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#### Contention 1 is physics.

#### Liquid fluoride thorium reactors are safe, efficient, and minimally wasteful

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Liquid fuel thorium reactors offer an array of advantages in design, operation, safety, waste management, cost and proliferation resistance over the traditional configuration of nuclear plants. Individually, the advantages are intriguing. Collectively they are compelling. Unlike solid nuclear fuel, liquid fluoride salts are impervious to radiation damage. We mentioned earlier that fuel rods acquire structural damage from the heat and radiation of the nuclear furnace. Replacing them requires expensive shutdown of the plant about every 18 months to swap out a third of the fuel rods while shuffling the remainder. Fresh fuel is not very hazardous, but spent fuel is intensely radioactive and must be handled by remotely operated equipment. After several years of storage underwater to allow highly radio-active fission products to decay to stability, fuel rods can be safely transferred to dry-cask storage. Liquid fluoride fuel is not subject to the structural stresses of solid fuel and its ionic bonds can tolerate unlimited levels of radiation damage, while eliminating the (rather high) cost of fabricating fuel elements and the (also high) cost of periodic shutdowns to replace them. More important are the ways in which liquid fuel accommodates chemical engineering. Within uranium oxide fuel rods, numerous transuranic products are generated, such as plutonium-239, created by the absorption of a neutron by uranium-238, followed by beta decay. Some of this plutonium is fissioned, contributing as much as one-third of the energy production of uranium reactors. All such transuranic elements could eventually be destroyed in the neutron flux, either by direct fission or transmutation to a fissile element, except that the solid fuel must be removed long before complete burnup is achieved. In liquid fuel, transuranic fission products can remain in the fluid fuel of the core, transmuting by neutron absorption until eventually they nearly all undergo fission. In solid fuel rods, fission products are trapped in the structural lattice of the fuel material. In liquid fuel, reaction products can be relatively easily removed. For example, the gaseous fission poison xenon is easy to remove because it bubbles out of solution as the fuel salt is pumped. Separation of materials by this mechanism is central to the main feature of thorium power, which is formation of fissile uranium-233 in the blanket for export to the core. In the fluoride salt of the thorium blanket, newly formed uranium-233 forms soluble uranium tetrafluoride (UF4). Bubbling fluorine gas through the blanket solution converts the uranium tetrafluoride into gaseous uranium hexafluoride (UF6), while not chemically affecting the lessreactive thorium tetrafluoride. Uranium hexafluoride comes out of solution, is captured, then is reduced back to soluble UF4 by hydrogen gas in a reduction column, and finally is directed to the core to serve as fissile fuel. Other fission products such as molybdenum, neodymium and technetium can be easily removed from liquid fuel by fluorination or plating techniques, greatly prolonging the viability and efficiency of the liquid fuel. Liquid fluoride solutions are familiar chemistry. Millions of metric tons of liquid fluoride salts circulate through hundreds of aluminum chemical plants daily, and all uranium used in today's reactors has to pass in and out of a fluoride form in order to be enriched. The LFTR technology is in many ways a straightforward extension of contemporary nuclear chemical engineering. Waste Not Among the most attractive features of the LFTR design is its waste profile. It makes very little. Recently, the problem of nuclear waste generated during the uranium era has become both more and less urgent. It is more urgent because as of early 2009, the Obama administration has ruled that the Yucca Mountain Repository, the site designated for the permanent geological isolation of existing U.S. nuclear waste, is no longer to be considered an option. Without Yucca Mountain as a strategy for waste disposal, the U.S. has no strategy at all. In May 2009, Secretary of Energy Steven Chu, Nobel laureate in physics, said that Yucca Mountain is off the table. What we're going to be doing is saying, let's step back. We realize that we know a lot more today than we did 25 or 30 years ago. The [Nuclear Regulatory Commission] is saying that the dry-cask storage at current sites would be safe for many decades, so that gives us time to figure out what we should do for a long-term strategy. The waste problem has become somewhat less urgent because many stakeholders believe Secretary Chu is correct that the waste, secured in huge, hardened casks under adequate guard, is in fact not vulnerable to any foreseeable accident or mischief in the near future, buying time to develop a sound plan for its permanent disposal. A sound plan we must have. One component of a long-range plan that would keep the growing problem from getting worse while meeting growing power needs would be to mobilize nuclear technology that creates far less waste that is far less toxic. The liquid fluoride thorium reactor answers that need. Thorium and uranium reactors produce essentially the same fission (breakdown) products, but they produce a quite different spectrum of actinides (the elements above actinium in the periodic table, produced in reactors by neutron absorption and transmutation). The various isotopes of these elements are the main contributors to the very long-term radiotoxicity of nuclear waste. The mass number of thorium-232 is six units less than that of uranium238, thus many more neutron captures are required to transmute thorium to the first transuranic. Figure 6 shows that the radiotoxicity of wastes from a thorium /uranium fuel cycle is far lower than that of the currently employed uranium/plutonium cycle--after 300 years, it is about 10,000 times less toxic. By statute, the U.S. government has sole responsibility for the nuclear waste that has so far been produced and has collected $25 billion in fees from nuclear-power producers over the past 30 years to deal with it. Inaction on the waste front, to borrow the words of the Obama administration, is not an option. Many feel that some of the $25 billion collected so far would be well spent kickstarting research on thorium power to contribute to future power with minimal waste. Safety First It has always been the dream of reactor designers to produce plants with inherent safety - reactor assembly, fuel and power-generation components engineered in such a way that the reactor will, without human intervention, remain stable or shut itself down in response to any accident, electrical outage, abnormal change in load or other mishap. The LFTR design appears, in its present state of research and design, to possess an extremely high degree of inherent safety. The single most volatile aspect of current nuclear reactors is the pressurized water. In boiling light-water, pressurized light-water, and heavywater reactors (accounting for nearly all of the 441 reactors worldwide), water serves as the coolant and neutron moderator. The heat of fission causes water to boil, either directly in the core or in a steam generator, producing steam that drives a turbine. The water is maintained at high pressure to raise its boiling temperature. The explosive pressures involved are contained by a system of highly engineered, highly expensive piping and pressure vessels (called the "pressure boundary"), and the ultimate line of defense is the massive, expensive containment building surrounding the reactor, designed to withstand any explosive calamity and prevent the release of radioactive materials propelled by pressurized steam. A signature safety feature of the LFTR design is that the coolant - liquid fluoride salt - is not under pressure. The fluoride salt does not boil below 1400 degrees Celsius. Neutral pressure reduces the cost and the scale of LFTR plant construction by reducing the scale of the containment requirements, because it obviates the need to contain a pressure explosion. Disruption in a transport line would result in a leak, not an explosion, which would be captured in a noncritical configuration in a catch basin, where it would passively cool and harden. Another safety feature of LFTRs, shared with all of the new generation of LWRs, is its negative temperature coefficient of reactivity. Meltdown, the bogey of the early nuclear era, has been effectively designed out of modern nuclear fuels by engineering them so that power excursions - the industry term for runaway reactors - are self-limiting. For example, if the temperature in a reactor rises beyond the intended regime, signaling a power excursion, the fuel itself responds with thermal expansion, reducing the effective area for neutron absorption - the temperature coefficient of reactivity is negative - thus suppressing the rate of fission and causing the temperature to fall. With appropriate formulations and configurations of nuclear fuel, of which there are now a number from which to choose among solid fuels, runaway reactivity becomes implausible. In the LFTR, thermal expansion of the liquid fuel and the moderator vessel containing it reduces the reactivity of the core. This response permits the desirable property of load following - under conditions of changing electricity demand (load), the reactor requires no intervention to respond with automatic increases or decreases in power production. As a second tier of defense, LFTR designs have a freeze plug at the bottom of the core - a plug of salt, cooled by a fan to keep it at a temperature below the freezing point of the salt. If temperature rises beyond a critical point, the plug melts, and the liquid fuel in the core is immediately evacuated, pouring into a subcritical geometry in a catch basin. This formidable safety tactic is only possible if the fuel is a liquid. One of the current requirements of the Nuclear Regulatory Commission (NRC) for certification of a new nuclear plant design is that in the event of a complete electricity outage, the reactor remain at least stable for several days if it is not automatically deactivated. As it happens, the freezeplug safety feature is as old as Alvin Weinberg's 1965 Molten Salt Reactor Experiment design, yet it meets the NRCs requirement; at ORNL, the "old nukes" would routinely shut down the reactor by simply cutting the power to the freeze-plug cooling system. This setup is the ultimate in safe power outage response. Power isn't needed to shut down the reactor, for example by manipulating control elements. Instead power is needed to prevent the shutdown of the reactor. Cost Wise In terms of cost, the ideal would be to compete successfully against coal without subsidies or market-modifying legislation. It may well be possible. Capital costs are generally higher for conventional nuclear versus fossil-fuel plants, whereas fuel costs are lower. Capital costs are outsized for nuclear plants because the construction, including the containment building, must meet very high standards; the facilities include elaborate, redundant safety systems; and included in capital costs are levies for the cost of decommissioning and removing the plants when they are ultimately taken out of service. The much-consulted MH study The Future of Nuclear Power, originally published in 2003 and updated in 2009, shows the capital costs of coal plants at $2.30 per watt versus $4 for light-water nuclear. A principal reason why the capital costs of LFTR plants could depart from this ratio is that the LFTR operates at atmospheric pressure and contains no pressurized water. With no water to flash to steam in the event of a pressure breach, a LFTR can use a much more close-fitting containment structure. Other expensive high-pressure coolant-injection systems can also be deleted. One concept for the smaller LFTR containment structure is a hardened concrete facility below ground level, with a robust concrete cap at ground level to resist aircraft impact and any other foreseeable assaults. Other factors contribute to a favorable cost structure, such as simpler fuel handling, smaller components, markedly lower fuel costs and significantly higher energy efficiency. LFTRs are high-temperature reactors, operating at around 800 degrees Celsius, which is thermodynamically favorable for conversion of thermal to electrical energy - a conversion efficiency of 45 percent is likely, versus 33 percent typical of coal and older nuclear plants. The high heat also opens the door for other remunerative uses for the thermal energy, such as hydrogen production, which is greatly facilitated by high temperature, as well as driving other industrial chemical processes with excess process heat. Depending on the siting of a LFTR plant, it could even supply heat for homes and offices. Thorium must also compete economically with energy-efficiency initiatives and renewables. A mature decision process requires that we consider whether renewables and efficiency can realistically answer the rapidly growing energy needs of China, India and the other tiers of the developing world as cheap fossil fuels beckon - at terrible environmental cost. Part of the cost calculation for transitioning to thorium must include its role in the expansion of prosperity in the world, which will be linked inexorably to greater energy demands. We have a pecuniary interest in avoiding the enviromental blowback of a massive upsurge in fossil-fuel consumption in the developing world. The value of providing an alternative to that scenario is hard to monetize, but the consequences of not doing so are impossible to hide from. Perhaps the most compelling idea on the drawing board for pushing thorium-based power into the mainstream is mass production to drive rapid deployment in the U.S. and export elsewhere. Business economists observe that commercialization of any technology leads to lower costs as the number of units increases and the experience curve delivers benefits in work specialization, refined production processes, product standardization and efficient product redesign. Given the diminished scale of LFTRs, it seems reasonable to project that reactors of 100 megawatts can be factory produced for a cost of around $200 million. Boeing, producing one $200 million airplane per day, could be a model for LFTR production.

