earth and satellite or other celestial body). The key empirical point isn't just that the state is stretched over two platforms, but that the orbital half relentlessly circles the terrestrial half.

When the political was solely terrestrial each state had a set number of other states on its border. Imagine two Chinas in the future. Let's call one Terrestrial China (TC), and the other,

² These terrestrially fixed boundaries/borders can be challenged, expand, contract, and in some instances disappear altogether, as in the historical case of Poland and the present national boundary of where eastern Syria ends and western Iraq begins. But this is an unstable state of political being where lines are being redrawn. The political history of the world may be one of shifting boundaries, but it is nonetheless the history of boundaries—such as territorial borders—and that is the point here.

³ For a provocative discussion of geopolitical tensions between continental (Behemoth) and maritime (Leviathan) states see Schmitt's *Land and Sea: A World Historical Mediation* (2015).

through its satellites, Orbital China (OC). Assuming nothing has changed, terrestrial China is fixed territorially as demarked by borders with 14 other states (Afghanistan, Bhutan, India, Kazakhstan, Kyrgyzstan, Laos, Mongolia, Myanmar, Nepal, North Korea, Pakistan, Russia, Tajikistan, and Vietnam). Orbital China, on the other hand, circles the Earth once every 90 minutes, or 16 times a day; and with orbit maneuverability Orbital China can, in principle, be over, or border, not just the 14 terrestrial states bordering Territorial China but any of Earth's 195 sovereign states. Territorially moored Weberian states are, by definition, limited; while the Argosian State's borders are not. It can, in principle, border as many states as its national interest dictates.

The emerging political reality of political sovereignty is now a political form that is both somewhere and everywhere at the same time. Importantly, the orbital aspect is not just up in the air, but constantly circling the terrestrial half of all other states and other Argosian States as well, which themselves have a constant presence in orbital space. Given, for instance, armed space stations/satellites/spacecraft in permanent orbit, the armed forces of, say, Orbital China, and, say, Orbital United States, could be "on" the border of each other's terrestrial half 16 times a day, or in geostationary orbit permanently hovering over each other. Therefore, Weber's "within a given territory" (1946) state is inadequate for an emerging future where part of the state is within a given territory, but at the same time partly over, around, and next too every other territorial state. The conundrum of being everywhere and only somewhere at the same time will require future research to flesh out the operational parameters of political sovereignty in the emerging orbital age.

It is fair to ask whether passing over another state is the same as sharing its territorial border. That is a question of theory that will have to be seriously addressed particularly when, in all likelihood, space stations, satellites, and space planes (such as US Air Force X-37) become weaponized, thereby creating threats to both orbital national assets and the territorial nation itself. The territorial nation will no doubt extend its Weberian-etched borders through their already nationalized atmospheres to demarcate chunks of the orbital space above them, as they earlier extended their terrestrial sovereignty into air and sea.

In the future, then, we will face quite a complex array of Orbital-to-Orbital as well as Orbital-to-Terrestrial foreign relations compared to the present situation of merely Terrestrial-to-Terrestrial international relations.⁴ Actual sovereign polities in orbit remain hypothetical. But the national and its sovereign assets are already in space, although they are not as yet separate sovereign polities independent of their territorial counterparts. Perhaps they never will be, but for certain, the political in human affairs has definitely jumped the gravitational hold of its earlier Weberian terrestrial essence.

⁴ It is presently known that anti-satellite weapons launched from terrestrial missiles (China) and terrestrially launched aircraft (United States) already exist, but orbital platform to orbital platform weapons and orbital platform to earth platform weapons seem at present to be merely under development (see for instance, Weeden and Samson 2018).

The Emerging Earth/Near Earth World-System

World-Systems, from the point of view of Space, are no longer the final spatial expansion of social relations; for the social has migrated into orbit and beyond. Given this fact, the sociological task at hand is to figure out how to theoretically incorporate orbital social actors with terrestrial social actors into a trans-orbital/terrestrial social formation, given the constraints of Einstein's special theory of relativity. At this point, though, it isn't entirely clear that the orbital social and the terrestrial social can be unified into a future Earth/Near Earth social system.⁵

We can begin, though, to consider some of the issues that will have to be addressed if social theory is to follow humanity from eons of terrestrial existence into near earth orbits and beyond.

