### 1

#### 1AC’s must use the three-tier process to justify the plan as topical. They don’t because of

Shanara Reid-Brinkley 2008 (“THE HARSH REALITIES OF “ACTING BLACK”: HOW AFRICAN-AMERICAN POLICY DEBATERS NEGOTIATE REPRESENTATION THROUGH RACIAL PERFORMANCE AND STYLE”, https://getd.libs.uga.edu/pdfs/reid-brinkley\_shanara\_r\_200805\_phd.pdf) VHS AI

In other words, those with social power within the debate community are able to produce and determine “legitimate” knowledge. These legitimating practices usually function to maintain the dominance of normative knowledgemaking practices, while crowding out or directly excluding alternative knowledge-making 83 practices. The Louisville “framework looks to the people who are oppressed by current constructions of power.”58 Jones and Green offer an alternative framework for drawing claims in debate speeches, they refer to it as a three-tier process: A way in which you can validate our claims, is through the three-tier process. And we talk about personal experience, organic intellectuals, and academic intellectuals. Let me give you an analogy. If you place an elephant in the room and send in three blind folded people into the room, and each of them are touching a different part of the elephant. And they come back outside and you ask each different person they gone have a different idea about what they was talking about. But, if you let those people converse and bring those three different people together then you can achieve a greater truth.59 Jones argues that without the three tier process debate claims are based on singular perspectives that privilege those with institutional and economic power. The Louisville debaters do not reject traditional evidence per se, instead they seek to augment or supplement what counts as evidence with other forms of knowledge produced outside of academia. As Green notes in the doubleocto-finals at CEDA Nationals, “Knowledge surrounds me in the streets, through my peers, through personal experiences, and everyday wars that I fight with my mind.”60 The three-tier process: personal experience, organic intellectuals, and traditional evidence, provides a method of argumentation that taps into diverse forms of knowledge-making practices. With the Louisville method, personal experience and organic intellectuals are placed on par with traditional forms of evidence. While the Louisville debaters see the benefit of academic research, they are also critically aware of the normative practices that exclude racial and ethnic minorities from policy-oriented discussions because of their lack of training and expertise. Such exclusions 84 prevent radical solutions to racism, classism, sexism, and homophobia from being more permanently addressed. According to Green: bell hooks talks about how when we rely solely on one perspective to make our claims, radical liberatory theory becomes rootless. That’s the reason why we use a three-tiered process. That’s why we use alternative forms of discourse such as hip hop. That’s also how we use traditional evidence and our personal narratives so you don’t get just one perspective claiming to be the right way. Because it becomes a more meaningful and educational view as far as how we achieve our education.61 The use of hip hop and personal experience function as a check against the homogenizing function of academic and expert discourse. Note the reference to bell hooks. Green argues that without alternative perspectives, “radical libratory theory becomes rootless.” The term rootless seems to refer to a lack of grounded-ness in the material circumstances that academics or experts study. In other words, academics and experts by definition represent an intellectual population with a level of objective distance from that which they study. For the Louisville debaters, this distance is problematic as it prevents the development of a social politic that is rooted in the community of those most greatly affected by the status of oppression.

#### To clarify, debaters don’t have to disclose traumatic past experiences, just something about their social location that informs the way in which they engage with the topic within the 1AC

#### Vote negative for access – normative knowledge-making practices are steeped in expert vernaculars that crowd-out minority participation which is a prereq to debate’s benefits – topical analysis without the three-tiers leads to distancing that demobilizes politics toward interpassivity and secures psychic violence

#### TVA – Include organic intellectuals to have a more robust defense of the 1AC and also include how your social location or personal experinces relate to the 1AC

Add paradigm issues

#### They should lose for defending an inaccessible model of politics

CI – Holds debaters accountable for actively excluding alternate forms of knowledge

No Rvis – proves our argument about how debates super competitive nature excludes good models of politics also hypercharges because they don’t care about their aff just about getting another route to the ballot

### 2

#### The Aff’s approach to capitalist expansion in outer space is not benign, but a calculated decision that strengthens regulatory capitalism.

David **Levi-Faur** 20**05** ([Israeli political scientist and academic who specializes in comparative political economy and public policy, regulation and governance. He is currently affiliated with the Hebrew University of Jerusalem. He is the author of over 70 academic papers.] “Regulatory Capitalism”, <https://www.jstor.org/stable/pdf/j.ctt1q1crtm.26.pdf>) Ngong

Capitalism is understood in this perspective not simply as a system of commodity accumulation via markets, in which things with use values are converted into things that have exchange value. Instead, it is understood as a patchwork of institutions that constitute and govern the triplet of markets, society and state and the imaginary borders between them.

Shifts in commodity accumulation depend on redefinitions of property rights, the latest and most important of these being the evolution of intellectual property rights (property rights are constitutive regulation). Constraining and empowering regulation are ways in which capitalism stabilises and adapts to the consequences of its main mission of commodity accumulation—for example, limiting patent duration means that monopolies over medicines come to an end. However, this is not a restraint on commodification, but rather eliminates one type of commodification (the patent on the invention) while allowing other property rights (for example, a trademark over the medicine, the property in the tangible product) to continue.

The concept of regulatory capitalism builds on and extends the observations on the rise of a particular form of state—the regulatory state (Majone 1997; Levi-Faur 2014)—and social governance via rule making, rule monitoring and rule enforcement (Braithwaite 2000; Scott 2004). At the same time, it strives to do more—namely, to embed the notion of the regulatory state in the literature on the capitalist state (Offe 1984; Jessop 2002; Hay 1999) and the literature on the autonomy of the democratic state (Dryzek and Dunleavy 2009; Nordlinger 1987). While the regulatory state literature captures the extent, scope and direction in which regulation shapes national-level institutions, the concept of regulatory capitalism allows us to explore the relations between the state, on the one hand, and the capitalist order, on the other. When we say or write ‘regulatory capitalism’, we look beyond the state as a domestic political institution, and, at the same time, make a theoretical judgement about the relations between states and markets. This, in turn, helps advance a ‘constitutive interpretation’ of the role of regulation—a perspective that focuses on the role of regulation in the continuing expansion, adaptation and transformation of capitalism. In this interpretation, states constitute markets and markets constitute the state. The chicken starts with the egg and the markets with the state. Not only are the state and its regulation necessary conditions, they are also the causal factors behind the creation and institutionalisation of markets. Commodification via new regulatory designs that shape incentives and choice—rather than deregulation— is the major characteristic of our changing politics, economic and society.

Redistribution is increasingly determined in the regulatory arena and, thus, we should think about the welfare state and about redistribution as a system of regulatory rather than fiscal transfers (Levi-Faur 2014; Mabbett 2011; Leisering 2011; Haber 2011). The expansion of capitalist governance is primarily regulatory rather than simply and solely via fiscal means. This means that the expansion of the welfare state (and the state more generally) is best captured via measures of regulatory impact rather than via accounts of state budget.2

Why regulatory capitalism? Why not work our way through the maze of social, political and economic changes with the help of perhaps more modest and more widespread concepts such as the state, capitalism or even the regulatory state? The concept of regulatory capitalism offers a broader and more rewarding understanding of what is going on around us—certainly, more than the idea that the current order is about the ‘free market’ or that liberalisation, privatisation and deregulation are about the retreat of the state or depoliticisation. In addition, it has the advantage over the concepts of both the regulatory state and regulatory governance in the sense that it requires us to think not only about institutions in general but also about capitalist institutions in particular. In other words, it brings capitalism back in (Streeck 2011). One should remember in this context that capitalism is rarely analysed from a regulatory governance point of view. It is the elephant in the room of scholarly literature on regulatory governance as much as regulation is the elephant in the room in the literature of the political economy of capitalism. The concept of regulatory capitalism aims to move beyond the walls that separate the two bodies of literature and the two scholarly communities. This move should make both capitalism and regulation more central and more legible than they are now.

2. Regulation, the state and beyond

The regulatory state is one morph of the capitalist state (Dryzek and Dunleavy 2009; Levi-Faur 2014). This means that one of its primary roles—perhaps secondary only to internal and external security— is to nurture a process of capitalist accumulation and commodification via various regulatory means, but most critically via regulation for competition (Offe 1984; Levi-Faur 1998). Note that both internal security (policing) and external security (military might) depend on plenty. Therefore, the economic logic of capitalism and the security logic of the state go hand-in-hand—that is, power and plenty are interdependent (see Katzenstein 1977). The state depends on a process of accumulation, which, in turn, depends on its power and capacity to nurture the process of commodification, nowadays mainly by active promotion of competition and ‘competitiveness’. To fulfil its role as guardian of the capitalist economy, the regulatory state has to be relatively autonomous. The resilience of the capitalist system itself, especially in times of rapid change, depends on this systemic autonomy, where the process of capitalist accumulation sets the limits on autonomy. The state has to protect the functioning of the capitalist system and even nurture it. In this sense, it is not fully autonomous but only partially so.

