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#### Our world is composed of a complex assortment 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. A human is just 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.

#### Unfortunately, this world is in jeopardy. Anthropogenic climate change poses an unmistakable danger to life of all kinds on Earth. At stake are the very life cycle processes relied upon by humans and nonhumans alike.

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.

#### Climate change also affects humans unequally. Regions responsible for the least GHG emissions will be at the greatest disadvantage. Sea level rise puts the hundreds of millions of people living on coastal and low-lying regions at risk, while climate shifts magnify food and water shortages. Entire islands are sinking. Action is key.

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.

#### Global warming is a crisis point for the coordinates of contemporary critique. For much of the 20th century, theory tasked itself with breaking down totalizing regimes of ‘truth’ and ‘certainty’—but as these deconstructive practices have lost their critical spirit, our tools have fallen into the hands of political conservatives. A New York Times article relates the following:

(This paragraph is taken from the middle of the evidence cited below)

In these most depressing of times, these are some of the issues I want to press, not to depress the reader but to press ahead, to redirect our meager capacities as fast as possible. To prove my point, I have, not exactly facts, but rather tiny cues, nagging doubts, disturbing telltale signs. What has become of critique, I wonder, when an editorial in the New York Times contains the following quote? Most scientists believe that [global] warming is caused largely by manmade pollutants that require strict regulation. Mr. Luntz [a Republican strategist] seems to acknowledge as much when he says that “the scientiﬁc debate is closing against us.” His advice, however, is to emphasize that the evidence is not complete. “Should the public come to believe that the scientiﬁc issues are settled,” he writes, “their views about global warming will change accordingly. Therefore, you need to continue to make the lack of scientiﬁc certainty a primary issue.” 2

#### Critical thinkers must take notice: the ‘science wars’ are over—now the left’s arguments are fighting the right’s battles. It’s time for critique to change. We must challenge the socioeconomic forces behind rampant fossil fuel emissions directly.

Latour ‘4 Bruno Latour, Professor and vice-president for research at Sciences Po Paris, “Why Has Critique Run out of Steam? From Matters of Fact to Matters of Concern,” Critical Inquiry 30, Winter 2004

Wars. So many wars. Wars outside and wars inside. Cultural wars, science wars, and wars against terrorism. Wars against poverty and wars against the poor. Wars against ignorance and wars out of ignorance. My question is simple: Should we be at war, too, we, the scholars, the intellectuals? Is it really our duty to add fresh ruins to ﬁelds of ruins? Is it really the task of the humanities to add deconstruction to destruction? More iconoclasm to iconoclasm? What has become of the critical spirit? Has it run out of steam? Quite simply, my worry is that it might not be aiming at the right target. To remain in the metaphorical atmosphere of the time, military experts constantly revise their strategic doctrines, their contingency plans, the size, direction, and technology of their projectiles, their smart bombs, their missiles; I wonder why we, we alone, would be saved from those sorts of revisions. It does not seem to me that we have been as quick, in academia, to prepare ourselves for new threats, new dangers, new tasks, new targets. Are we not like those mechanical toys that endlessly make the same gesture when everything else has changed around them? Would it not be rather terrible if we were still training young kids—yes, young recruits, young cadets—for wars that are no longer possible, ﬁghting enemies long gone, conquering territories that no longer exist, leaving them ill-equipped in the face of threats we had not anticipated, for which we are so thoroughly unprepared? Generals have always been accused of being on the ready one war late— especially French generals, especially these days. Would it be so surprising, after all, if intellectuals were also one war late, one critique late—especially French intellectuals, especially now? It has been a long time, after all, since intellectuals were in the vanguard. Indeed, it has been a long time since the very notion of the avant-garde—the proletariat, the artistic—passed away, pushed aside by other forces, moved to the rear guard, or maybe lumped with the baggage train. 1 We are still able to go through the motions of a critical avant-garde, but is not the spirit gone? In these most depressing of times, these are some of the issues I want to press, not to depress the reader but to press ahead, to redirect our meager capacities as fast as possible. To prove my point, I have, not exactly facts, but rather tiny cues, nagging doubts, disturbing telltale signs. What has become of critique, I wonder, when an editorial in the New York Times contains the following quote? Most scientists believe that [global] warming is caused largely by manmade pollutants that require strict regulation. Mr. Luntz [a Republican strategist] seems to acknowledge as much when he says that “the scientiﬁc debate is closing against us.” His advice, however, is to emphasize that the evidence is not complete. “Should the public come to believe that the scientiﬁc issues are settled,” he writes, “their views about global warming will change accordingly. Therefore, you need to continue to make the lack of scientiﬁc certainty a primary issue.” 2 Fancy that? An artiﬁcially maintained scientiﬁc controversy to favor a “brownlash,” as Paul and Anne Ehrlich would say. 3 Do you see why I am worried? I myself have spent some time in the past trying to show “‘the lack of scientiﬁc certainty’” inherent in the construction of facts. I too made it a “‘primary issue.’” But I did not exactly aim at fooling the public by obscuring the certainty of a closed argument—or did I? After all, I have been accused of just that sin. Still, I’d like to believe that, on the contrary, I intended to emancipate the public from prematurely naturalized objectiﬁed facts. Was I foolishly mistaken? Have things changed so fast? In which case the danger would no longer be coming from an excessive conﬁdence in ideological arguments posturing as matters of fact—as we have learned to combat so eﬃciently in the past—but from an excessive distrust of good matters of fact disguised as bad ideological biases! While we spent years trying to detect the real prejudices hidden behind the appearance of objective statements, do we now have to reveal the real objective and incontrovertible facts hidden behind the illusion of prejudices? And yet entire Ph.D. programs are still running to make sure that good American kids are learning the hard way that facts are made up, that there is no such thing as natural, unmediated, unbiased access to truth, that we are always prisoners of language, that we always speak from a particular standpoint, and so on, while dangerous extremists are using the very same argument of social construction to destroy hard-won evidence that could save our lives. Was I wrong to participate in the invention of this ﬁeld known as science studies? Is it enough to say that we did not really mean what we said? Why does it burn my tongue to say that global warming is a fact whether you like it or not? Why can’t I simply say that the argument is closed for good? Should I reassure myself by simply saying that bad guys can use any weapon at hand, naturalized facts when it suits them and social construction when it suits them? Should we apologize for having been wrong all along? Or should we rather bring the sword of criticism to criticism itself and do a bit of soul-searching here: what were we really after when we were so intent on showing the social construction of scientiﬁc facts? Nothing guarantees, after all, that we should be right all the time. There is no sure ground even for criticism. 4 Isn’t this what criticism intended to say: that there is no sure ground anywhere? But what does it mean when this lack of sure ground is taken away from us by the worst possible fellows as an argument against the things we cherish?