First, we need to disengage the concept of "world" from that of "global," for that theoretical fusion was only applicable until the middle of the twentieth century and the advent of post-terrestrial migration. World-systems theory broadly writ is focused on a social system that is at present limited, like Weber's definition of the state, only to planet Earth. It should be relabeled as an earth-spanning system. This, of course, is not a matter of any short sightedness but of historical change, for social life in all forms was until now entirely bound to Earth.

Second, being gravitationally tied to Earth's geography meant that the role of that physical platform was held constant across all social forms, hence not seen as a causal variable in sociological theory.⁶ This fact is reflected in Durkheim's (1982) assertion that social facts are to be explained only by other social facts, leaving out both the mind/brain of the individual actor and the geographic terrain of socio-political forms. In this regard, social theory has continued to exist in a hermeneutic bubble divorced of any serious explanatory role for either the pre-social mind/brain or geographic setting.⁷

Third, the autonomy of social and world-systemic forms would continue to have been cut off from their geographic foundation if it weren't for the historical emergence of human migratory patterns off planet and into orbit (astronauts, space stations, space planes; lunar settlements planned by China, the United States, India, and Israel; Japanese and American orbiting, landing upon, snatching, and grabbing minerals on asteroids; plans by space faring nations for human flights to Mars; and so on and so forth).

Fourth, and this is the key: humanity in Space, in orbit, or on various planets within the solar system isn't just another version of the earlier migratory trek from continent to continent, or within continents, or across oceans, or into the atmosphere, or even into outer space. The point is that

⁵ While here we are discussing the future, there is some great comparative historical sociology to be done on this topic as well. So, for example the comparative stages of space and oceanic political and commercial expansion:

First comes state funding: Queen Isabella/Columbus then; now NASA/Apollo 11, or Soviets/Sputnik-Gagarin

Second comes commerce: British East India Company then; now SpaceX, Blue Origin, and so on

Third comes state supported commerce: the British Navy then; now US/China/Russia interested anti-satellite weapons and controlling cislunar space with lunar outposts lunar orbiting space stations.

⁶ There is, of course, a long history of geopolitical thinking stretching back to Thucydides and Ibn Khaldun, but it has had little impact upon professional sociology and social science.

⁷ For a critique of this shortcoming see Bergesen (2004a, 2004b, 2005).

having individuals in orbit places actors in physical motion relative to other individuals upon Earth. Sociology's task, then, is to resolve theoretical problems with a sociality that can encompass and be meaningful to actors upon two platforms in motion relative to each other.

This theoretical rethinking requires the following assumption: at present there are not enough people in space for the kinds of sociality found on Earth,⁸ and so, as we are trying to speculate about the future, I will assume size and sustainability of habitable space stations will only grow. At present the International Space Station (ISS) has been continually inhabited for close to a quarter of a century, and it wouldn't be science fiction to extrapolate from the present limited social life in orbit of the early twenty-first century what might be a larger orbital population on one or another space stations in the future. In this regard I will operate with the assumption that sometime in the future, size and habitability of space or lunar stations will allow permanent residence, procreation, and generational transmission of collective orbital experiences.

Fifth, and finally; what specifically is it about humanity dispersed across two rigid physical platforms in relative motion to each other that provides questions about possible trans-orbital/terrestrial social relations? The answer requires a step outside the conventional theoretical assumption that the social is the only explanation of the social, with the introduction here of some principles taken from the special theory of relativity (Einstein [1905] 1952) that can be applied to Earth and space station as separate in relative motion frames of reference. While Einstein is describing the relative mechanics of physical objects, he speaks of theory as formulating "general laws of nature as they are obtained from experience" (Einstein 1961: 60), and the laws of sociology are also those obtained from social experience; and as such there is a natural bridge between the principles of physical mechanics and those of social mechanics. This leads us to Einstein's Problem.