These limits on the autonomy of the state are sometimes taken for granted by analysts who focus on the interpersonal and intersocial interdependencies between the state’s elected and nominated officials and business. The literature on the relative autonomy of the state contrasts these two dimensions of relative autonomy in conflicting terms as if one is more important than the other. In my account, these are two important dimensions of the relative autonomy of the regulatory capitalist state. Still, the interdependent relations between the state’s elected and nominated officials, on the one hand, and the capitalists, on the other, are a secondary feature of a more systemic dependency of the state on the process of capitalist accumulation. When conflicts occur between the demands of capitalists (for example, subsidies or favourable regulations) and the demands of capitalism (for example, competition or creative destruction and economic transformation), autonomous state officials are expected to favour capitalism over the interests of the capitalist class. The autonomy of the state and its officials is nonetheless relative, since the requirements of capitalism will prevail over other demands and needs.

The autonomy of the regulatory state is expressed in its claim for a legitimate monopoly over the deployment and distribution of power through rule making, rule monitoring and rule enforcement. It is this claim of monopoly—which may be delegated or shared, practised or not, at will or under constraint—that matters. In this way, the regulatory state is distinguished from the police and warfare states that are defined by their claim of a legitimate monopoly on the means of violence; and from the welfare state, which is defined by its aim of welfare for all citizens. Of  course, the claim of a monopoly does not suggest actual monopoly either now or in the past. A claim is just a claim, no more and no less, and there are gaps with regard to the actual monopoly over the regulatory distributional authority just as there are gaps with regard to the actual monopoly of the means of violence.

While it is tempting to focus the discussion on the regulatory state, it should be recognised that regulatory globalisation, on the one hand, and domestic centres of regulatory powers, on the other, augment and compete with the regulatory state (Braithwaite and Drahos 2000). Here,  the concept of regulatory capitalism is useful as well. It  suggests that regulation and rule making are major instruments in the expansion of global governance, and takes regulation theory and regulatory analysis beyond national boundaries (hence, also beyond the nation-state). The locus of the analysis is simply shifted from the state to capitalism and the perspective is expanded—up, down and to the side(s)—to envelop not only the capitalist state but also the capitalist society (or  market society) and the capitalist economy (or simply the economy). The agents of objects of regulation are not merely state actors anymore, and the regulatory space is extended beyond national borders and traditional administrative law. The concept also moves regulatory analysis beyond formal state-centred rule making and therefore towards civil and business regulation and decentred analysis of regulatory systems (see Levi-Faur 2011a). It also denotes a world where regulation is increasingly a hybrid of different systems of control, where statist regulation coevolves with civil regulation, national regulation expands with international and global regulation, private regulation coevolves and expands with public regulation, business regulation coevolves with social regulation, voluntary regulations expand with coercive ones and the market itself is used or mobilised as a regulatory mechanism.

3. Regulation of/for/and/with commodification

As noted at the beginning of this chapter, governance in capitalist polities is increasingly designed as a regulatory system—that is, as a patchwork of  regulatory institutions, strategies and functions. One  of the most useful ways to understand the relations of regulation and capitalism is via the concept of commodification. Commodification is increasingly taking over key concepts such as accumulation, exploitation and alienation in the lexicon of critical theory.

Commodification was first systematically introduced into the social sciences by Claus Offe in the 1970s (Offe 1984). Inspired by both Marx and Polanyi (1944), Offe’s work uses commodification to refer to processes of the transformation of non-wage labourers into wage labourers. In a more general manner, it refers to the transformation of social relations to commodity relations. The term suggests its meaning is being extended from the properties or characteristics of labour to a set of human relations, which encompasses all human relations without regard to their class or status. Thus, commodification specifies the conditions under which every citizen becomes a participant in commodity relationships (Offe 1984). Offe goes on to discuss—indeed, develop— two more concepts: decommodification and recommodification. Decommodification is ‘the withdrawal and uncoupling of an increasing number of social areas and social groups (surplus labor power) from market relations’ (Offe  1984:  61). Recommodification is the administrative and political reform of human commodification processes where they become obsolete (Offe 1984: 124).

True to critical tradition in the social sciences, the current literature on commodification emphasises the commodification of labour and, more recently, that of nature itself. Implicit in this critical approach is the idea that capital and investment are natural commodities or at least that some institutions, subjects and objects are less ‘fictitious commodities’ than others. At the same time, this tradition has a tendency to assume away or limit the analysis to the commodification of everything but capital. I contend, however, that ‘capital’ and ‘accumulation’ processes are not inherently ‘commodities’. There is no reason to assume that capital keeps a dynamic form and investment and innovation logically follow from the profit motive. The role of regulatory organisations in promoting the commodification of capital itself is critical. Forms of capital failure and stagnation of investment are abundantly captured by concepts such as rentier capitalism, crony capitalism and monopoly capitalism. Rentier capitalism is a term that denotes profits and investment that are generated by the privileged position of having capital without contestation of position, rights and gains (as is also the case with the terms monopoly capitalism and crony capitalism). De/re/commodification should be conceived as institutional strategies that are directed at capital as much as they are at labour, meaning they ought to be adopted in the context of domestic developmental aims as well as in the context of international economic competition. The design of regulatory regimes in general and the regulatory state in particular should allow public actors, inside and outside the state, to opt for commodification, decommodification and recommodification strategies according to autonomous preferences.

A key element in the theory of regulatory capitalism depends on the relations between regulation and commodification. To fully grasp these relations, we need to make some conceptual distinctions between strategies and types of regulation. Regulation is a form of bureaucratic legalisation (Levi-Faur 2011a). As such, and not unlike commodification, it has two conceptualisation siblings: deregulation and reregulation. Deregulation became the favoured strategy for economic and political renewal by neoliberals in the United States. It often conveys the idea that regulation is a major problem and that deregulation—that is, the removal and elimination of regulation—is the solution. Reregulation, on the other hand, suggests that the content, instruments and outcomes of many of the reforms that were put in place in the name of deregulation reflect a new mixture and balance between the political, the economic and the social—that is, new types of regulation rather than simply deregulation.

It is useful to distinguish between three types of regulation: constraining, empowering and constitutive. Regulation as a constraint is probably the most intuitive and frequent way in which we think of it. Regulation as a set of prescriptive rules specifies prohibitions and mandates behaviour. It is expected that failure to comply will be followed by punishment as a deterrent or will incur a social and political extraction of payment by the rule maker. Yet, regulation is sometimes, and in important ways, also about empowerment or the allocation of rights. Regulation may empower and thus acquire positive associations with values such as liberty and freedom, rather than the negative association with constraints. Yet, constraining someone is often empowering others and vice versa. Boundaries are blurred and can be distinguished with reference to primary and secondary effects. This is also true for constitutive regulation that constitutes categories of action, entitlements, identity and normative behaviour. Some regulations do not merely regulate but also create or define new forms of behaviour, rights and identity. This is, indeed, the basis of Kant’s distinction between regulative and constitutive rules. The regulative rules overlap in constraining and empowering regulation.

What is interesting is the notion of the constitutive rules as developed by Searle. Let me start with a borrowed example before defining the constitutive type of rules. The rules of chess, Searle tells us:

do not merely regulate an antecedently existing activity called playing chess; they, as it were, create the possibility of or define that activity. The  activity of playing chess is constituted by action in accordance with these rules. Chess has no existence apart from these rules. (Searle 1964: 55)

While regulative rules regulate activities whose existence is independent of the rule, constitutive regulation constitutes forms of activity whose existence is logically dependent on the rules. Rules of polite table behaviour regulate eating, Searle further suggests, but eating exists independently of these rules and therefore the regulation of eating should be considered regulative rather than constitutive.

The distinctions between different types of regulation allow us in turn to distinguish between regulation of capitalism and regulation for capitalism. The first reflects the common understanding of regulation as inherently different and exogenous to capitalism. Regulation here is either an external constraint or an external empowerment—in other words, the first two types of regulation described above. The term ‘regulation for capitalism’ refers to a more endogenous understanding where regulation is a constitutive element of capitalism. As in chess, here, capitalism and its rules are inseparable. So far, I have distinguished between three of the manifestations of regulation and decommodification: de/re/regulation and de/re/commodification. I have also distinguished between regulation of and for capitalism and between three types of regulation: constraining, empowering and constitutive. It is now time to link them together. Table 17.1 brings capitalism and regulation together but distinguishes between them via the notions of de/re/commodification. Note that the distinctions made in Table 17.1 are much harder to draw clearly in reality and require detailed case analysis. For example, limiting patent duration means that monopolies over medicines come to an end. One can treat this action as decommodification. However, this is not a restraint on commodification but rather eliminates one type of commodification (the patent on the invention) while allowing other property rights (the trademark, the property in the tangible product) to continue. Thus, it  is better to understand this action as recommodification. Still, the action itself should also be understood with reference to the larger context of the economic value of the trademark. If the trademark is protected strongly and widely, the balance tends towards recommodification, but, if it is not, the balance tends towards decommodification.