#### However, thorium tech hasn’t caught on in the US

Niiler ’12 Eric Niiler, “Nuclear power entrepreneurs push thorium as a fuel,” Washington Post, 2/20/2012, http://www.washingtonpost.com/national/health-science/nuclear-power-entrepreneurs-push-thorium-as-a-fuel/2011/12/15/gIQALTinPR\_story.html

The proposed fuel is thorium, an abundant silver-gray element named for the Norse god of thunder. It is less radioactive than the uranium that has always powered U.S. plants, and advocates say that not only does it produce less waste, it also is more difficult to turn into nuclear weapons. They’re pushing the idea of adapting plants to use thorium as a fuel or replacing them with a completely new kind of reactor called a liquid-fluoride thorium reactor, or LFTR (pronounced “lifter”). The LFTR would use a mixture of molten chemical salts to cool the reactor and to transfer energy from the fission reaction to a turbine. Proponents say such a system would be more efficient and safer than existing plants, which use pressurized water to cool uranium fuel rods and boiling water or steam to transfer the energy they create. “A molten-salt reactor is not a pressurized reactor,” said John Kutsch, director of the Thorium Energy Alliance, a trade group based in Harvard, Ill. “It doesn’t use water for cooling, so you don’t have the possibility of a hydrogen explosion, as you did in Fukushima.” Kutsch and others say that a thorium-fueled reactor burns hotter than uranium reactors, consuming more of the fuel. “Ninety-nine percent of the thorium is burned up,” he said. “Instead of 10,000 pounds of waste, you would have 300 pounds of waste.” ‘Small boatloads of fanatics’ Although the idea of thorium power has been around for decades — and some countries are planning to build thorium-powered plants — it has not caught on with the companies that design and build nuclear plants in the United States or with the national research labs charged with investigating future energy sources.

#### Climate change is coming now and bears a hugely disproportionate impact on those already at the greatest socioeconomic disadvantage, causing widespread physical displacement and death

Byravan and Rajan ’10 Sujatha Byravan and Sudhir Chella Rajan, “The Ethical Implications of Sea-Level Rise Due to Climate Change,” Ethics & International Affairs 24, No. 3, 9/20/2010, only accessible on some exclusive database