Einstein's Problem

Up until humans were in orbit there has been no sustained human action that is divorced from platform Earth, upon which humanity has been permanently attached. A coming future, though, with larger, more habitable, and generationally reproduceable populations in continuous orbit will pose Einstein's Problem, an analogy with what is called Plato's Problem, in which Chomsky (1986) sought to solve how, on the basis of fragmented, sporadic and degraded input data, the human mind was capable of coming up with the intricate, precise, and law-like mental architecture that characterizes syntax in language. His resolution was that it was not learned but innate, as part of our evolutionary bio-inheritance.⁹ Einstein's Problem asks how our species-wide social

⁸Theorizing astro-social relations as something like an "astrosociology" has had little traction, although interestingly enough, the theoretical concept of "astropolitics" does have a serious journal, *Astropolitics: The International Journal of Space Politics and Policy*, that has been in existence for 16 years (<https://www.tandfonline.com/toc/fast20/current>).

⁹ For further discussion on Chomsky and Plato's Problem with a specific reference to social theory, see Bergesen (2004a, 2004b, 2005).

formations are possible when social actors are divided between earth and orbit, on two physical reference platforms in uniform motion relative to each other.

To try and understand why this is a problem, let's begin with Einstein, who asks:

returning to the illustration we have frequently used of the embankment and the railway carriage, we can express the fact of the motion here taking place in the following two forms, both of which are equally justifiable:

(a) The carriage is in motion relative to the embankment.

(b) The embankment is in motion relative to the carriage.

In (a) the embankment, in (b) the carriage, serves as the body of reference in our statement of the motion taking place. (Einstein 1961: 59)

Rewriting (a, b) in terms of orbiting space station and Earth, we can justifiably say,

(c) Individuals on a space station are in motion relative to individuals on Earth.

(d) Individuals on Earth are in motion relative to individuals on a space station.

This implies that the human experience of the relative mechanics of physical motion is transferable to social motion, what we call social behavior and social action. Individuals on a train in motion experience each other as at rest, or stationary, while they also experience individuals in the train station or embankment as in motion; and of course the opposite: on the embankment/train station individuals experience each other as stationary or at rest and those individuals as "passing them," as in motion.

Substitute individuals on a space station for Einstein's train and individuals on Earth for Einstein's train station, and the effect is the same: those on a space station experience themselves as stationary and those on Earth as moving beneath them, and those on Earth experience each other as stationary and those on the space station as in motion.¹⁰

Now, consider how Einstein's Problem affects the very basic and primal social theoretic notion of internalization; that is, individuals take others' points of view (Mead, Cooley, Blumer, etc.) and collective understandings (Berger and Luckmann, Bourdieu, Althusser, etc.) as their own. One of sociology's central tenants, "inspired by Mead and Cooley, [is] that one's self-perceptions are an internalization of the perceptions of the views of others" (Yeung and Martin 2003: 843).

To illustrate Einstein's Problem for this theoretical tradition, assume for a moment that we have four individuals in the future (A, B, C, D). A and B are born, raised, and socialized on Earth; C and D are born, raised, and socialized on an orbiting space station. Following Einstein, we will assume Symbolic Interaction Theory processes operate identically for individuals on both and Earth and space station, as "general laws of nature...have exactly the same form in both cases" (Einstein 1961: 60). Theoretically, following social theory, A and B can take the role of the other (Mead); or see themselves in the assumptions of the other (Cooley), or internalize their society's

¹⁰ For example, see the YouTube video, (<https://www.youtube.com/watch?v=GOAEIMx39-w>). And, those on earth experience those on the space station as circling in motion above them see the video, (<https://www.youtube.com/watch?v=TaPQqCofwQc>).

collective sentiments (Durkheim), or class cultures/world views (Marx, Gramsci), or their socially constructed reality (Berger and Luckmann) or habitusinal cultures of daily life (Bourdieu),¹¹ along with being more formally socialized by their Ideological State Apparatus (Althusser). Bottom line, in modern social theory, the individual internalizes their social context. But is that so if their contexts are set upon different physical platforms in relative motion to each other? For an example, think for a moment of nomads and settlements. To the settled, the nomad passes by (is in motion); to the nomad, settlements pass them by (are in motion); wheeled carts and mud/brick/steel and glass houses represent two different reference-bases. From the point of view of the special theory of relativity it is, justified to say,

- (e) The nomad is in motion relative to the settlement.
- (f) The settlement is in motion relative to the nomad.

just as has been argued here that it is also justified to say,

- (g) The space station is in motion relative to the Earth.
- (h) The Earth is in motion relative to the space station.