The notion of regulation of capitalism captures regulation as a reactive response that sets ex-ante rules and institutions that either constrain or empower actors. These rules basically accommodate and moderate the negative and positive externalities and internalities of capitalism. Both constraining and empowering regulation fall within the category of regulation of capitalism. Constitutive regulations, by contrast, are part of a second category, regulation for capitalism, where regulation serves not just as a moderating affect, but also as the set of constitutional rules of capitalist institutions and as a facilitative force—framing, nurturing and steering capitalism. When this happens, the disciplinary and allocative functions of regulation are secondary to its constitutive functions. The constitutive approach to the regulation of capitalism requires rules whose constitutive effects are the building blocks of capitalist institutions. The intersection between these different dimensions allows us to point to nine different ways in which regulation and capitalism are linked and, in effect, to demonstrate how variegated order is made possible. These links provide much more room for regulation than the analytical ‘market failure’ approach because there is room for ‘empowering regulation’ and for applying it in a constitutive manner.

The emphasis here on the many faces of regulation helps us to understand not only the variegated nature of the current order but also that regulation is both a progressive policy instrument (for example, empowering minorities) and a regressive policy instrument (for example, various forms of conditionalities and caps that aim to discipline the poor). Change in capitalism is strongly linked to the progressive and regressive uses of both regulation and commodification. The term itself should be seen—much like the notion of the regulatory state—as a constitutive element of other morphs of capitalism rather than as a competing morph. It is possible to use regulatory institutions—state, civil and economic—to extend the other institutional morphs of capitalism such as the developmental, the welfare, the financial and the risk; such extension and expansion do not necessarily represent trade-offs but may represent trade-ins. This applies not only at the level of the so-called tensions between equality and efficiency, growth and welfare and development and regulation. It also holds with regard to the relations between global and regional regulation and can expand where there is a good infrastructure of regulation via the state. This also is the case with private and public regulation—which can expand in tandem to enhance the effectiveness of regulation or simply to enhance the legitimacy and powers of the regulators and regulatory institutions. Because regulation entails the delegation of power and has distributive implications, the expansion of regulation to global and private realms can also simply represent a system of checks and balances by which the reproduction of regulatory controls allows a wider number of actors and institutions to keep some control over processes of rule making, monitoring, enforcement and interpretation.

#### Capitalism causes environmental extinction---depletion and waste crisis outpace technological gains.

Tony Smith 2021 ([Professor emeritus of philosophy at Iowa State University], "The Deadly Metabolic Rift’, https://againstthecurrent.org/atc211/the-deadly-metabolic-rift/)

(1) There is indeed “an existential crisis in the human relation to the earth.” (1) Over the last 10,000 years planetary conditions fluctuated within relatively narrow and stable boundaries. The entire history of settled human civilizations has unfolded in this “Holocene” period of our planet’s life.

This period has now concluded. In a number of areas crucially important to humanity, these boundaries have been (or are about to be) transgressed: climate change, ocean acidification, stratospheric ozone depletion, nitrogen and phosphorus cycles, global freshwater use, changes in land use, biodiversity loss, atmospheric aerosol loading, and chemical pollution. (244)

Human activity is the main causal factor explaining this development, leading earth scientists to refer to the new period as the “Anthropocene.”

The authors of an important study cited by Foster and Clark warn that if the upper-range of projections of global warming were to occur it “would severely challenge the viability of contemporary human societies.”(1) When we recall how little has been done to prevent increased global warming, and how y-it is only one of the numerous planetary transformations imposing comparable risks on human societies, talk of an “existential threat” is fully warranted.

(2) There is no “technological fix” for this existential crisis. The more intelligent representatives of capital do not deny that serious environmental challenges must be faced. For them, however, this is best done by working with capitalist markets and not against them.

A carbon tax on polluting firms would give companies a strong market incentive to lower their costs by using technologies requiring fewer carbon emissions. Having to purchase rights to release carbon into the atmosphere in carbon markets would supposedly have the same effect, in their view.

There are also calls for the state to support firms undertaking massive geoengineering projects, such as sending aerosols into the upper atmosphere to reflect away the sun’s rays before they increase the planet’s surface temperature. Another proposal is to install technologies capable of extracting and sequestering significant amounts of carbon from the atmosphere.

As Foster and Clark remind us, technological change in capitalism tends to develop “greener” technologies without any special spur. Over the course of the industrial revolution, for example, each succeeding generation of steam engines became “greener” over time, burning less coal per unit of output than the one before. The total amount of coal burned in England increased nonetheless. (245)

This “Jevons paradox” (named after the British political economist who first brought it to attention) is easily explained: the increase in the number of units produced overwhelmed the reduction of coal use per unit, leading to more coal being burned overall.

Is there any reason to think that introducing technologies “greener” than those employed today won’t have a similarly paradoxical result? Investors in the stock market, whose pricing of oil companies’ stocks assumes that the last drop of oil in the ground will be profitably extracted, do not seem to think so. (243-4)

Engineering Disaster

Regarding geoengineering projects, Foster and Clark repeat the warning of many scientists that such unprecedented technological experiments would almost surely have pernicious consequences as harmful as the harms they are supposed to alleviate. (278)

Further, their massive scale would leave few resources for other social needs. An infrastructure capable of handling annual throughput 70 percent larger than that handled currently by the global crude oil industry would be required, along with ridiculous quantities of water — 130 billion tons annually just to capture and store U.S. emissions. (280)

Far from being a step towards socialism (as some techno-utopians of the left hold), government funded geoengineering would simply solidify an environmental industrial complex alongside the military industrial complex, the pharmaceutical industrial complex, and other complexes of big capital. (281-2)

Finally, once again, climate change is only one way in which present environmental trends will soon “severely challenge the viability of contemporary human societies.” In all the other cases too the sorts of technologies that have been developed, and the ways they have been used, have been part of the story of how we got to the present “existential crisis.”

Unless we figure out why that has been the case and eliminate that reason, to think we will be saved by technologies is to indulge in fantasy.

(3) Capitalism is the fundamental cause of the existential crisis in the relation between humans and the earth. All living beings appropriate resources from their environment and all generate wastes back into their surroundings. For a species to successfully occupy an environmental niche, the rate at which it depletes resources from its ecosystem must correspond to the rate they are replenished, and the rate it generates wastes must be aligned with the rate wastes can be processed.

When the social forms of capitalism are in place, neither condition is met, creating the metabolic rift between human society and its environment.

Capitalist market societies are distinguished from other societies in that products generally take the form of commodities sold for a profit. Any capitalist producers who do not attempt to make as much profit as possible, as fast as possible, will find themselves losing market share to those who do, if not forced out of existence altogether.

Making as much profit as possible, as fast as possible, generally means producing and selling as many commodities as possible, as fast as possible. This accelerated temporality is in tension with the temporality of our environment; resources tend to be depleted at a faster rate than they can be replenished, and wastes generated at a faster rate than they can be processed.

From this standpoint the “Jevons Para­dox” is less a paradox than a general description of how capitalism works. Any environmental benefits from technologies using fewer natural resources or generating fewer wastes per unit of production necessarily tends to be overwhelmed by the increase in the number of commodities produced in response to the “Grow or die!” imperative so ruthlessly imposed by the demands of capital accumulation.

#### Vote neg for eco-anarchism

Ted **Trainer** 2-26-20**21** ([Australian academic, author, and an advocate of economic degrowth, simple living, and 'conserver' lifestyles], “The answer is not Eco-Socialism … It is Eco-Anarchism”, https://thesolutionsjournal.com/2021/02/26/the-answer-is-not-eco-socialism-it-is-eco-anarchism-2/)