As scientific evidence for the adverse effects of human-induced climate change grows stronger, it is becoming increasingly clear that these questions are of urgent practical interest and require concerted international political action. In the course of this century and the next, the earth’s climate will almost surely get warmer as a direct result of the emissions accumulated in the atmosphere from the burning of fossil fuels since the Industrial Revolution. This warming will very likely result in heat waves, heavy precipitation in some areas, extreme droughts in others, increased hurricane intensity, and sea-level rise of about one meter—although recent findings suggest this rise could quite plausibly be greater than that by century’s end.1 Forecasts of how many people will be displaced by 2050 by climate change vary widely, from about 25 million to 1 billion. The difficulty in accurate forecasting lies not only in the uncertainty regarding future climate change impacts and adaptation measures but also in estimating the outcome of the several complex factors driving migration.2 No other form of environmentally induced human migration will likely be as permanent as that caused by climate-induced SLR; and there are special reasons why its victims deserve unique moral consideration. SLR will affect coastal populations in a variety of ways, including inundation, flood and storm damage, erosion, saltwater intrusion, and wetland loss. Together, these will greatly reduce available land for cultivation, water resources, and fodder, causing severe hardship in terms of livelihood and habitat loss. Worst of all, SLR and the associated changes in the coastal zone will add burdens to many who are already poor and vulnerable. The physical changes associated with SLR may themselves take place in abrupt, nonlinear ways as thresholds are crossed. In turn, the least resilient communities— that is, those dependent on subsistence fishing—will be the first to experience ‘‘tipping points’’ in their life systems, so that the only option available to them would be to abandon their homes and search for better prospects elsewhere. As the average sea level continues to rise, coastal inundation, saltwater intrusion, and storm surges will become more intense and people will find it increasingly difficult to stay in their homes and will look for ways to migrate inland. As ever larger numbers pass thresholds in their ability to cope, more societal tipping points will be crossed, resulting in the sudden mass movements of entire villages, towns, and cities in coastal regions.3 On small islands and in countries with heavily populated delta regions, the very existence of the nation-state may become jeopardized, so that the extremely vulnerable will no longer have state protection they can rely on. The extent of vulnerability to sea-level rise in any given country will depend on more than just its terrain and climatic conditions: the fraction of the population living in low-lying regions, the area and proportion of the country inundated, its wealth and economic conditions, and its prevailing political institutions and infrastructure will all be of relevance. Thus, in a large country, such as the United States or China, coastal communities would be able to move inland, given adequate preparation and government response. In the case of small islands in the South Pacific, however, such an option does not exist, since it is expected that most or even the entire land area will sink or become uninhabitable. In such cases as Bangladesh, Egypt, Guyana, and Vietnam, where nearly half or more of the populations live in low-lying deltaic regions that support a major fraction of their economies, SLR will threaten the very functioning of the state. Moreover, it is increasingly clear that for tens to hundreds of millions of people living in low-lying areas and on small islands, no physical defense is realistically possible or can be fully protective. A recent report by the Dutch Delta Committee proposes annual investments of about 1.5 billion Euros for the rest of the century just to protect the Netherlands’ 200-mile coastline, and indicates that 20–50 percent of coastal land worldwide cannot be protected, especially under conditions where SLR takes place rapidly—as a result, say, of a collapse of major ice sheets in Greenland or Antarctica.4 Even if greenhouse gases are removed from the atmosphere through some future technology, we are already committed to a certain degree of warming and sea-level rise because of the thermal inertia of the oceans. In addition, most residents of small island nations and other low-lying coastal regions around the world will not be able to avail themselves of the sorts of conventional adaptation remedies that are conceivable for the victims of drought, reduced crop yields, desertification, and so on. Apart from exceptional cases where adequate engineering solutions can be developed to prevent inundation, coastal erosion, saltwater intrusion, and other challenges associated with rising seas, people living in these vulnerable regions will be forced to flee, generally with no possibility of return to their original homes. Indeed, migration and permanent resettlement will be the only possible ‘‘adaptation’’ strategy available to millions. Existing international law provides no solution for these individuals, for whom, we will argue, the only just remedy is in the form of special rights of free global movement and resettlement in regions and countries on higher ground in advance of disaster. What Needs to Be Done The issue of climate change and migration has received considerable scholarly attention, primarily in terms of its political and legal implications, but there has been little focus on the ethical aspects.5 In an earlier paper we suggested that the responsibility of absorbing ‘‘climate exiles’’ should be shared among host countries in a manner that is proportional to a host’s cumulative emissions of greenhouse gases.6 Here, we try to develop the ethical basis for the international community, first, to recognize that displaced persons, and in particular those whose nation states will have become physically nonexistent or will face an unendurable burden, should have a special right to free movement to other countries; and, second, to formulate institutional means for providing them political, social, and economic rights. We define the victims’ unbearable burden in the following terms: they will face a breakdown or total forfeiture of prevailing physical, economic, and social support systems; and they will have no effective state to endow them with rights and alleviate their pain. It is not our intention to provide a particular formula for how individual countries should be made responsible for the victims’ habitation and citizenship, but to suggest instead that once the basic principle of shared responsibility based on each country’s contribution to climate change is accepted, there could be several ways to determine precisely how the costs of policy implementation should be distributed, how rights could be exercised by the climate exiles and migrants, and what other institutional and political mechanisms should be established to avert a massive refugee crisis. The fairest solution, we therefore propose, is for the international community to grant, in the first instance, the individual right to migrate to safe countries for those who will be displaced forcibly by SLR. We then recommend that an international treaty begin to address this issue so that climate migrants and future exiles will be able to find homes well in advance of the actual emergency.7 Indeed, unlike in the case of natural disasters, such as the Asian tsunami of December 2004, the world is already sufficiently forewarned about the need to prepare for the effects of SLR and has ample time and opportunity to make reasoned judgments about how best to respond.8 We contend that the alternative—to ignore potential victims until after they become ‘‘environmental refugees’’—is morally indefensible as well as impractical. For one thing, the victims in the case of SLR cannot even be classified as ‘‘refugees’’ since there are no legal instruments that give them this option. Notably, the Refugee Convention, designed to protect those forced to flee their homes as a result of war or persecution, in force since 1954, recognizes as a refugee someone who is ‘‘unable [or] unwilling to avail himself of the protection’’ of his country of nationality and is outside that country ‘‘owing to well-grounded fear of being persecuted for reasons of race, religion, nationality, membership in a particular social group or political opinion’’—a definition that does not extend to those adversely affected by environmental disasters, including climatic change. In this paper and elsewhere we therefore reserve the terms ‘‘climate migrants’’ and ‘‘climate exiles’’ to refer to the victims of SLR attributed to climate change. The former includes all those who are displaced because of the effects of climate change, while the latter refers to a special category of climate migrants who will have lost their ability to remain well-functioning members of political societies in their countries, often through no fault of their own. Further, while most climate migrants will be internally displaced people, or have the opportunity of returning to their countries or regions of origin if adequate adaptation measures were taken, climate exiles will be forced to become permanently stateless in the absence of other remedies. Duties to Climate Exiles Our fundamental argument is that humanity carries a special obligation to present and future generations of people whose homes, means of livelihood, and membership in states will be lost specifically as a result of sea-level rise caused by climate change. We draw upon the principle of intergenerational equity, wherein each generation is collectively responsible for protecting and using natural resources in a sustainable manner so that future generations are not unduly harmed by their present misuse. The recognition of this duty implies, as Joerg Tremmel suggests, that ‘‘in spite of the difficulties such as opportunity costs, restricted human ability and foresight, modern collective agents (present governments and leading industrial companies) have to take their responsibility for future generations seriously.’’9 This responsibility is carried over to representative agents in the future who share the legacy of causing harm with their forebears but who now have the ability to recognize the suffering that ensues as a result of historical (if not continuing) actions and can therefore make amends to the sufferers who live in their midst. As we discuss later, this is not always equivalent to an argument for making reparations for past injury.

#### Global warming risks massive species die-off and habitat destruction

Hannah ’12 Lee Hannah, senior researcher in climate change biology at Conservation International, visiting researcher and adjunct professor at the Bren School of Environmental Science & Management at UC-Santa Barbara, has a pretty detailed Wikipedia page, “As Threats to Biodiversity Grow, Can We Save World’s Species?” Yale Environment 360, 4/19/2012, http://e360.yale.edu/feature/as\_threats\_to\_biodiversity\_grow\_can\_we\_save\_worlds\_species/2518/

Now, with 7 billion people on the planet — heading to 10 billion — and with greenhouse gas emissions threatening more rapid temperature rises than the warming that brought the last Ice Age to an end, the many millions of living things on Earth face an unprecedented squeeze. Is a wave of extinctions possible, and if so, what can we do about it? The late climate scientist and biologist Stephen Schneider once described this confluence of events — species struggling to adapt to rapid warming in a world heavily modified by human action — as a “no-brainer for an extinction spasm.” My colleagues Barry Brook and Anthony Barnosky recently put it this way, “We are witnessing a similar collision of human impacts and climatic changes that caused so many large animal extinctions toward the end of the Pleistocene. But today, given the greater magnitude of both climate change and other human pressures, the show promises to be a wide-screen technicolor version of the (by comparison) black-and-white letterbox drama that played out the first time around.” The magnitude of the threat was first quantified in a 2004 Nature study, “Extinction Risk from Climate Change.” This paper suggested that in six diverse regions, 15 to 37 percent of species could be at risk of extinction. If those six regions were typical of the global risk, the study’s authors later calculated, more than a million terrestrial and marine species could face extinction due to human encroachment and climate change — assuming conservatively that 10 million species exist in the world. Headlines around the world trumpeted the 1 million figure. Whether that scenario will unfold is unclear. But signs of what is to come are already all around us: nearly 100 amphibian species in South America vanishing in a disease outbreak linked to climate change, large areas of western North American facing massive die-offs of trees because of warming-driven beetle outbreaks, and increasing loss of coral reefs worldwide because of human activities and coral bleaching events driven by rising ocean temperatures. Most of the world’s biologically unique areas have already lost more than 70 percent of their high-quality habitat. The world community has the power to greatly reduce the prospect of an extinction spasm by lowering greenhouse gas emissions and launching large-scale conservation and forest preservation programs that both slow global warming and provide a sanctuary for countless species. But progress on these fronts is slow, and pressure on the world’s biodiversity remains relentless. An important part of the solution is preserving the ability of species to move across a changing landscape. Before humans, species responded to climate change by migrating, sometimes long distances, to track their preferred climatic conditions. Fully natural landscapes were conducive to these movements, with even slow-dispersing plants shifting the heart of their range on continental scales. The mechanisms of these changes are still being worked out, but we know they happened: Insects once found in Britain are now found only in the Himalayas, and centers of oak distribution have moved from the Mediterranean to Central Europe and from Georgia to Pennsylvania. Recent studies have shown that migration was an important method for species to cope with rapid climate change as far back as 55 million years ago, a period known as the Paleocene-Eocene Thermal Maximum, or PETM. Then, for reasons that are still not entirely clear, vast amounts of greenhouse gases were released into the atmosphere and oceans, leading to an increase in global temperatures of 4 to 9 degrees C (7 to 14 degrees F) in less than 10,000 years. Geological and fossil studies, using techniques such as stable isotope analysis, show major extinctions, the evolution of new animals and plants, and the migration of species on a large scale. Now, however, landscapes are crowded with human uses. Cities, urban sprawl, and agriculture take up huge areas. Freeways and roads create long linear obstructions to natural movement and present a patchwork of obstacles that are a severe challenge to species’ natural modes of shifting to track climate. To unravel these future responses requires understanding of past response, modeling of future response, and insights from changes already underway. To date, marine systems have experienced the most extensive impacts of climate change. From coral bleaching to melting sea ice, marine systems are changing on global and regional scales. Coral bleaching occurs when water temperatures exceed regional norms, causing corals to expel symbiotic micro-organisms from their tissues, ultimately leading to morbidity or death. Bleaching has exterminated some coral species from entire ocean basins. Global extinctions may follow as temperatures continue to rise. Corals face a second threat from acidification as CO2 builds up in the atmosphere and oceans, which prevents corals and many other marine organisms, including clams and oysters, from forming their calcium carbonate shells. Overall, the evidence suggests that the world’s roughly 5 million marine species face as severe threats from climate change as their terrestrial counterparts. On land, tropical biodiversity hotspots in places such as the Amazon and the rainforests of Indonesia and Malaysia are especially at risk. All global climate models now show significant future warming in the tropics, even if more muted than warming at high latitudes. Tropical animals, insects, and plants are tightly packed along climatic gradients from lowlands to mountaintops, and these organisms are sensitive to changes in temperature and rainfall. Already, scores of amphibians in South America have disappeared as a warmer, drier climate has led to outbreaks of disease such as the chytrid fungus. At the same time, large areas of tropical forest are being cleared for timber, ranching, and farming such crops as soybeans and oil palm.