There is an important difference in nomad/settlement and space station/Earth relations though: both the nomadic and the settled exist on a common reference platform, Earth. And when the nomadic stop for the night, or for a summer encampment, their reference platform becomes the same as that of the settled, and only shifts when they are again in motion. The nomadic and the settled are not, then, platforms in constant motion vis a vis each other. This is not a new observation, though, and can be found the fourteenth century writings of Ibn Khaldun when he spoke of the solidarity property (*asaibayya*) that belonged to nomadic groups but that dissipated when they became settled. Similarly, today's astronauts in orbit experience Earth moving beneath them; but when they return to Earth their reference-body shifts and they experience the space station in motion above them.

The full effect of the special theory of relativity will kick in sometime in the future with permanently inhabited space stations or settlements on celestial bodies, where generations will only experience the fact that it is the Earth that moves and they are stationary; and of course the opposite where Earthlings experience celestial bodies as in motion.

There is no way, then, that actors A or B on Earth can internalize individual's C and D's view/perceptions that the space station is at rest and stationary and that it is Earth that is moving,

¹¹ For Bourdieu, “[l]earned culture (including learned language) are objectively defined by the degree of internalization of the linguistic norm...[as] the habitus is the product of the work of inculcation and appropriation necessary in order for those products of collective history, the objective structures (e.g., of language...etc.) to succeed in reproducing themselves...in the form of durable dispositions, in the organisms” (Bourdieu 1977: 85, 201).

any more than C and D can internalize A and B's view/perception that the space station is in motion and the Earth is stationary.¹²

Let's consider two other future individuals who this time were born and raised on the Moon, E and F. A and B's consensual reality is that the Moon rises and sets around the Earth, while E and F's consensual reality is that it is the Earth that rises and falls around the Moon. A and B and E and F each engage in the social construction of reality but A and E, A and F, or B and E and B and F cannot agree on a common reality without our introducing all sorts of caveats, adjustments, and special conditions that make it an artificially contrived situation. For A and B the Moon rises and for E and F the Earth rises, such that each have a viably constructed reality such that each can internalize the other's perceptions and world views. Mead's, Cooley's, Blumer's, Berger's, and Luckman's theories all operate between individuals on Earth and on a space station or the Moon, but not between individuals on the Earth and on a space station or on the Moon.

These social theories—symbolic interaction, socialization, internalization, among others—were supposedly universal, applicable to all humans in all places, what we call general theories; but it turns out they only worked between individuals upon a single physical reference platform like planet Earth, or a reference platform like the Moon, or a planet, or space station. When portions of humanity live in orbital space they will occupy a non-Earth reference platform, and Einstein's Problem will arise for social theory that tries to encompass all of them. Present universal social theory then, now thought applicable to all humans, will have to find some way to overcome Einstein's Problem.

Understandably, no pre-space social theorists had thought of a condition where humanity would be distributed across two physical platforms in constant relative motion with each other, nor did anyone think the special theory of relativity would bleed into social theory. Further; there is, in the space age, no such thing as a universal social actor, for there are no actors without their accompanying physical reference frames, and upon any single rigid physical reference platform, the laws of sociology hold; although not across them, for they are relative to specific reference frame.