Hence a major tactical principle now would seem to be, do not confront capitalism. It is understandable that when faced by an oppressive system it might seem necessary to turn towards it and fight it strenuously. There are situations in which this would clearly seem to be the appropriate response and most if not all previous liberation movements and revolutions have probably been of this kind. However again it can be argued that in the historically unique situation the limits are imposing on us the appropriate strategy is not confrontational but involves turning away and “ignoring capitalism to death.” Consumer-capitalist society cannot survive if people do not continue to purchase, consume and throw away at an accelerating rate. The Simpler Way strategy (in the present early **Stage 1** of the revolution) is to gradually build the alternative practices and systems which will enable more and more people to move out of the mainstream, to shun consumer society, and to secure more of their material and social needs from the alternative systems and sources emerging within their neighbourhoods and towns. Central in this is the more or less spontaneous and automatic development of local Needs-Driven-Economies beside the old Profit-Driven-Economy. People will come across to The Simpler Way because as the ecological and economic crises intensify and seriously disrupt supply to their supermarkets they will increasingly realise that the old system is not going to provide for them and that the simpler local way is their best, indeed their only, option. One of Marx’s most important insights was that the fundamental contradictions built into capitalism drive it towards self-destruction. The hope must be for a slow Goldilocks depression, not so savage as to rule out any chance of reconstruction but sufficient to jolt people into the realisation that the consumer-capitalist way has to be abandoned. The Socialist is strongly inclined to dismiss this approach focused on building alternatives within the old system as naïve, on the grounds that the rich and powerful do not willingly relinquish their dominant position. Yet this “turning away” strategy is now widespread, for instance among the large scale Andean peasant movements, most notably the Zapatistas and the Via Campesino.6 78 910 1112 13 14, Dafermos on the Catalan Integral Cooperative15 and Shilton on Rojava.16 It is also growing in the richest countries, evident in **the Transition Towns, Eco-village, Localisation, Municpalism** and other alternative movements. Thus trying to get rid of capitalism is not where energy should be focused at present…because it is in the process of getting rid of itself. Far more important is beginning to get its replacement going. What is to be done?…Pre-figure. The Simpler Way answer is the Anarchist notion of “Pre-figuring”, i.e., do what we can to build post-revolutionary ways here and now within the existing consumer-capitalist society.17 18 19 20 21 The point of Pre-figuring can easily be misunderstood. Socialists readily take it to be based on the assumption that the new and good society can be created just by starting to build elements of it here and now, and continuing to do so until the old society has been replaced. But Simpler Way transition theory does not assume this. The point is educational, that is, Pre-figuring is seen as probably the most effective awareness raising activity. As has been explained, this revolution cannot progress unless the new ideas and values come to be predominant, and therefore the crucial task is to work at getting them understood, appreciated and adopted. This can involve a variety of initiatives but few if any are likely to be more effective than the establishment of examples of the required alternatives within existing towns and suburbs. Possibly the most important project in this domain is the development of the local Needs-Driven-Economy. This is the powerful mechanism that will grow in scope as the old Profit-Driven-Economy increasingly fails to provide. A merit of the Pre-figuring approach is that it minimizes overt conflict let alone violence. It holds open the possibility that alternatives can gradually and quietly gain in strength towards the point where new ideas and values undermine the legitimacy of old ways and structures, which then might more or less crumble. Community gardens and town meetings and Needs Driven Economies are small, largely invisible, peaceful, under the radar and difficult to eradicate. There is another very important point on which the contrast between Socialist and Anarchist strategy is marked. Socialists cannot provide experience of aspects or benefits of the intended society until well after the revolution, let alone use this to attract people to the cause. The Socialist’s effort to motivate people is largely negative, confined to stirring up discontent with present conditions and promising little more than struggle, at least until the revolution succeeds. But Pre-figuring can provide positive and inspirational experience of aspects of the alternative. **Stage 2** of the revolution. The development of a local economy cannot get far without relatively few but crucial inputs from the national economy, such as light steel, irrigation poly-pipe, cement, and chicken pen wire. This will generate pressure on states and national economies to move towards revolutionary macroscopic change. The towns will increasingly demand that the priorities of the centre be shifted to focus on providing the towns and regions with those relatively few inputs their survival depends on. In time this pressure is likely to shift from submitting requests to the state to making demands on it, and then to taking increasing control of it. There will be increasing insistence that frivolous industries must be phased out so that scarce resources can be devoted to meeting fundamental town and regional needs. Meanwhile towns will be driven by necessity to bypass the centre and take initiatives such as setting up their own farms, energy supplies and manufacturing, thus transferring various functions out of the control of the centre. It will be increasingly recognized that the local is the only level where the right decisions for self-sufficient communities can be made. If all goes well these shifts will in time lead to the transfer of functions and power from state-level agencies to the local level, leaving the centre with relatively few tasks, and mainly with the role of facilitating local systems. This radical restructuring could conceivably be a smooth and peaceful process, driven by a general recognition that scarcity is making local self-governing communities the only viable option and that the national economy has to be greatly reduced and focused on helping the towns to thrive. If this happens then in effect Stage 1 will be recognised as having constituted the revolution, essentially a cultural phenomenon, and the macroscopic structural changes in Stage 2 will be seen as consequences of the revolution. Those arrangements that must be organised beyond the town level can best be dealt with via the essential Anarchist principal of “federation”. This involves communities with a stake in a policy formation, such as for management of the river valley they all share, discussing options and sending delegates to conferences which work out what the best ones seem to be. These possibilities are then taken back down to all the towns for further consideration and eventually agreement in participatory assemblies. If complications are seen further conferences are held, until a mutually beneficial solution is found. There would still be a need for considerable bureaucracy at the centre, e.g., to work out what train timetables seem preferable across large regions, but it would be misleading to refer to this as constituting a “state” as the term usually implies authoritarian power. Similarly Anarchist organization would draw on high level technical expertise in formulating options, but again it would not give higher authorities power to impose what they thought was best. Conclusion It will be evident that the alternative social organisation sketched in Part 1 and above is a fairly straight forward Anarchist vision, and that the means for achieving it are also Anarchist. (Obviously there are varieties of Anarchism that are not being advocated here.) Consider the components. Settlements enabling a high quality of life for all the world’s people despite very low resource use rates must involve all members in participatory deliberations regarding the design, development and running of their local productive, political and social systems. Their ethos must be non-hierarchical, cooperative and collectivist, seeking to avoid all forms of domination and to prioritise the public good. They must draw on the voluntary good will and energy of conscientious citizens who are eager to cooperate an contribute generously and to identify and deal with problems informally and spontaneously, and to focus on seeking mutually beneficial arrangements with little if any need for industrial infrastructures, transport networks, bureaucracy, paid officials or politicians. Regional and wider issues would be tackled by the characteristic Anarchist mechanisms of federations and (powerless) delegates bringing recommendations back down to town meetings. The principle of “subsidiarity” is evident in the practice of grass roots politics, the avoidance of hierarchies, and the central role of town assemblies. The very low resource costs that are essential for sustainability are achievable because of the proximity, diversity of functions and integration, the familiarity enabling informal communication and spontaneous action, and the elimination of much industry, transport and bureaucracy etc. Eco-villages typically operate according to such Anarchist principles, achieving high levels of sustainability and quality of life. The foregoing analysis involves to two important and previously unrecognized extensions of Anarchism. In the past it has been seen as primarily concerned with social and political issues. Little if any attention has been given to its significance for thinking about desirable economic arrangements. The argument has been that when the seriousness of the global predicament is understood, inescapable implications for radically new economic arrangements are seen. The basic economic form must be small scale, zero growth, largely collectivist and under participatory social control. Perhaps of even greater importance is the previously unrecognized ecological significance of Anarchism. An ecologically sustainable and just world cannot be achieved unless ways are found of living well on dramatically reduced per capita resource use rates, and the above argument has been that these ways must follow Anarchist values and practices.

#### Examining structures comes first—we should use unique formative spaces like debate to reject reformism and cultivate anti-capitalist pedagogies to break the cycle of error replication

Giroux 16 — Henry A. Giroux, McMaster University Chair for Scholarship in the Public Interest @ McMaster University, Ph.D. from Carnegie-Mellon, former professor of education at Boston University, professor of education and renowned scholar in residence at Miami University in Oxford, Ohio, Waterbury Chair Professorship at Penn State University (“Writing the Public Good Back into Education: Reclaiming the Role of the Public Intellectual,” Ch 1, pg 3-28, <http://link.springer.com/chapter/10.1007%2F978-1-137-58162-4_1>, Accessed 9/14/17)

Conclusion

In conclusion, I want to return to my early reference to the global struggles being waged by many young people. I believe that while it has become more difficult to imagine a democratic future, we have entered a period in which poor minority youth, students, and other disenfranchised young people all over the world are protesting against a range of policies imposed under regimes of neoliberalism, extending from state terrorism and the abolishing of civil liberties to the destruction of the planet and a range of punishing austerity measures. Police violence in Ferguson and Baltimore has mobilized a range of groups that view such violence as endemic to the system and far from simply the consequence of a few bad apples. In Greece, Spain, and Italy social movements are gaining momentum fighting against the defunding or elimination of social services and the ongoing privatization of public goods. In Chile, the United States, Canada, and England students are taking a stand against the neoliberal war against higher education. Refusing to remain voiceless and powerless in determining their future, these young people are organizing collectively in order to create the conditions for societies that refuse to view politics as an act of war and markets as the measure of democracy. And while such struggles are full of contradictions and setbacks, they have opened up a new conversation about politics, poverty, inequality, class warfare, and ecological devastation.

These ongoing protests make clear that this is not—indeed, cannot be— only a short-term project for reform, but a political movement that needs to intensify, accompanied by the reclaiming of public spaces, the progressive use of digital technologies, the development of public spheres, the production of new modes of education, and the safeguarding of places where democratic expression, new identities, and collective hope can be nurtured and mobilized. A formative culture must be put in place pedagogically and institutionally in a variety of spheres extending from churches and public and higher education to all those cultural apparatuses engaged in the production and circulation of knowledge, desire, identities, and values. Clearly, such efforts need to address the language of democratic revolution rather than the seductive incremental adjustments of liberal reform.

This suggests pedagogies of resistance and disruption that promote policies that insure a living wage; jobs programs, especially for the young; the democratization of power; economic equality; and a massive shift in funds away from the machinery of war and big banks but also new alliances and a social movement that both engages in critique and makes hope a real possibility by organizing for the creation of a radical democracy along with the institutions, social relations, and modes of justice that support it. We need collective narratives that inform concrete struggles. In this instance, public intellectuals can play a crucial role in providing theoretical resources and modes of analyses that can help to shape such narratives along with broader social movements and collective struggles.