#### We affirm: The United States federal government should substantially increase market-fixed production cost incentives for Liquid Fuel Thorium Small Modular Reactors.

#### Flexible incentives would prompt a thorium renaissance

Rosner and Goldberg ‘11 (Robert (William E. Wrather Distinguished Service Professor in the Departments of Astronomy and Astrophysics and Physics) and Stephen (Special Assistant to the Director at the Argonne National Laboratory) , *Energy Policy Institute at Chicago*, “Small Modular Reactors – Key to Future Nuclear Power Generation in the U.S.”, Technical Paper, Revision 1, November 2011)

Production Cost Incentive: A production cost incentive is a performance-based incentive. With a production cost incentive, the government incentive would be triggered only when the project successfully operates. The project sponsors would assume full responsibility for the upfront capital cost and would assume the full risk for project construction. The production cost incentive would establish a target price, a so-called “market-based benchmark.” Any savings in energy generation costs over the target price would accrue to the generator. Thus, a production cost incentive would provide a strong motivation for cost control and learning improvements, since any gains greater than target levels would enhance project net cash flow. Initial SMR deployments, without the benefits of learning, will have significantly higher costs than fully commercialized SMR plants and thus would benefit from production cost incentives. Because any production cost differential would decline rapidly due to the combined effect of module manufacturing rates and learning experience, the financial incentive could be set at a declining rate, and the level would be determined on a plant-by-plant basis, based on the achievement of cost reduction targets.43 The key design parameters for the incentive include the following: 1. The magnitude of the deployment incentive should decline with the number of SMR modules and should phase out after the fleet of LEAD and FOAK plants has been deployed. 2. The incentive should be market-based rather than cost-based; the incentive should take into account not only the cost of SMRs but also the cost of competing technologies and be set accordingly. 3. The deployment incentive could take several forms, including a direct payment to offset a portion of production costs or a production tax credit. The Energy Policy Act of 2005 authorized a production tax credit of $18/MWh (1.8¢/kWh) for up to 6,000 MW of new nuclear power plant capacity. To qualify, a project must commence operations by 2021. Treasury Department guidelines further required that a qualifying project initiate construction, defined as the pouring of safety- related concrete, by 2014. Currently, two GW-scale projects totaling 4,600 MW are in early construction; consequently, as much as 1,400 MW in credits is available for other nuclear projects, including SMRs. The budgetary cost of providing the production cost incentive depends on the learning rate and the market price of electricity generated from the SMR project. Higher learning rates and higher market prices would decrease the magnitude of the incentive; lower rates and lower market prices would increase the need for production incentives. Using two scenarios (with market prices based on the cost of natural gas combined-cycle generation) yields the following range of estimates of the size of production incentives required for the FOAK plants described earlier. For a 10% learning rate, 􏰂 Based on a market price of $60/MWh44 (6¢/kWh), the LEAD plant and the subsequent eight FOAK plants would need, on average, a production credit of $13.60/MWh (1.4¢/kWh), 24% less than the $18 credit currently available to renewable and GW-scale nuclear technologies. (The actual credit would be on a sliding scale, with the credit for the LEAD plant at approximately $31/MWh, or 3.1¢/kWh, declining to a credit of about $6/MWh, or 0.6¢/kWh, by the time of deployment of FOAK-8). The total cost of the credit would be about $600 million per year (once all plants were built and operating). If the market price were about $70/MWh (7¢/kWh), the LEAD and only four subsequent FOAK plants would require a production incentive. In this case, the average incentive would be $8.40/MWh (0.8¢/kWh), with a total cost of about $200 million per year. Higher learning rates would drive down the size of the production incentive. For example, at a 12% learning rate, 􏰂 At a market price of $60/MWh (6¢/kWh), the LEAD and the subsequent five FOAK plants would require a production incentive, with an average incentive level of about $15/MWh (1.5¢/kWh). Total annual cost (after all plants are in full operation) would be about $450 million per year. 􏰂 At a market price of $70/MWh (7¢/kWh), the LEAD and three FOAK plants would require a production incentive averaging $9.00/MWh (0.9¢/kWh, half of the current statutory incentive), with a total annual cost of about $170 million per year. The range of costs for the production incentive illustrates the sensitivity of the incentive level to the learning rate and the market price of electricity. Thus, efforts to achieve higher learning rates, including fully optimized engineering designs for the SMRs and the manufacturing plant, as well as specially targeted market introduction opportunities that enable SMRs to sell electricity for higher priced and higher value applications, can have a critical impact on the requirements for production incentives. The potential size of the incentive should be subject to further analysis as higher quality cost estimates become available.

#### This would trigger key reductions in carbon emissions—that’s essential to slow and reverse anthropogenic climate change

Hargraves and Moir ’11 Robert Hargraves, teaches energy policy at the Institute for Lifelong Education at Dartmouth, PhD in physics from Brown, and Ralph Moir, Sc.D. in nuclear engineering from MIT, published 10 papers on molten-salt reactors during his career at Lawrence Livermore National Laboratory, “Liquid Fuel Nuclear Reactors,” Physics & Society, January 2011, http://www.aps.org/units/fps/newsletters/201101/hargraves.cfm