Sociology, of course, has been very aware of aware of "social relativity" of points of view, values, and social reference frames, but it is now clear that the socially relative is dependent upon the physically absolute. If individuals A, B, C, and D all live on Earth, then that is their pre-social common physical reference platform. Again, they don't experience themselves in motion vis a vis each other and as such this is the geographic a priori that enables stable social relations, hierarchies, status categories, organizations, societies, and even world-systems to form. The fixed physical allows the emergence of the social, which is itself a fixed interactional presence, which in turn is the prerequisite for social relativity. For example: if one class is to have one set of cultural standards compared to another, such classes must exist relative to each other. There must be classes in the first place before they can be experienced as relative to each other. But classes cannot form

¹² These contrasting points of view of AB and CD can be illustrated in these videos, <https://www.youtube.com/watch?v=GOAEIMx39-w> and <https://www.youtube.com/watch?v=EPy11LgNtoQ>.

across moving physical platforms (e.g.; on Earth, on a space station, the Moon, Mars, etc.). This means that social order between earthly A and B and between orbital C and D can and does exist. Sociological principles hold, like those of physics upon the rigid stationary physical reference platforms upon which they can emerge in the first place and then be enacted secondarily. But if A and B and C and D experience each others' collective sentiments (Durkheim), socially constructed realities (Berger, Luckman), or on take the role of the other differently (Mead, Goffman, Cooley, Blumer), as with the earlier example of the lunar platform, then C and D's reality is that the Earth rises, and earth-platformed A and B's reality that the Moon rises, there can be no common interactional understandings as the basis of social order. They simply cannot realize a common set of experiences that they can internalize as self and other across their moving physical reference platforms of Earth and Moon.

Political Philosophy Problems

Einstein's Problem exists for political philosophy as well as for social theory, for not only is there also no universal individual, but no universal humanity either. For example, consider the universal conception of humanity in the following treatises in political philosophy:

We hold these truths to be self-evident, that all men are created equal, that they are endowed by their Creator with certain unalienable Rights, that among these are Life, Liberty, and the pursuit of Happiness...(United States Declaration of Independence 1776).

Men are born, and always continue, free and equal in respect of their rights. (Declaration of the Rights of Man by the National Assembly of France 1789).

Men are born, and always continue, free and equal in respect of their rights....the natural and imprescriptible rights of man....the enlightened state of mankind....the wretched condition of man... (Paine 1791).

We are all equal, are we not? This principle is uncontested...(Maréchal, Pierre-Sylvain. [1796] 1920: 93).

Nature has given to each individual an equal right to enjoyment of all the goods of life. (Babeuf 1796).

Its [the working man] freedom is the freedom of humanity itself...(Lasalle [1862] 1884).

Isaac Newton believed in the universal presence of time and space; the backdrop, or stage, upon which object mechanics, motions, velocities, and so forth played themselves out. In pre-space social theory, ideas of "all," or "humanity," or "humanity itself," "social being" or "species being" represented a taken for granted universal pre-social being that is humanity. Newtonian space, though, turned out not to be a universal background upon which objects and forces played out their essences in general laws throughout the universe. Instead, the laws of mechanics turn out to be

relative to the reference platform upon which they operate, and the same now appears to be the case for the laws we call social theory.

In pre-space theories, universal political actors turn out not to be a constant across the human universe, when some are in orbit and others are on Earth. The Moon and Earth don't absolutely rise and fall at the same time; each does but only from the point of view of that reference platform we call Earth and Moon. And, as an analogy, the earthly self cannot naturally see itself as the lunar other sees it. Class consciousnesses, *habiti*, group cultures, collective sentiments, and all the rest can only be internalized by selves from others on the same physical platform.

The social/physical binary dissolves. To paraphrase Minkowski on Einstein's relativity theory, "henceforth, the social by itself, and the physical by itself, are doomed to fade away into mere shadows and only a kind of union of the two will preserve an independent reality" (Minkowski 1952: 76). If so, what are the chances of realizing a common species being (Feuerbach) or common social being (Marx), or universal human rights, or a common trans-orbital/terrestrial social formation, polity, state, or world-system?

We are at present on the cusp of our Einstein Moment when the orbital eyes and weapons of the Argosian State break off from its terrestrial body, or the terrestrial body is absorbed by the orbital half, and we return to a Weberian-like state; however one that only exists in orbit or on Earth, but not between. The half terrestrial/half orbital state will not last forever, and future international relations may be comprised of Weberian States, on Earth only territorially bounded; Argosian States, half terrestrial/half orbital; and, finally, pure orbital polity—where body and eyes are unified in some orbital format (space station, lunar, asteroid, or planet).