Academics, artists, journalists, and other cultural workers can help put into place the formative cultures, necessary to further such efforts through the production and circulation of the knowledge, values, identities, and social relations crucial for such struggles to succeed. Writing in 1920, H. G. Wells insisted that “History is becoming more and more a race between education and catastrophe.”61 I think Wells got it right but what needs to be acknowledged is that there is more at stake here than the deep responsibilities of academics to defend academic freedom, the tenure system, and faculty autonomy, however important. The real issues lie elsewhere and speak to preserving the public character of higher education and recognizing that defending it as a public sphere is essential to the very existence of critical thinking, dissent, dialogue, engaged scholarship, and democracy itself. Universities should be subversive in a healthy society; they should push against the grain, and give voice to the voiceless, the unmentionable, and the whispers of truth that haunt the apostles of unchecked power and wealth. These may be dark times, as Hannah Arendt once warned, but they don’t have to be, and that raises serious questions about what educators are going to do within the current historical climate to make sure that they do not succumb to the authoritarian forces circling the university, waiting for the resistance to stop and for the lights to go out. Resistance is no longer an option, it is a necessity. Academics in their role as public intellectuals can exercise a formidable influence both in and outside of public schools, colleges, and universities in raising critical questions, connecting critical modes of education to social change, and making clear that the banner of critical independence and civic engagement, “ragged and torn though it may be, is still worth fighting for.”62

### 3

#### CP: Private entities ought not appropriate lunar mining sites, except for the appropriation of lunar mining sites in the Sea of Tranquility by helium-3 mining. States ought to clarify that the lunar mining of helium-3 is permissible under the Outer Space Treaty.

#### Site classification uncertainty kills investment in He-3 mining.

Bilder 09 “A Legal Regime for the Mining of Helium-3 on the Moon: U.S. Policy Options” Richard B. Bilder [Foley & Lardner-Bascom Emeritus Professor of Law, University of Wisconsin Law School.] 10/8/2009 <https://media.law.wisc.edu/m/wndnj/bilder1489273mining_helium-3ftns.pdf> SM

B. Should the U.S. Attempt to Establish an International Lunar Resource Regime Outside of the Framework of the Present Moon Agreement? While I have suggested that there are now good arguments for the U.S. – preferably, collectively with other space powers – to ratify and accede to the Moon Agreement under arrangements which would ensure that the legal regime established pursuant to Article 11 fully met U.S. requirements, the fact remains that such ratification by the U.S. may not currently be politically attainable. As was the case when the Agreement was first presented to the Senate subcommittee in 1980, influential and respected individuals and groups in the U.S. continue to strongly oppose U.S. ratification, remaining convinced that the Agreement’s fundamental cast – especially, its provisions characterizing lunar resources as the “common heritage of mankind” and mandating the establishment of an “international regime” – will in practice inhibit the productive development and exploitation of He-3 and other lunar resources, and, in particular, create such uncertainty for private enterprise as to effectively discourage, if not prevent, private investment and industry from playing any meaningful role in the exploitation of such resources – a role they believe essential to the successful commercial development of such resources.61 It may be argued that, given the risks and uncertainty necessarily involved in the development of lunar He-3-based fusion energy, the enormous investment certainly required, and the likely very long time horizon before any financial return can hope to be achieved, the prospect of private enterprises choosing to play a leading role in He-3 or other lunar resource development – at least without substantial government assistance – is open to question.62 However, the 1980 Senate Hearings and subsequent lack of administration interest in the Agreement suggest that, if such opposition persists, the prospect for Senate ratification of the Agreement at any time soon may remain uncertain.

#### Especially since the most precise and formal delineation of heritage site borders is this blurry NASA screenshot

https://moon.nasa.gov/resources/53/lunar-heritage-sites/

Diagram

Description automatically generated

#### Mining on heritage sites lets us skip in the research project with human-obtained samples – that’s preferable to generic sites.

Glass 92 “Lunar Site Characterization and Mining” Charles E. Glass [registered professional geological engineer in the State of Arizona, this is from a NASA edited paper] 1992 <https://space.nss.org/settlement/nasa/spaceresvol3/lscam1.htm> SM

Before resources are committed to lunar mining, a significant amount of information will be needed. I hope that our workshop group will illuminate some of the more obscure areas, such as the specific requirements of an ore processing facility. Other important information can be acquired only through onsite exploration and testing.

Potential lunar mining sites can be divided into two general groups- generic sites and Apollo sites. Geologic data for both types of site are sparse and of poor spatial resolution

Generic sites have not been visited. They are potential mine sites only because they are in lunar regions with mineralogic properties that are generally understood by comparison of remotely sensed data with data from analysis of Apollo site samples; e.g., mare sites, highland sites, or transition sites. See figure 15. Generic sites will require exploration at a variety of scales.

Initial exploration using a satellite in lunar orbit will allow regional exploration of many generic sites. Polar sites, if suitable ones can be identified, have several advantages for a mining operation. First, the continuous solar radiation at the poles would enable continuous mining o perations under stable temperature and lighting conditions. (See figure 16.) Such an environment would eliminate the stress on mining equipment and personnel caused by the alternation of 2-week lunar nights and days at other sites. Second, the high thermal gradients encountered at the poles due to low Sun angles could help provide cryogenic storage for processing gases and product gases. Third, the potential occurrence of water frozen in the perpetually shadowed areas of the poles is an incentive for exploring polar sites.

Exploration of generic sites at intermediate scales is required to bridge the gap between the low- resolution remote sensing data and the more intensive measurements made by human beings. This intermediate-scale exploration could be done by automated rovers, which should be able to cover relatively large areas rather rapidly.

The automated nature of lunar exploration will demand advances in high-resolution sensing and in computer processing and integration of data acquired by different instruments on the same roving vehicle. Knowledge gained from terrestrial mineral exploration can be used for preliminary training of automated interpretation systems, but the unique conditions of the lunar environment will likely require an intelligent computer- vision system capable of "learning" and adjusting as new data become available.

[Images omitted]

Completion of these exploration programs should bring our knowledge of generic sites up to that of the Apollo sites, the second general category. Regional exploration is not deemed necessary for the Apollo sites because of the relatively extensive body of knowledge already assembled. However, detailed site investigations to obtain specific parameters for mine design will be required for the first mining attempt.

In outlining these exploration requirements, our workshop group made several assumptions. First, we assumed that the prototype lunar mining venture should be an unqualified success. Second, we assumed that the startup product would be liquid oxygen, with the subsequent addition of such byproducts as metals for structural use, ceramics, and bulk materials for shielding. Third, we assumed that the mining operation wou[a excavate lunar regolith and deliver a well-graded feedstock to the processing facility. (No crushing is required, with oversized material being removed mechanically.)

Specific Parameters for Mine Design

The final stage of the exploration program-to acquire specific parameters for mine design-will begin only after a chosen site has been as thoroughly explored as an Apollo site. Even for the Apollo sites, information is insufficient to assure the success of our first lunar mine. Factors that affect mining include mineralogy, grain size distribution, abrasiveness, depth of loosely compacted regolith, and surface topography. How these factors vary from place to place is not well understood. The Apollo missions were never intended to be resource appraisals. Nevertheless, a restudy of Apollo samples and survey data with an eye toward resource appraisal would be a promising first step toward obtaining the needed site detail.

#### Tranquility mining is key – it has the highest known density of He-3.

O’Reilly 16 LUNAR EXPLORATION FOR HE-3 Bryan O’Reilly The Ohio State University 2016 <https://core.ac.uk/download/pdf/159567253.pdf> SM

* Mare Tranquillitatis = science word for Sea of Tranquility

Schmitt (2006) summarized initial research on the exploration for lunar He-3 that identified potential areas of high He-3 concentration. Mare Tranquillitatis, for example, is considered a particularly attractive site for a manned lunar base and the mining of lunar He-3. This site also holds Fe, Ti, and other minerals important for cost-effective, on-site production of construction materials and O2 from mineralized oxygen. In siting a manned lunar base, water may be extracted atomically bound OH- and lunar ice, and other issues that need to be addressed in choosing a manned lunar base.

The present research study further tests the recommended locations (e.g. Mare Tranquillitatis) of high He-3 concentrations. In particular, the utility of satellite-based Gamma Ray Spectrometers (GRS) is investigated to indirectly map He-3 abundances in terms of the surficial abundances of gamma-radiating elements like titanium, oxygen and iron that reflect distributions of lunar ilmenite (e.g., Hasebe et al., 2008). In addition, satellite microwave measurements may be used to estimate regolith thickness, maturity, and dielectric constants to help map out He-3 concentrations and other lunar mineral deposits (Wang, 2010).

Satellite remote sensing data from past lunar missions are used to estimate TiO2 and hydrogen concentrations, and the solar wind flux over the crust to identify lunar He-3 prospects. These results may help constrain the fiscal and technological viability of mining lunar He-3.

Current uses of helium-3 far outpace its supply and production on Earth. This shortage is detrimental to areas ranging from national security to important physics and medical research. The growing decrease of He-3 stores also drastically limits efforts to make He-3-D fusion a realistic energy source. However, the growing demand may well be satisfied with the He-3 concentrations hosted within the regolith of our closest celestial neighbor, the Moon. Indeed, the mining of He-3 on the Moon is an imminent, if not the next, giant leap for space exploration (Schmitt, 2006).