Burning coal for power is the largest source of atmospheric CO2, which drives global warming. We seek alternatives such as burying CO2 or substituting wind, solar, and nuclear power. A source of energy cheaper than coal would dissuade nations from burning coal while affording them a ready supply of electric power. Can a LFTR produce energy cheaper than is currently achievable by burning coal? Our target cost for energy cheaper than from coal is $0.03/kWh at a capital cost of $2/watt of generating capacity. Coal costs $40 per ton, contributing $0.02/kWh to electrical energy costs. Thorium is plentiful and inexpensive; one ton worth $300,000 can power a 1,000 megawatt LFTR for a year. Fuel costs for thorium would be only $0.00004/kWh. The 2009 update of MIT’s Future of Nuclear Power shows that the capital cost of new coal plants is $2.30/watt, compared to LWRs at $4/watt. The median of five cost studies of large molten salt reactors from 1962 to 2002 is $1.98/watt, in 2009 dollars. Costs for scaled-down 100 MW reactors can be similarly low for a number of reasons, six of which we summarize briefly: Pressure. The LFTR operates at atmospheric pressure, obviating the need for a large containment dome. At atmospheric pressure there is no danger of an explosion. Safety. Rather than creating safety with multiple defense-in-depth systems, LFTR’s intrinsic safety keeps such costs low. A molten salt reactor cannot melt down because the normal operating state of the core is already molten. The salts are solid at room temperature, so if a reactor vessel, pump, or pipe ruptured they would spill out and solidify. If the temperature rises, stability is intrinsic due to salt expansion. In an emergency an actively cooled solid plug of salt in a drain pipe melts and the fuel flows to a critically safe dump tank. The Oak Ridge MSRE researchers turned the reactor off this way on weekends. Heat. The high heat capacity of molten salt exceeds that of the water in PWRs or liquid sodium in fast reactors, allowing compact geometries and heat transfer loops utilizing high-nickel metals. Energy conversion efficiency. High temperatures enable 45% efficient thermal/electrical power conversion using a closed-cycle turbine, compared to 33% typical of existing power plants using traditional Rankine steam cycles. Cooling requirements are nearly halved, reducing costs and making air-cooled LFTRs practical where water is scarce. Mass production. Commercialization of technology lowers costs as the number of units produced increases due to improvements in labor efficiency, materials, manufacturing technology, and quality. Doubling the number of units produced reduces cost by a percentage termed the learning ratio, which is often about 20%. In The Economic Future of Nuclear Power, University of Chicago economists estimate it at 10% for nuclear power reactors. Reactors of 100 MW size could be factory-produced daily in the way that Boeing Aircraft produces one airplane per day. At a learning ratio of 10%, costs drop 65% in three years. Ongoing research. New structural materials include silicon-impregnated carbon fiber with chemical vapor infiltrated carbon surfaces. Such compact thin-plate heat exchangers promise reduced size and cost. Operating at 950°C can increase thermal/electrical conversion efficiency beyond 50% and also improve water dissociation to create hydrogen for manufacture of synthetic fuels such that can substitute for gasoline or diesel oil, another use for LFTR technology. In summary, LFTR capital cost targets of $2/watt are supported by simple fluid fuel handling, high thermal capacity heat exchange fluids, smaller components, low pressure core, high temperature power conversion, simple intrinsic safety, factory production, the learning curve, and technologies already under development. A $2/watt capital cost contributes $0.02/kWh to the power cost. With plentiful thorium fuel, LFTRs may indeed generate electricity at less than $0.03/kWh, underselling power generated by burning coal. Producing one LFTR of 100 MW size per day could phase out all coal burning power plants worldwide in 38 years, ending 10 billion tons per year of CO2 emissions from coal plants.

#### Thorium spills over—formal mechanisms encourage global tech dispersal

Johnson 6 (Brian, BS Nuclear Engineering from Oregon State U, later received a Ph.D. in Nuclear Science and Engineering from M.I.T., "Thorium for Use in Plutonium Disposition,Proliferation-Resistant Fuels for DevelopingCountries, and Future Reactor Designs," [www.wise-intern.org/journal/2006/Johnson-ANS.pdf], jam)

As it stands, the joint plutonium disposition plans of the United State and Russia have stalled. This is because MOX, the technology chosen to undertake disposition, has taken more time and money than expected. In addition to this, Russia refuses to bear any of the cost of plutonium disposition through the use of MOX. This has opened the door to other options including thorium based fuels. A program in Russia examining thorium-based fuels has made a lot of progress and promises to be an excellent way to dispose of plutonium. The United States cannot directly benefit from this research and should start a program equal in size to the Russian program so that if thorium-based fuels turn out to be a better option for disposition there will be less delay in implementation. The United States outlines a desire in the Global Nuclear Energy Partnership (GNEP) to establish reactors in developing nations to provide potable water, heat for industrial processes, and electricity to growing populations. There are currently no designs that have all of the characteristics desired for reactors to be deployed in developing countries. Thorium-based, proliferation-resistant fuels can provide an evolutionary step until better technologies are developed. The design of this fuel shares a lot of the same technology as thorium-based fuel for plutonium disposition. Because of this, the same program could cover both research objectives with marginal added cost. Molten salt reactors meet all of the goals of next generation fuel cycles. However, the United States is not currently funding research into the technology. Recent research done in France has shown that some of the issues that prohibited development can be resolved. The United States is the only country with operating experience with molten salt reactors. Considering these facts, it makes sense for the United States to fund some research into this promising technology. Thorium could be used to reach several goals in the United States. The technology is not ready for implementation. The United States should fund research into thorium to reach these goals. In doing so, the United States could become a leader in thorium-based technology.

#### Formal mechanisms buoy global exports

Rosner & Goldberg 11 (Robert, William E. Wrather Distinguished Service Professor, Departments of Astronomy and Astrophysics, and Physics, and the College at the U of Chicago, and Stephen, Energy Policy Institute at Chicago, The Harris School of Public Policy Studies, "Small Modular Reactors - Key to Future Nuclear Power Generation in the U.S.," November 2011, [https://epic.sites.uchicago.edu/sites/epic.uchicago.edu/files/uploads/EPICSMRWhitePaperFinalcopy.pdf], jam)

Previous studies have documented the potential for a significant export market for U.S. SMRs, mainly in lesser developed countries that do not have the demand or infrastructure to accommodate GW-scale LWRs. Clearly, the economics of SMR deployment depends not only on the cost of SMR modules, but also on the substantial upgrades in all facets of infrastructure requirements, particularly in the safety and security areas, that would have to be made, and as exemplified by the ongoing efforts in this direction by the United Arab Emirates (and, in particular, by Abu Dhabi). This is a substantial undertaking for these less developed countries. Thus, such applications may be an attractive market opportunity for FOAK SMR plants, even if the cost of such plants may not have yet achieved all of the learning benefits. The Department of Commerce has launched the Civil Nuclear Trade Initiative, which seeks to identify the key trade policy challenges and the most significant commercial opportunities. The Initiative encompasses all aspects of the U.S. nuclear industry, and, as part of this effort, the Department identified 27 countries as “markets of interest” for new nuclear expansion. A recent Commerce Department report identified that “SMRs can be a solution for certain markets that have smaller and less robust electricity grids and limited investment capacity.” Studies performed by Argonne National Laboratory suggest that SMRs would appear to be a feasible power option for countries that have grid capacity of 2,000-3,000 MW. Exports of SMR technology also could play an important role in furthering non-proliferation policy objectives. The design of SMR nuclear fuel management systems, such as encapsulation of the fuel, may have non-proliferation benefits that merit further assessment. Also, the development of an SMR export industry would be step toward a U.S.-centric, bundled reliable fuel services. Exports of FOAK plants help achieve learning without the need for a full array of production incentives required for domestic FOAK deployments. Projected, unsubsidized, electricity market prices will likely be higher in selected foreign markets, particularly when the electricity pricing is based on liquefied natural gas import prices. 49 This situation would enable SMRs to be in a more favorable competitive position. SMR exports would qualify, if needed, for export credit assistance under current U.S. government programs, but this assistance would not require the need for new federal funding.

#### Contention 2 is fragility.

#### Our world is composed of an unimaginable complexity of interacting force-fields, each following their own rules and working to their own tempo, continually being driven by their interactions and contradictions with other fields. The human is but one small piece in a play of forces involving solar energy, tectonic plate shifts, ocean currents, asteroid showers, earthquakes, volcanos, species evolutions and extinctions, rainstorms, tornadoes, and hurricanes.

#### However, human influence is accelerating in dangerous ways, such as increasing emissions of green-house gases into the air, trapping heat within the atmosphere, severely disturbing the prior functioning of ecological processes. We should take two things from this. First, humanity is not alone on the earth. We are surrounded not only by other critters, but also inorganic pulses of energy and matter with unmistakable impact on our lives. In fact, humanity itself is not closed; it too is open, changing, continuously including and excluding. Second, we still carry a disproportionate influence on things—this complex world of becoming is radically fragile, open to change, for better or for worse. And thus our social realities are also malleable, contestable, and fragile.