Conclusion

What all of this is about, in terms of intellectual history, is the shift ever upward in units of analysis; that is, individuals, groups, institutions, societies, world-systems, and now hints of a possible terrestrial/orbital social formation. Space, as the "final frontier" is also Space the "final unit of analysis" in sociology terms. Off-planet living and terrestrial/orbital social relations begs astrosociological theory (Bergesen 2018) to grasp its essence. Put more bluntly: if the intellectual imperative for sociology is to think context, and so we theorize the individual in the social context, and that, in the world-system context, we must now theorize all of that in the newly emerging terrestrial/orbital context.

Social change is often upon us before we turn to adjusting our theoretical frames. The space age is less than a hundred years old and the habitable part as space stations only a quarter of that time. It is all so very new, this human migration to near-earth residency, and the full realization of the preliminary ideas outlined here lie in the future.

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References

- Babeuf, Gracchus. 1796. "Analysis of the Doctrine of Dabeuf." <https://www.libertarian-labyrinth.org/working-translations/analysis-of-the-doctrine-of-babeuf-1796/>
- Bergesen, Albert. 2004a. "Chomsky vs. Mead". *Sociological Theory*. 22: 257–370.
- _____. 2004b. "Durkheim's Theory of Mental Categories: A Review of the Evidence". *The Annual Review of Sociology*. 30: 395–408.
- _____. 2005. "Culture and Cognition." Pp. 35–47, in M. Jacobs and N. Hanrahan (Eds.) *The Blackwell Companion to the Sociology of Culture*. New York: Basil Blackwell.
- _____. 2018. "From Geopolitics to Astropolitics" Pp. 169–182 in A.J. Bergesen and C. Suter (eds.) *The Return of Geopolitics*. Berlin/Münster/Wien/Zürich/London: LIT Verlag.
- Bourdieu, Pierre. 1979. *Outline of a Theory of Practice*. Cambridge: Cambridge University Press.
- Brooks, Max, John Amble, ML Cavanaugh, Jaym Gates, and Stanley A. McChrystal (eds.) 2018. [*Strategy Strikes Back: How Star Wars Explains Modern Military Conflict*](#). Washington, DC: Potomac Books.
- Buzan, Barry. 2010. "America in Space: The International Relations of Star Trek and Battlestar Galactica," *Millenium: Journal of International Relations* 39: 175–180.
- Carpenter, Charli. 2016. "Re-Thinking the Political/-Science/Fiction Nexus," *Perspectives on Politics* 14: 53–69.
- Chomsky, N. 1986. *Knowledge of Language: Its Nature, Origin, and Use*. Westport CT: Praeger.
- Daniel, J.Furman, III. and Paul Musgrave. 2017. "Synthetic Experiences: How Popular Culture Matters for Images of International Relations," *International Studies Quarterly* 61: 503–16.
- DeGrasse Tyson, N. and Avis Lang. 2018. *Accessory to War: The Unspoken Alliance Between Astrophysics and the Military*. New York: W.W. Norton.