Elements of this research were presented at the fall’15 Undergraduate Student Poster Forum and the spring’16 Denman Undergraduate Research Forum of The Ohio State University. Further aspects of this research were presented at the annual conferences of the Geologic Society of America (O’Reilly and von Frese, 2015) and NASA’s Lunar and Planetary Institute (O’Reilly and von Frese, 2016).

METHODS

National Aeronautics and Space Administration (NASA) data collection

The elemental abundance data for this research were collected from NASA’s publicly available Planetary Data System (PDS) Geoscience Node. Specifically, the data were observed by the Lunar Prospector (LP) mission’s gamma ray and neutron spectrometer tools and processed by the LP Spectrometer Team as part of a NASA Lunar Data Analysis Program. Elemental abundances of Ti were derived from LP gamma ray spectrometer (Feldman et al., 1999) observations acquired during the high-altitude portion of the LP mission. For the Ti distribution, the data are given in units of elemental weight percent (Prettyman et al., 2002). The half-degree hydrogen abundances came from the LP neutron spectrometer epithermal neutron data that had been corrected by the thermal neutron data (Feldman et al., 2001). Equations 3 and 4 of Feldman et al. (2001) show how the corrected epithermal data were converted into hydrogen abundances as parts per million (ppm). Note, however, that these abundances can be unreliable in regions of high thorium and rare-Earth element abundances (Maurice et al., 2004).

In general, using the above method yields an average ±1.7 wt% uncertainty in the TiO2 estimates (Elphic et al., 2002). Estimates from areas with higher levels of TiO2 are considered to be more reliable than those from lower TiO2 areas. Uncertainties in H estimates are typically less than 1% over latitudes ±70° and increase significantly towards the poles (Feldman et al., 2001). Estimates of H taken from large lunar craters in the South Pole showed uncertainties averaging around 50% (Feldman et al., 2001).

Modeling

The raw elemental abundance data were converted from the original ASCII files to Microsoft Excel through the “paste special” tool for import into MATLAB. Once imported, the data were processed by the scripts in Appendix A to produce various lunar abundance maps. The script in Figure A1 produces contour maps of the elemental data on the lunar near and far sides using the M\_Map MATLAB mapping package (Pawlowicz 2014). This script uses the sinusoidal map projection to produce equal-area representations of the abundance data.

The script in Figure A2 produces stereographic projections of abundances in the lunar polar regions. Equation 1 (Fa and Ya-Qiu, 2007) was used to estimate crustal exposure to solar wind flux as a percentage in terms of lunar longitude (θ) and latitude (Φ) in degrees, and the constant flux (F0) at a subsolar point. Here, f represents the amount of time the lunar surface is fully shielded from solar winds by Earth’s magnetotail in the span of 28 days (one orbital period). To produce the normalized solar wind flux, the model assumed F0 = 0.5, and f = 0.25 based on the amount of time the moon is in the magnetotail. Equation 1 was implemented by the MATLAB script in Figure A3 to produce a contour map (Figure 2) of the lunar near and far side exposures in percent of the maximum solar wind flux over a single lunar orbital period. These maps in the sinusoidal map projection were obtained using the previously cited M\_map mapping package.

𝟐 + 𝒔𝒊𝒏(𝜽 − 𝒇𝝅) − 𝒔𝒊𝒏(𝜽 + 𝒇𝝅), |𝜽| ≤ 𝝅(. 𝟓 − 𝒇) 1) 𝑭(𝜱,𝜽)=𝑭𝟎𝒄𝒐𝒔(𝜱)∗{𝟏+𝒔𝒊𝒏(|𝜽|−𝒇𝝅),𝝅(𝟎.𝟓−𝒇)≤|𝜽|≤𝝅(.𝟓+𝒇)

𝟐, 𝝅(. 𝟓 + 𝒇) ≤ |𝜽| ≤ 𝝅

RESULTS

Solar Flux

Figure 2 shows that the Moon’s orbit around Earth largely affects the intensity of solar exposure on its surface, with the near side receiving significantly lower exposure than the far side. This is due to Earth’s magnetosphere which, during a full Moon when the near side is facing the Sun, rests within Earth’s magnetotail shielded from solar radiation.

[Figure omitted] Figure 2. Solar flux as a percent of solar wind flux exposure per lunar cycle for the near (top) and far (bottom) sides of the lunar surface between 65°S - 65°N.

Titanium Distribution

The distribution of Ti correlates with large impact events (Schmitt, 2006), and thus the highest Ti concentrations are within the maria of the lunar near side (Figure 3). Mare Tranquillitatis, in particular, appears to have the highest overall concentration. On the moon, Ti occurs as the mineral ilmenite (FeTiO3) with the crystal structure that locks in the small He-3 atoms. The blank strip surrounding 180°E in Figure 3 reflects a no-data area due to lack of orbital coverage by the satellite (Feldman et al., 1999).

Diurnal Heating

Areas within ±60 ̊ latitudes experience large average daily temperature shifts. The Apollo 15 site (26.13224 N, 3.63400 E), for example, underwent a shift from 374 ̊K to 92 ̊K (Heiken et al., 1991). The areas around the poles typically stay within 10 ̊ of 115 ̊K with even smaller variations in permanently shadowed craters (Vasavada et al., 1999). Volatiles are essentially baked out of the regolith when subjected to these extreme temperature changes (Cocks, 2010).

Polar Migration

After volatiles are released from the lunar regolith, they are either redeposited on the lunar surface or released into space (Cocks 2010). Figure 4 shows the increase of hydrogen around the poles compared to lower longitudes. This measurable increase is attributed to permanently shadowed craters, which prevent massive temperature fluctuations and provide shielding from micrometeoroids. The blank strips surrounding 180°E in Figure 4 reflect areas with no data due to lack of orbital coverage by the satellite (Feldman et al., 1999).

Wt. %

AR = (5.6, 0) ASD = 0.8929 AM = 0.6560 CI = 0.5

[Figure omitted] Figure 3. Weight percent Ti distribution for the near (top) and far (bottom) sides of the lunar surface from 65°S - 65°N. Mare Tranquillitatis is highlighted (8.5°N, 31.4°E) as an area of high Ti. Map statistics include the amplitude range (AR) of (max, min) values, amplitude standard deviation (ASD), amplitude mean (AM), and contour interval (CI) in weight %.

AR = (169.01, 0.0215) ASD = 23.04

AM = 57.06

CI = 20

ppm

[Figure omitted] Figure 4. Volatile hydrogen concentrations in ppm for the lunar north pole (top left) from 90°N - 65°N, south pole (top right) from 90°S - 65°S, and the far side (bottom) from 90°W - 90°E and from 65°S - 65°N of the lunar surface. Map statistics include amplitude range (AR) of (max, min) values, amplitude standard deviation (ASD), amplitude mean (AM), and contour interval (CI) in ppm.

DISCUSSION

The data above contain implications for the search for large concentrations of He-3. The only method for deposition of He-3 is through exposure of the regolith to solar radiation carrying the isotope. Figure 5 shows the geometry of the Moon’s exposure to solar radiation over a single orbital period (28 days). Accordingly, most of this exposure occurs on the far side of the Moon when it is between the Sun and Earth outside the magnetosphere.

In general, the areas of high solar exposure are also subject to extreme diurnal

[Figure omitted] Figure 5. A 2-D geometric rendering of the relationship between the Sun (orange), Earth (large circle), and the moon (small circle) throughout a lunar orbital period. The moon is positioned outside the magnetosphere (green dashed line) during a new moon exposing the far side (light blue). The moon is positioned inside the protective magnetotail (red dashed line) during a full moon preventing exposure of the near side (dark blue).

temperature fluctuations. During the lunar orbital period, these drastic temperature changes will occur due to the prolonged exposure or protection from solar radiation causing the deposited volatiles to leave the regolith and possibly be re-ionized and –deposited onto the lunar surface (Cocks, 2010). This implies that many of the volatiles initially deposited by solar wind exposure do not remain stably in place. The distribution of hydrogen measured in Figure 4 suggests that the volatiles in general may be concentrated around the poles.

Much like hydrogen, He-3 is also deposited in the regolith through solar wind. However, exposing these elements to extreme temperature shifts causes them to vaporize and leave the lunar surface. Some of these volatiles are re-ionized due to subsequent solar wind exposure and possibly deposited again near the poles where they are better protected from temperature changes (Cocks, 2010). This mechanism could help explain the larger polar accumulations of volatiles.

The lunar polar regions offer protection from extreme temperature variations, which also may be provided by the presence of permanently shadowed craters. These craters not only protect volatiles from vaporizing out of the regolith, but they also shield the regolith from micrometeorite impacts that disturb the surface encouraging the further release of volatiles. These polar regions are estimated by the Lunar Prospector team (Schmitt, 2000) to contain roughly 5 to 15 times more hydrogen. Figure 6 shows an example of the permanently shadowed Shackleton crater.

[Figure omitted] Figure 6. The Shackleton crater located near the South Pole, where the colors indicate the percentage of time illuminated during a single lunar orbital period. The rim of the crater contains zero (white) and near zero illumination values which identify it as a permanently shadowed crater (Zuber et al., 2012).