#### Amidst all these diffuse networks, vectors, and multiplicities, it’s hard to believe that some still hold onto ‘total’ and ‘whole’ accounts of being and identity, but if the last 10 years of military interventions social oppressions tell us anything, it’s that these totalizing world-views live on, and produce vengefulness and ressentiment when they encounter difference, leading to massive, unflinching exercises of violence. “*They”* killed 3,000 people who happened to reside within the same geographic boundaries as us, so *“we”* re-raised by invading two of their countries, resulting in the deaths of hundreds of thousands (at least). All this destruction because an impossible number of contingent factors aligned to pit two stratified social fields against each other, both trapped in absolutist ideology and unwilling to see change.

#### These are the stakes of leftist politics today. We can either resign ourselves to stratified fundamentalism or take a risk on a new strategy to contest environmental destruction, combining critical thought, social interaction, and institutional engagement. Affirm the plan as an experiment in political becoming.

Connolly ’11 William E. Connolly, Krieger-Eisenhower Professor of Political Science at Johns Hopkins University, A World of Becoming, 2011, p. 5-8

A force-field, roughly speaking, is any energized pattern in slow or rapid motion periodically displaying a capacity to morph, such as a climate system, biological evolution, a political economy, or human thinking. As we shall explore in chapter 1, different force-fields display differential capacities of agency. We inhabit a world of becoming composed of heterogeneous force-fields; and we also participate in two registers of temporal experience, each of which can help us to get bearings in such a world. It is when the story of multiple force-fields of different types, in and beyond the human estate, is linked to the exploration of two registers of temporal experience in the human estate that things get interesting. Nonetheless, the themes of this book may carry little weight for anyone who finds nothing of interest in the Barton Fink scene or in a moment from their own past that resonates somehow with the scene I have painted from mine. You may give singular priority to the demands of punctual time while I seek to maintain a tense balance between the incorrigible demands and pleasures of operational perception set in punctual time (the kids’ attention to that spinning bottle as it drew to a halt) and the need to dwell periodically in protean moments that exceed the operational demands of action. You may initially connect the temper I commend to ‘‘optimism’’ or ‘‘romanticism’’ rather than to the pessimism, coolness, realism, or abiding sense of the negative that you respect. I don’t see it that way, though. My sense is that those who jump to such a conclusion have too limited an arsenal of ontological alternatives available. To appreciate two registers of experience in a world of becoming can also help us come to terms with tragic possibility. Such an appreciation encourages us to embrace the world as we act and intervene resolutely in it, even though it is replete with neither divine providence nor ready susceptibility to human mastery. Indeed, I don’t read the absence of providence or mastery as a ‘‘lack,’’ finding the use of that term by some to express a hangover of previous views inadequately overcome in the view officially adopted. I also know that shared experiences of grief or loss can help to consolidate connections with others, and that collective anger, resentment, and indignation are often indispensable spurs to critical action. So there is no sense here that ‘‘thinking it is so makes it so’’ or that ‘‘optimism is always healthy.’’ These orientations are attached to a different take on existence than that advanced here, though there are people who confuse the two. I do suspect that when inordinate drives for individual self-sufficiency, unity, community, consensus, or divine redemption are severely disappointed, things can become dangerous. These disappointed drives—I am sure there are others as well—readily cross over into entrenched dispositions to take revenge on the most fundamental terms of human existence, as a person, a constituency, or a putative nation grasps those terms. If and when that happens, an exclusionary, punitive, scandal-ridden, bitter politics is apt to result, regardless of how the carriers represent themselves to others. Here actions speak louder than words. A world of becoming has considerable evidence on its side, as we shall see; and affirmation of this condition without existential resentment provides one way to act resolutely in the world while warding off individual and collective drives to existential resentment. There are others, as we shall also see. Given the human predicament (explored in chapter 4), no theological or nontheological perspective at this level carries iron-clad guarantees. A crack or fissure running through every final perspective is part of the human predicament as I construe it. On my rendering, the course of time is neither governed solely by a pattern of efficient causation—where each event is determined to occur by some prior event in linear temporal order—nor expressive of an inherent purpose revolving around the human animal as such. Neither/nor. To put it in different terms, time is neither mechanical nor organic, and its human apprehension is neither susceptible to the method of ‘‘individualism’’ nor that of ‘‘holism.’’ We participate, rather, in a world of becoming in a universe set on multiple zones of temporality, with each temporal force-field periodically encountering others as outside forces, and the whole universe open to an uncertain degree. From this perspective, tragic possibility—not inevitability but possibility—is real: tragic possibility as seen from the vantage point of your time or country or species; tragic possibility sometimes actualized through the combination of hubris and an unlikely conjunction of events. Or by some other combination. I even suspect that differential degrees of agency in other force-fields, with which we enter into encounters of many types, increases the risk of that possibility. The universe is not only open; there is an ‘‘outside’’ to every temporal force-field. We are not only limited as agents, but part of our limitation comes from the different degrees of agency in other force-fields with which we interact. The operation of multiple tiers of becoming in a world without a higher purpose amplifies the need to act with dispatch, and sometimes with militancy, in particular situations of stress. The fact that we are not consummate agents in such a world, combined with the human tendency to hubris, means that we must work to cultivate wisdom under these very circumstances. These two dictates, engendering each other while remaining in tension, constitute the problematic of political action in a world of becoming. William James, Henri Bergson, Friedrich Nietzsche, Alfred North Whitehead, and Gilles Deleuze all advance different versions of time as becoming. Perhaps Merleau-Ponty and Marcel Proust do too, with qualifications. I draw from several of them the idea that it takes both philosophical speculation linked to scientific experiment and dwelling in uncanny experiences of duration to vindicate such an adventure. Both. Luckily, as we shall see, some strains of complexity theory in the natural sciences also support the theme of time as becoming as they compose new experiments and rework classical conceptions of causality. Moreover, in everyday life fugitive glimmers of becoming are available to more people more of the time, as we experience the acceleration of many zones of life, the enhanced visibility of natural disasters across the globe, the numerous pressures to minoritize the entire world along several dimensions at a more rapid pace, the globalization of capital and contingency together, the previously unexpected ingress of capital into climate change, the growing number of film experiments with the uncanniness of time, and the enlarged human grasp of the intelligence and differential degrees of agency in other plant and animal species. Such experiences and experiments together call into question early modern conceptions of time. Many respond to such experiences by intensifying religious and secular drives to protect an established image, as either linear and progressive or infused with divine providence. I suspect, however, that such responses— unless their proponents actively engage the comparative contestability of them without deep existential resentment—can amplify the dangers and destructiveness facing our time. Or, at least, they need to be put into more active competition with a conception that speaks to an array of contemporary experiences otherwise pushed into the shadows. To amplify the experience of becoming is one affirmative way to belong to time today. Active exploration and support of such a perspective can make a positive contribution to the late-modern period by drawing more people toward such a perspective or by showing others how much work they need to do to vindicate their own perspective. I belong to a growing contingent who think that a perspective defined by active examination of becoming can make positive contributions to explorations of spirituality, economics, political action, poetic experience, and ethics.

#### Praxis can be hard. In all our critiquing, destabilizing, and disrupting, we risk losing sight of the important goals our critiques suggest—the material changes necessary to reorient institutions and social relations in less violent fashions. This obviates particular strategies for change in conjunction with broadening our theoretical lenses.