- Dickens, Peter. 2010. "The Humanization of the Cosmos—To What End?" *Monthly Review*. Volume 62, Issue 06 (November). <https://monthlyreview.org/2010/11/01/the-humanization-of-the-cosmos-to-what-end/#en85>
- _____. 2017. "Astronauts at Work: The Social Relations of Space Travel." *Monthly Review*. Volume 68, Issue 10. <https://monthlyreview.org/2017/03/01/astronauts-at-work/>
- Dickens, P and J. Ormrod. 2008. "Who Really Won the Space Race?" *Monthly Review* 59:30–37.
- _____. 2009. *Cosmic Society: Towards a Sociology of the Universe*. London: Routledge.
- Durkheim, Émile. 1982. *The Rules of Sociological Method*. New York: Free Press.
- Duvall, R. and J. Havercroft. 2008. "Taking sovereignty out of this world: space weapons and the empire of the future". *Review of International Studies*. Volume 34: Issue 4.
- Einstein, Albert. [1905] 1952. "On the Electrodynamics of Moving Bodies" in *The Principle of Relativity: A collection of Original Memoirs on the Special and General Theory of Relativity*, edited by H. Lorentz, A. Einstein, H. Makowski, and H. Weyl. New York: Dover Publications.
- _____. 1961. *Relativity: The Special and General Theory*. New York: Crown Publishers.
- Everett, C. Dolman. 2002. *Astropolitik: Classical Geopolitics in the Space Age*. London: Frank Cass.
- Grayson, Kyle, Matt Davies, and Simon Philpott, "Pop Goes IR: Researching the Popular Culture—World Politics Continuum," *Politics* 29 (2009): 155–163.
- Havercroft, Jonathan and Raymond Duvall. 2009. "Critical Astropolitics: The Geopolitics of Space Control and the Transformation of State Sovereignty." Pp. 42–58 in *Securing Outer Space: International Relations Theory and the Politics of Space*, edited by Natalie Bormann and Michael Sheehan. New York: Routledge (Critical Security Studies).
- Hobbes, Thomas. *The Essential Leviathan*. [1651] 2016. Indianapolis: Hackett.
- Lassalle, Ferdinand. [1862] 1884. *The Working Man's Programme*. London, England: The Modern Press.
- Maréchal, Pierre-Sylvain. [1796] 1920. "Manifesto of the Equals." Pp. 54–56 in *Revolution from 1789 to 1906*, edited by R.W. Postgate. London: Grant Richards.
- Messer, Lisa. 2016. *Placing Outer Space: An Earthly Ethnography of Other Worlds*. Durham: Duke University Press.
- Meyer, John W., John Boli; George M. Thomas; Francisco O. Ramirez. 1997. "World Society and the Nation-State." *American Journal of Sociology* 103 (1): 144–181.
- Minkowski, Hermann. 1952. "Space and Time." Pp. 75–91 in *The Principle of Relativity: A Collection of Original Memoirs on the Special and General Theory of Relativity*, edited

- by Hendrik A. Lorentz, Albert Einstein, Hermann Minkowski, and Hermann Weyl. New York: Dover.
- National Assembly of France. 1789. *Declaration of the Rights of Man*, Article 1.
- Neumann, Franz. [1942] 2009. *Behemoth: The Structure and Practice of National Socialism, 1933–1944*. Chicago: Ivan R. Dee.
- Olson, Valerie, 2018. *Into the Extreme: U.S. Environmental Systems and Politics Beyond Earth*. Minneapolis: University of Minnesota Press.
- Paine, Thomas. 1791. *The Rights of Man Part I (1791 ed.)*. London: J. S. Jordan.
- Pixalytics, 2018. "How Many Satellites are Orbiting the Earth in 2018?"
<https://www.pixalytics.com/sats-orbiting-the-earth-2018/>
- Ruane, Abigail E. and Patrick James. 2012. *The International Relations of Middle Earth: Learning from the "Lord of the Rings"* Ann Arbor: University of Michigan Press.
- Schmitt, Karl. [1942] 2015. *Land and Sea: A World-Historical Mediation*. Candor NY: Telos Press.
- Taylor, Chris. 2014. *How Star Wars Conquered the Universe*. New York: Basic Books.
- Wallerstein, Immanuel. 1974. *The Modern World-System*. New York: Academic Press.
- Weber, Max. "Politics as a Profession." 1946. Pp. 77–128 in *From Max Weber: Essays in Sociology*, edited and translated by H.H. Gerth and C. Wright Mills. New York : Oxford University Press. https://www.ucc.ie/archive/hdsp/Weber_Politics_as_Vocation.htm.
- Weeden, Brian and Victoria Samson (eds). 2018. *Global Counterspace Capabilities: An Open Source Document*. Secure World Foundation.
https://swfound.org/media/206118/swf_global_counterspace_april2018.pdf
- Yeung, King-To and John L. Martin. 2003. "The Looking Glass Self: An Empirical Test and Elaboration." *Social Forces* 81(3): 843–879.