Another important aspect to consider is the relationship between titanium (Ti) and He-3. The majority of Ti on the Moon appears in the form of ilmenite (FeTiO3). Tests done on lunar ilmenite, olivine, pyroxene, and plagioclase show that for grains in the same size range from the same soil, ilmenite (FeTiO3) contains 10 to 100 more times as much He-3 (Fa and Ya-Qiu, 2007). The structure of ilmenite, seen in Figure 7, is better able to hold onto the small He-3 ions when subjected to extreme conditions. This suggests that He-3 is more protected from the effects of massive temperature shifts than other volatiles when high concentrations of Ti are present. Figure 3 shows that most of the Ti on the Moon appears in the large impact craters of the nearside.

[Figure omitted] Figure 7. The crystal structure of Ilmenite. The alternating layers of Fe and Ti along with the rhombohedral shape shown above allow for tighter confinement of loose He-3 ions (Ribeiro and Lazaro, 2014).

With all of these factors considered, two areas of particular interest are suggested for holding large concentrations of He-3. They include Mare Tranquillitatis (8.5 ̊N 31.4 ̊E) that has the highest concentration of Ti on the lunar surface, and thus also possible large He-3 stores. The second area of interest is the South Pole Aitken basin with large permanently shadowed craters that enhance its ability to hold volatiles like He-3 through diurnal heating shifts over the lunar orbital period. These permanently shadowed craters would protect the volatiles from temperature shifts and the regolith from being disturbed by micrometeorite impacts.

CONCLUSIONS

Lunar resource development is an extensive and expensive effort, however, this study seeks to introduce the need to explore for these resources. This study examined the shortage of available He-3 and the affected industries. Hopes in the distant future for clean fusion energy also rest on access to this valuable resource. As U.S. stockpiles diminish and demand continues, the economic incentive for the acquisition of He-3 deposits on the moon becomes an increasingly attractive option.

The objective of this study was to use available satellite data to estimate possible locations of large lunar He-3 deposits. From the analysis of NASA’s satellite gamma ray data, two areas were targeted for possibly holding large concentrations of He-3. Specifically, Mare Tranquillitatis was identified as holding enhanced ilmenite concentrations and other elements that would be essential in any mining mission. The South Pole Aitken basin was also targeted due to its large permanently shadowed areas that enhance its ability to hold volatiles and prevent their migration due to diurnal heating. In general, these results are also consistent with previous lunar site recommendations for locating large He-3 concentrations (e.g. Schmitt, 2006).

#### Only mining at Tranquility sites is economically feasible and profitable – it’s the only location with enough data to be categorized as a measured resource.

Schmidt 06 “Return to the Moon exploration, enterprise, and energy in the human settlement of space” Harrison Schmidt [an American geologist, retired NASA astronaut, university professor, former U.S. senator from New Mexico, and the most recent person living, and only civilian to have walked on the Moon. Schmitt is the last surviving crew member of Apollo 17] <https://www.amazon.com/Return-Moon-Exploration-Enterprise-Settlement/dp/0387242856> SM

Economic geologists — who study the value, quantity, and origin of mineral deposits — use the terms "measured," "indicated," and "inferred" to distinguish resources that are at decreasing levels of certainty in terms of available tonnage at a specified value (see Figure 6.4).87 Exploration, drilling, and sample analysis, or other direct means, have delineated "measured reserves" to the extent that further investments of capital for actual production are warranted. Of course, such investments only will be made if the value and tonnage, or volume, make economic sense in the time frame that the resource can be sold in a forecasted market. "Indicated resources" have enough geological definition to be included in long-term mine planning but will require additional investment in quantitative exploration before they can become defined as measured resources ready for production. "Inferred resources" are based on geological inference but are too speculative to be included in planning until further exploration takes place.

The current economic and geological position of lunar helium-3 in the titanium-rich portions of Mare Tranquillitatis is shown in Figure 6.4. Relative to the figure, upward, positive economic change in lunar helium-3 will be determined by increases in the cost of alternative sources of terrestrial energy, particularly coal. Downward, negative economic change would be caused by higher than anticipated lunar development costs. Increases in geological certainty could arise from direct sensing of helium-3 from orbital spacecraft; however, it definitely will come from detailed mapping and the fusion of all pertinent geochemical and geotechnical data prior to mining.

The first consideration an economic geologist makes relative to a potential resource must involve its estimated value, against which the costs of production can be weighed. What is the likely price per unit that can be realized in the marketplace at the point in the future when the production operations begin? The value of lunar helium-3 for fusion electrical power plants on Earth will be a function of the demand and supply of competitive energy sources. As already discussed in the previous chapter (Section 5.3), helium-3 will be in direct future competition with steam coal for power generation. Forecasting coal prices in the 2010-2015 time frame will be important to evaluating the competitive value of lunar helium-3. Prices for thermal or steam coal in Asia (4% of world demand, rising at 10% annually) have begun to rise rapidly, up 70-80% in 2004.88 In fact, some analysts expect steam coal to reach and hold over $2.50/million BTU in 2005.89 Spot prices have approached $2.00 in the United States for the eastern stoker coal in 2004.9° Therefore, forecasting coal prices of at least $2.50/million BTU, appears to be a reasonable planning assumption for 2010-2015.9' This gives a conservative estimate that the energy equivalent value of 100 kg of helium-3 in 2010-2015 would be about $140 million.

6.3.2 Mining analysis With this value of $140 million 100 kg in mind, how much helium-3 is reasonably available in the richest (highest grade or concentration) known portions of the lunar regolith? Working with the Wisconsin Fusion Technology Institute team in the 1980s, the late Professor Eugene Cameron,92 one of the world's foremost economic geologists, made the

[Figure omitted] FIGURE 6.4 Current position of lunar helium-3 in titanium-rich portions of Mare Tranquillitatis relative to demonstrated economic potential. (Graphic background courtesy of P. J. Brown, University of Wisconsin—Madison)

first estimates of the quantities of helium-3 expected to be present in titanium-rich regolith on the Moon. Cameron, using available spectro-scopic data on titanium concentration as discussed in Section 6.2.3, determined that the highest grade area for helium-3 totaled about 84,000 km2 and another 195,000 km2 of medium grade concentrations all within Mare Tranquillitatis. By geological inference, using photogeological mapping and remotely-sensed titanium concentrations, this is the region to which Apollo 11 samples apply, as well as those provided by Apollo 17. Cameron also studied the distribution of craters and estimated that about 50% of the 84,000 km2 would be minable by the Wisconsin Mark II miner (see Section 7.2.2). If mined to a depth of 3 meters with a helium-3 concentration of 20 wppb (Section 5.2), this highest grade area would yield about 2500 tonnes of helium-3. In 2010-2015, with coal at $2.50/ million BTU, this amount of helium-3 will probably have an energy equivalent value of about $3.5 trillion! Even at 2003's contract coal prices, the value would be about $1.75 trillion. This economic potential, and the policy and environmental advantages of helium-3 fusion, have been exciting enough to keep the interest of the Wisconsin group and the author since the late 1980s.

Since Cameron's initial work, as discussed above, the helium-3 resources in Mare Tranquillitatis have moved close enough to being "measured resources" to warrant investment in the integrated analysis of all available sample and remote-sensing data. Cameron based his analysis on Apollo 11 sample data, the available spectroscopic definition of titanium distribution, and 1960s Lunar Orbiter photography.93 Apollos 15, 16, and 17 metric and panametric cameras, operating from orbit, gathered additional high-resolution and stereophotography of the area of interest in Mare Tranquillitatis. Subsequently, two additional data sets obtained by the Department of Defense and NASA promise to further refine our knowledge of the distribution of titanium in that region's regolith. Respectively, these data came from optical spectrometers aboard the Clementine mission in 199494 and from the neutron and gamma-ray spectrometers of the Lunar Prospector mission in 1998-1999.95 Further, improved optical specrometric data from Earth have been collected.96 As discussed above, nanophase native iron accumulates in the regolith as a function of exposure to micrometeor impact, so remotely-sensed concentrations of such iron measure the length of exposure to solar wind and, in turn, indirectly measure relative helium-3 concentrations. This accounts for the strong correlation between both titanium oxide concentration and regolith maturity.97

It may be possible, as well as desirable to potential investors, to directly map helium-3 distribution in the regolith. This could be done on a global scale by developing an advanced gamma-ray spectrometer for a special-purpose, low-cost lunar orbiter, mapping the 20.6 (and higher) MeV gamma-rays released when a helium-3 nucleus captures a solar cosmic-ray-induced neutron.98 (Significant in-situ understanding of neutron flux at the lunar surface was gained by the lunar neutron probe experiment deployed on Apollo 17.99) Telerobotic rovers could accomplish more specific and higher resolution mapping of a targeted mining site, albeit at significantly higher cost than an orbital sensor. The cost, however, of either an orbiter or surface rovers should not be incurred until the existing data sets are fully exploited and the need for one or the other becomes clear.