Bryant ’12 Levi Bryant, teaches philosophy at Collin College, “RSI, Discursivity, Critique, and Politics,” Larval Subjects, 7/18/2012, http://larvalsubjects.wordpress.com/2012/07/18/rsi-discursivity-critique-and-politics/

If I get worked up about these issues, then this is because I think they’ve created serious lacuna in our political theory and practice. Suppose I focus on norms, for example. Great, I’ve developed a theory of norms and how they contribute to the social fabric. Yet while Kant claims that “ought implies can”, I’m not so sure. You’ve shown that something is unjust or that this would be the reasonable way to proceed. But at the real-material level people are caught in sticky networks that suck them into life in particular ways. They ought, for example, to drive an electric car, but what if it’s not available where they are or what if they can’t afford it? Well they should do whatever they can to get it? But what of their other obligations such as eating, sheltering themselves, taking care of their children, paying their medical bills, etc? It would be so nice if we just had mistaken beliefs or failed to recognize the right norms. Things would be so easy then. But there’s life, there’s the power of things. Sometimes the issues aren’t ones of ideology– and yes, of course, I recognize that ideology is probably involved in making electric cars expensive and hard to obtain, but not for them always –sometimes they’re simply issues of the power of things. And if we treat things as blank screens we’ll have difficulty seeing this and we’ll miss out on other opportunities for engagement. Long ago I used to keep track of my blog. I had a map that showed me where all my visits were coming from about the world. I noticed that the interior portions of the United States were largely dark with no visits and that the coasts and cities had a high volume of traffic. Given that my blog talks about all sorts of things ranging from weather patterns to beavers to mantis shrimps to octopi (I get all these random visits from folks searching for these things), it followed that the absence of traffic from these regions of the country couldn’t be explained in terms of a lack of interest in French and continental philosophy (yes, I recognize that there are also cultural reasons folks from these reasons might shy away from such things). What then was it? I think the answer must be that there’s a lack easy and inexpensive internet access from these portions of the country. Notice also that these regions of the country are also the most conservative regions of the country. Could there be a relation between lack of access and conservatism? I am not suggesting that lack of access is the cause of conservatism and fundamentalism. Clearly there’s a whole history in these regions and an entire set of institutions that exercise a particular inertia. I’m saying that if the only voices you hear are those in your immediate community, how much opportunity is there to think and imagine otherwise? You’re only exposed to the orthodoxy of your community and their sanctions. I am also not saying that if you give people the internet they’ll suddenly become radical leftists. Minimally, however, they’ll have a vector of deterritorialization that allows them to escape the constraints of their local social field. All of this begs the question of who critique is for. If it can’t get to the audience that you want to change, what’s it actually doing? Who’s it addressed to? Sometimes you get the sense that the practice of radical political philosophy and critical theory is a bit like the Underpants Gnomes depicted in South Park: The Underpants Gnomes have a plan for success: collect underwear —>; ? [question mark] —->; profit. This is like our critical theorists: debunk/decipher —>; ? [question mark] —->; revolution! The problem is the question mark. We’re never quite sure what’s supposed to come between collecting the underwear and profit, between debunking and revolution. This suggests an additional form of political engagement. Sometimes the more radical gesture is not to debunk and critique, but to find ways to lay fiber optic cables, roads, plumbing, etc. How, for example, can a people rise up and overturn their fundamentalist dictators if they’re suffering from typhoid and cholera as a result of bad plumbing and waste disposal? How can people overturn capitalism when they have to support families and need places to live and have no alternative? Perhaps, at this point, we need a little less critique and a little more analysis of the things that are keeping people in place, the sticky networks or regimes of attraction. Perhaps we need a little more carpentry. This has real theoretical consequences. For example, we can imagine someone writing about sovereignty, believing they’re making a blow against nationalism by critiquing Schmitt and by discussing Agamben, all the while ignoring media of communication or paths of relation between geographically diverse people as if these things were irrelevant to nationalism occurring. Ever read Anderson on print culture and nationalism? Such a person should. Yet they seem to believe nationalism is merely an incorporeal belief that requires no discussion of material channels or media. They thereby deny themselves of all sorts of modes of intervention, hitching everything on psychology, attachment, and identification. Well done!

#### We should stop treating structures as unmovable wholes—all it takes is one crack to expose the fragility of oppressive institutions. The plan is a radical experiment in democratic politics.

Connolly ’12 William E. Connolly, Krieger-Eisenhower Professor of Political Science at Johns Hopkins University, “Steps toward an Ecology of Late Capitalism,” Theory & Event, Vol. 15, Issue 1, 2012, Muse

A philosophy attending to the acceleration, expansion, irrationalities, interdependencies and fragilities of late capitalism suggests that we do not know with confidence, in advance of experimental action, just how far or fast changes in the systemic character of neoliberal capitalism can be made. The structures often seem solid and intractable, and indeed such a semblance may turn out to be true. Some may seem solid, infinitely absorptive, and intractable when they are in fact punctuated by hidden vulnerabilities, soft spots, uncertainties and potential lines of flight that become apparent as they are subjected to experimental action, upheaval, testing, and strain. Indeed, no ecology of late capitalism, given the variety of forces to which it is connected by a thousand pulleys, vibrations, impingements, dependencies, shocks and thin threads, can specify with supreme confidence the solidity or potential flexibility of the structures it seeks to change. The strength of structural theory, at its best, was in identifying institutional intersections that hold a system together; its conceit, at its worst, was the claim to know in advance how resistant those intersections are to potential change. Without adopting the opposite conceit, it seems important to pursue possible sites of strategic action that might open up room for productive change. Today it seems important to attend to the relation between the need for structural change and identification of multiple sites of potential action. You do not know precisely what you are doing when you participate in such a venture. You combine an experimental temper with the appreciation that living and acting into the future inevitably carries a shifting quotient of uncertainty with it. The following tentative judgments and sites of action may be pertinent.

#### Talking about state policies that improve the ways we produce energy and contest climate change has a radical potential. The 1AC affirms a militant pluralist assemblage tasked with exploring new strategies for reducing inequality and changing human interaction with our so-called ‘environment.’

Connolly ’12 William E. Connolly, Krieger-Eisenhower Professor of Political Science at Johns Hopkins University, “Steps toward an Ecology of Late Capitalism,” Theory & Event, Vol. 15, Issue 1, 2012, Muse

3. Today, perhaps the initial target should be on reconstituting established patterns of consumption by a combination of direct citizen actions in consumption choices, publicity of such actions, and social movements to reconstitute the state/market supported infrastructure of consumption. By the infrastructure of consumption I mean state support for market subsystems such as a national highway system, a system of airports, medical care through private insurance, etc., etc., that enable some modes of consumption in the zones of travel, education, diet, retirement, medical care, energy use, health, and education and render others more difficult or expensive to procure.21 To shift several of these in the correct direction would already reduce extant inequalities. To change the infrastructure is also to affect the types of work and investment available. Social movements that work upon the infrastructure and ethos in tandem can make a real difference directly, encourage more people to extend their critical perspectives, and thereby open more people to a militant politics if and as a new disruptive event emerges. Perhaps a cross-state citizen goal should be to construct a pluralist assemblage by moving back and forth between shifts in role performance, revisions in political ideology, and adjustments in political sensibility, doing so to generate enough collective energy to launch a general strike simultaneously in several countries in the near future. Its aim would be to reduce inequality and to reverse the deadly future created by established patterns of climate change by fomenting significant shifts in patterns of consumption, corporate policies, state law and the priorities of interstate organizations. Again, the dilemma of today is that the fragility of things demands shifting and slowing down intrusions into several aspects of nature as we speed up shifts in identity, role performance, cultural ethos, market regulation, and citizen activism.

#### Nature and humanity do not exist as pre-formed totalities, but social theory which discards either as platonic myopia commits a severe strategic and ethical error. The future of humanity is not determined by humanism; time remains open to strategic interventions which infuse an emancipatory ethic into a spirit of engagement with difference.

Connolly ’11 William E. Connolly, Krieger-Eisenhower Professor of Political Science at Johns Hopkins University, A World of Becoming, 2011, p. 17-21

There has been a tendency in cultural theory, philosophy, and political theory to bypass work in biology and neuroscience, even though we humans have ourselves evolved from other species and come equipped with genes, blood, hearts, muscles, brains, sexual organs, feet, and even hands for typing, a practice that depends upon unconscious habits wired into the body/brain system through training and repetition. (No one I know can recite the order of the alphabet on the keypad they use so efficiently.) There are diverse, even contending, sources of that tendency. The reductionism of biology and neuroscience has been one. The difficulty of engaging them from the outside has been another. The desire to provide cultural theory its own foundations has constituted a third. Related to this, the desire to protect a theology of transcendence has provided a fourth. These disparate pressures push in the same direction. They spawn modes of cultural theory that do not come to terms closely enough with the biocultural organization of perception, the layered complexity of thought, multiple modes and degrees of agency in the world, innumerable intersections between nonhuman force-fields of several types and cultural life, the role of multi-media micropolitics in organizing nonconscious registers of intersubjective life, the critical role that cultivation of the visceral register of being plays in ethical life, the connections between natural and cultural time, and other issues besides. The arrival of complexity theory in the physical sciences places these reasons and excuses under new pressure. Complexity theory, as I receive it, moves natural science closer to the concerns of cultural theory as it surmounts reductionism. It advances several distinctive themes that touch received theories of explanation, interpretation, agency, ethics, and time in the human sciences. First, because of periodic confluences between novel changes in the environment and ‘‘pre-adaptations’’ that cannot be identified in advance, much of biological evolution cannot be predicted. A pre-adaptation is a biological feature that plays one role or is redundant at one time, but upon a strategic change in the environment now becomes important and promotes a new function. Thus, early fish had lungs that evolved into swim bladders, a novel functionality that allows fish to adjust their buoyancy to the water level, as the amount of air and water in the bladder is adjusted. Without the lung, fish would have evolved in a different way; with it there was no way to predict in advance that it would evolve the way it did. It is impossible to predict its evolution apart from detailed knowledge of other changes in and around it at a later date.∞ Innumerable such pre-adaptations are retrospectively discernible in cultural life, such as the bills of exchange that evolved into pivots of capitalist systems, the Calvinist quest for signs of predestination that evolved into capitalist tendencies in northern Europe to industriousness and accumulation, the creative (and destructive) use of high speed computers by a financial elite to exploit slower market transactions by the largest mass of investors, the Spinozist inspiration to Einsteinian theory, the receptivity of the visceral register of human intersubjectivity to multi-media coding by tv, the creative adaptation of the liberal doctrine of human rights into rights of doctor assisted suicide and same sex marriage, and the transfiguration of the human knowledge of mortality into a series of faiths that promise life after death. Since pre-adaptations are known after rather than before the fact, we already encounter a source of unpredictability and uncertainty in the evolution of nature/culture. Second, because of ‘‘Poincare resonances’’ that come into play when a previously stable system is thrown into disequilibrium, there are potentials for self-organization in some natural systems that also exceed our powers of prediction before they find expression. Ilya Prigogine suggests that such resonances were already in play in the period immediately following the Big Bang, generating one temporal flow out of several potentialities available, a direction that has affected everything else since.≤ When a simple physical system faces a new situation of disequilibrium, the pattern of resonance that arises seems to generate forks that can issue in more than one vector of development. The direction selected affects everything else that later emerges, without determining everything else in a simple, linear way. Brian Goodwin suggests, for instance, that such modes of self organization ‘‘at the edge of chaos’’ play a role at strategic intervals in species evolution.≥ The turn actually taken at a bifurcation point is interpreted by some under the star of chance or contingency. Perhaps. I suspect that it is wise to read such turns as modes of emergent causality that are neither reducible to chance, nor to explanation according to a classic concept of causality, nor to probability within a known distribution of possibilities. The actual turn sometimes exceeds any probability heretofore organized into the matrix of recognized possibilities. Some modes of opacity are due to incomplete information and others to processes that are intrinsically complex, when we recognize new conditions of intensified disequilibrium but cannot project with confidence the new turn that will be taken from that point. I claim that the American evangelical-capitalist resonance machine arose in a similar way, though the fact that its generators included sophisticated human subjects interacting across different subject positions during a period of accentuated uncertainty makes a real difference to the account. At a pregnant moment of new uncertainty, when many social scientists projected the expansion of secular development, a constellation of disaffected white workers, evangelicals, and neoliberal corporate leaders responded creatively to an evolving situation in a way that enabled a new econo-political constellation to emerge. It was irreducible to the separate parts—the perceived self-interests of each constituency—from which it emerged. Its advance grew out of prior spiritual affinities (pre-adaptations) across partial differences of interest and creed between the constituencies. Such a set of spiritual pre-adaptations is most readily identified retrospectively, though those who worried about how new movements of pluralization were closing out white blue collar workers did sense dimly that a potential realignment of some sort could be in the works.∂ As we shall see in a later chapter, similar developments are discernible in global politics today. The demise of the Soviet Union and the Cold War has combined with concomitant changes in the three religions of the Book to open new destructive patterns of resonance between cross-territorial constituencies. Third, because every spatio-temporal system constituting the universe is open to some degree, and because each regularly maintains connections with other heterogeneous systems and periodically forms connections to others, another source of potential disequilibrium stalks stable systems. For instance, the tier of chrono-time on which an asteroid flow is set could intersect with the rotational pattern of the earth, creating a collision that affects future life on the face of the earth. Or the trajectory of global capitalism and that of climate evolution could intersect, altering the intensity of the latter and changing the pressures for capitalist development. Or a world financial system with some degree of autonomy could collapse, creating new pressures for war or capitalist reform that were not discernible before that event occurred. Stuart Kaufman, indeed, conjectures that a collision between three open systems helped to generate preconditions for life on earth. ‘‘It may be that myriad small organized molecules and even more complex molecules, fell onto the young earth to supply some preconditions that then mixed with the electrical force-fields and soupy stuff on early earth [to form life].’’Σ Each of these open systems—molecules, electrical force-fields, and the soupy earth—was propelled by its own tendencies, but the improbable conjunction between them may have been responsible for the origin of life on earth. Of course, many will doubt that such an improbable event could have occurred in this way, as much as some of us doubt the story of a divine creation of life. Pre-adaptations unstateable in advance, intersections between partially open systems of multiple kinds, and novel capacities for self-organization within a system triggered by infusions from elsewhere periodically operate in and upon each other, generating turns in time out of which a new equilibrium emerges, transcending our ability to articulate it in advance. That means that recent developments in complexity theory carry implications for the image of time we bring to the study of nature and culture and particularly to the multiple imbrications between them. Some advocates of complexity theory in the natural sciences see this. Ilya Prigogine, for instance, a Nobel Prize-winning founder of chaos theory, argues that time preceded ‘‘existence’’ at the inception of our universe, meaning that the chaos preceding the big bang was itself temporal in character. The universe we inhabit, not necessarily the only one that could have evolved, continues to be ‘‘heterogeneous and far from equilibrium.’’ This leads him to postulate an image of time as becoming, a temporal flow that is irreversible in ways that upset the Newtonian model of reversible processes, replete with an element of uncertainty in what becomes and periodically the source of new events and processes. It is the relations between disparate processes set on different time scales that impress him the most. ‘‘We are in a world of multiple fluctuations, some of which have evolved while others have regressed. These fluctuations are the macroscopic manifestations of fundamental properties of fluctuations arising on the microscopic level of unstable dynamic systems . . . Irreversibility, and therefore the flow of time, starts at the dynamical level. It is amplified at the macro scopic level, then at the level of life, and finally at the level of human activity. What drove these transitions from one level to the next remains largely unknown, but at least we have achieved a noncontradictory description of nature rooted in dynamical instability.’’ The flow of irreversible time is eternal: ‘‘We have an age, our civilization has an age, but time itself has neither a beginning nor an end.’’Π Stuart Kaufman evinces a similar view. He draws upon the elements listed above to identify real creativity in the trajectory of natural and cultural processes. Attempts to expunge the creative dimension from natural processes are legion, either in pursuit of a linear, deterministic science or to protect the image of an omnipotent God who monopolizes creativity. But they rest upon speculative leaps or unproven articles of faith. Kauffman is willing to make such a leap in the opposite direction. Why go in that direction? Well, dominant assumptions postulate a radical break between nature and culture that is more and more difficult to sustain. The radical break between humanity and other processes—the ‘‘anthropic exception’’—is introduced to explain how we have capacities to understand natural regularities but the objects we comprehend have no power to participate in a world of becoming at all. Moreover, the alternative conjecture opens a door to urgently needed modes of collaboration between practitioners in literature, the natural sciences, and the human sciences, as we explore complex interconnections between the human estate and nonhuman processes. This conjecture also carries considerable promise in several fields of inquiry in the natural sciences, most particularly biology and neuroscience. And finally, following this trail may promote new possibilities of cross-fertilization between devotees of divine transcendence who concentrate creativity in God (not all devotees of transcendence do so) and devotees of a world immanent to itself who, while joining them in resisting closures in the Gallilean tradition, admit differential degrees of real agency and creativity into a variety of natural-social processes.