Although a major project that fuses all the available data sets is clearly necessary, there can be little doubt that very interesting concentrations (grades) of helium-3 are present in the upper 3 to 6 meters of Mare Tranquillitatis regolith. Based on analyses of Apollo samples to date, the average, undisturbed concentration of helium-3 in major portions of Mare Tranquillitatis appears to be at least 20 wppb, and conceivably higher. Analysis of drill cores from Apollo 15, 16, and 17, even though they have been depleted in volatiles by agitation and are highly variable from one buried ejecta blanket to another, indicates that this average grade will continue to a depth of at least 3 meters and probably to the base of the regolith.10°

#### Helium-3 fusion possible now—Solves warming and energy infrastructure reliability

**Whittington 21** (Mark, contributor to the Hill. “Solving the climate and energy crises: Mine the Moon's helium-3?”<https://thehill.com/opinion/technology/540856-solving-the-climate-and-energy-crises-mine-the-moons-helium-3> February 28, 2021)DR 22

Solar System Resources has agreed to provide 500 kilograms of helium-3 mined from the Moon to U.S. Nuclear Corp. in the 2028-2032 timeframe.

According to [a paper](https://mdcampbell.com/Helium-3version2.pdf) published by Jeff Bonde and Anthony Tortorello, helium-3 is an isotope that has been deposited in lunar soil over billions of years by solar wind. Roughly 1.1 million metric tons of the isotope exists on the Moon down to a depth of several meters. Twenty-five metric tons of helium-3, about a quarter of the cargo capacity of a SpaceX Starship, would suffice to fuel all the power needs of the United States for a year.

The announcement does not reveal how Solar System Resource proposes to mine the helium-3. The company’s website is very heavy on breathtakingly inspirational verbiage and light on how it intends to raise the money and develop the technology to mine the solar system’s resources. However, the paper suggests that a rover could scoop up lunar regolith, separate helium-3 along with oxygen and hydrogen, store them and eject the processed lunar soil. The gasses would be taken back to a lunar base where the oxygen and hydrogen would be put to good use and the helium-3 stored for later export to Earth.

The announcement also does not reveal what U.S. Nuclear Corp. intends to do with the helium-3 once it takes delivery. The company, which builds radiation detection devices, has a subsidiary, [Magneto-Inertial Fusion Technology, Inc.,](https://www.usnuclearcorp.com/magneto-inertial-fusion-technologies/) that is researching a fusion technology called [staged Z-pinch.](https://arpa-e.energy.gov/sites/default/files/04_WESSEL.pdf) This would create a fusion reaction long enough and sustained enough to become a power source. Presumably, an abundant store of helium-3 could be an asset for those experiments.

Fusion using helium-3 has advantages and disadvantages over using deuterium, an isotope of hydrogen and tritium, another isotope of hydrogen.

Deuterium and tritium fusion releases radioactive neutrons that will damage and weaken the containment vessel. Periodically, a fusion reactor using this method would have to be taken offline for decontamination. Tritium is also radioactive, making its handling difficult and dangerous. A deuterium and helium-3 fusion creates helium and charged protons as byproducts and few or no radioactive particles.

The main disadvantage of fusion using helium-3 is that it would take a far greater amount of energy to achieve it than the conventional deuterium and tritium variety. According to [Open Mind,](https://www.bbvaopenmind.com/en/science/physics/helium-3-lunar-gold-fever/#:~:text=In%201986%2C%20scientists%20at%20the,produce%20energy%20by%20nuclear%20fusion.) Frank Close, a physicist at the University of Oxford, regards fusion using helium-3 as “moonshine.” Close suggests that a deuterium and helium-3 fusion will still produce some radioactive neutrons.

Gerald Kulcinski, director of the [Fusion Technology Institute](https://fti.neep.wisc.edu/fti.neep.wisc.edu/index.html) at the University of Wisconsin at Madison, disagrees. Close’s objection is based on using conventional fusion technology. The Fusion Technology Institute has achieved some progress in minimizing radioactive neutron production using different technology.

Helium-3 fusion is an even more promising technology, albeit a more difficult and complicated one to develop. The consensus seems to be that such reactors will not be achieved for some decades, say mid-century.

No one can guarantee that enough helium-3 will be mined from the Moon to jump-start serious development of technology using the isotope as a fusion fuel in the foreseeable future. There is no guarantee that such a development will see practical results anytime soon. However, the effort would be well worth pursuing, with substantial money and effort deployed behind it. If not the two aforementioned companies, someone should undertake the effort. Fusion using helium-3 as fuel would change the world in profoundly beneficial ways.

The great problem civilization faces is access to clean, affordable and reliable energy. Recent [events](https://www.nbcnews.com/news/weather/knocked-out-texas-millions-face-record-lows-without-power-new-n1257964) in Texas prove that not having energy, even for a few days, can be catastrophic. At the same time, humankind needs sources of energy that do not harm the environment, especially by emitting greenhouse gasses.

It appears that humankind is returning to the Moon, at long last. [President Trump](https://thehill.com/people/donald-trump) [started](https://thehill.com/opinion/technology/482265-trump-goes-all-in-for-nasas-artemis-return-to-the-moon-program) the Artemis Project. [President Biden](https://thehill.com/people/joe-biden) has thrown his support behind the effort. There are many reasons to return to the Moon, from science, to commerce, to soft political power. Solving the decades-long energy crisis could be the singular benefit for expanding human activity to Earth’s nearest neighbor.

#### Extinction from energy collapse

Greene 19 [Sherrell R. Greene Mr. Greene received his B.S. and M.S. degrees in Nuclear Engineering from the University of Tennessee. He is a recognized subject matter expert in nuclear reactor safety, nuclear fuel cycle technologies, and advanced reactor concept development. Mr. Greene is widely acclaimed for his systems analysis, team building, innovation, knowledge organization, presentation, and technical communication skills. Mr. Greene worked at the Oak Ridge National Laboratory (ORNL) for over three decades. During his career at ORNL, he served as Director of Research Reactor Development Programs and Director of Nuclear Technology Programs. . "Enhancing Electric Grid, Critical Infrastructure, and Societal Resilience with Resilient Nuclear Power Plants (rNPPs)." <https://ans.tandfonline.com/doi/pdf/10.1080/00295450.2018.1505357?needAccess=true> edited for ableist language in brackets[]]

Societies and nations are examples of large-scale, complex social-physical systems. Thus, societal resilience can be defined as the ability of a nation, population, or society to anticipate and prepare for major stressors or calamities and then to absorb, adapt to, recover from, and restore normal functions in the wake of such events when they occur. A nation’s dependence on its Critical Infrastructure systems, and the resilience of those systems, are therefore major components of national and societal resilience.

There are a variety of events that could deal ~~crippling~~ [Incapacitating] blows to a nation’s Grid, Critical Infrastructure, and social fabric. The types of catastrophes under consideration here are “very bad day” scenarios that might result from severe GMDs induced by solar CMEs, HEMP attacks, cyber attacks, etc.5

As briefly discussed in Sec. III.C, the probability of a GMD of the magnitude of the 1859 Carrington Event is now believed to be on the order of 1%/year. The Earth narrowly missed (by only several days) intercepting a CME stream in July 2012 that would have created a GMD equal to or larger than the Carrington Event.41 Lloyd’s, in its 2013 report, “Solar Storm Risk to the North American Electric Grid,” 42 stated the following: “A Carrington-level, extreme geomagnetic storm is almost inevitable in the future…The total U.S. population at risk of extended power outage from a Carrington-level storm is between 20-40 million, with durations of 16 days to 1-2 years…The total economic cost for such a scenario is estimated at $0.6-2.6 trillion USD.” Analyses conducted subsequent to the Lloyd’s assessment indicated the geographical area impacted by the CME would be larger than that estimated in Lloyd’s analysis (extending farther northward along the New England coast of the United States and in the state of Minnesota),43 and that the actual consequences of such an event could actually be greater than estimated by Lloyd’s.

Based on “Report of the Commission to Assess the Threat to the United States from Electromagnetic Pulse (EMP) Attack: Critical National Infrastructures” to Congress in 2008 (Ref. 39), a HEMP attack over the Central U.S. could impact virtually the entire North American continent. The consequences of such an event are difficult to quantify with confidence. Experts affiliated with the aforementioned Commission and others familiar with the details of the Commission’s work have stated in Congressional testimony that such an event could “kill up to 90 percent of the national population through starvation, disease, and societal collapse.” 44,45 Most of these consequences are either direct or indirect impacts of the predicted collapse of virtually the entire U.S. Critical Infrastructure system in the wake of the attack.

Last, recent analyses by both the U.S. Department of Energy46 and the U.S. National Academies of Sciences, Engineering, and Medicine47 have concluded that cyber threats to the U.S. Grid from both state-level and substatelevel entities are likely to grow in number and sophistication in the coming years, posing a growing threat to the U.S. Grid.

These three “very bad day” scenarios are not creations of overzealous science fiction writers. A variety of mitigating actions to reduce both the vulnerability and the consequences of these events has been identified, and some are being implemented. However, the fact remains that events such as those described here have the potential to change life as we know it in the United States and other developed nations in the 21st century, whether the events occur individually, or simultaneously, and with or without coordinated physical attacks on Critical Infrastructure assets.