#### There are a variety of ways to respond to our energy and climate crises. In the 1950s, nuclear planners chose solid uranium/plutonium fuel cycle designs—these reactors, after all, produced plutonium that we could make nuclear bombs from. Unfortunately, safe and efficient liquid-fluoride thorium reactors were passed over, and have since been ignored.

Hargraves and Moir ’10 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 Fluoride Thorium Reactors: An old idea in nuclear power gets reexamined,” American Scientist, Vol. 98, No. 4, July-August 2010, http://www.americanscientist.org/issues/feature/liquid-fluoride-thorium-reactors

What if we could turn back the clock to 1965 and have an energy do-over? In June of that year, the Molten Salt Reactor Experiment (MSRE) achieved criticality for the first time at Oak Ridge National Laboratory (ORNL) in Tennessee. In place of the familiar fuel rods of modern nuclear plants, the MSRE used liquid fuel - hot fluoride salt containing dissolved fissile material in a solution roughly the viscosity of water at operating temperature. The MSRE ran successfully for five years, opening a new window on nuclear technology. Then the window banged closed when the molten-salt research program was terminated. Knowing what we now know about climate change, peak oil, Three Mile Island, Chernobyl, and the Deepwater Horizon oil well gushing in the Gulf of Mexico in the summer of 2010, what if we could have taken a different energy path? Many feel that there is good reason to wish that the liquid-fuel MSRE had been allowed to mature. An increasingly popular vision of the future sees liquid-fuel reactors playing a central role in the energy economy, utilizing relatively abundant thorium instead of uranium, mass producible, free of carbon emissions, inherently safe and generating a trifling amount of waste. Of course we can't turn back the clock. Maddeningly to advocates of liquid-fuel thorium power, it is proving just as hard to simply restart the clock. Historical, technological and regulatory reasons conspire to make it hugely difficult to diverge from our current path of solid-fuel, uraniumbased plants. And yet an alternative future that includes liquid-fuel thorium-based power beckons enticingly. We'll review the history, technology, chemistry and economics of thorium power and weigh the pros and cons of thorium versus uranium. We'll conclude by asking the question we started with: What if? The Choice The idea of a liquid-fuel nuclear reactor is not new. Enrico Fermi, creator in 1942 of the first nuclear reactor in a pile of graphite and uranium blocks at the University of Chicago, started up the world's first liquid-fuel reactor two years later in 1944, using uranium sulfate fuel dissolved in water. In all nuclear chain reactions, fissile material absorbs a neutron, then fission of the atom releases tremendous energy and additional neutrons. The emitted neutrons, traveling at close to 10 percent of the speed of light, would be very unlikely to cause further fission in a reactor like Fermi's Chicago PiIe-I unless they were drastically slowed - moderated - to speeds of a few kilometers per second. In Fermi's device, the blocks of graphite between pellets of uranium fuel slowed the neutrons down. The control system for Fermi's reactor consisted of cadmium-coated rods that upon insertion would capture neutrons, quenching the chain reaction by reducing neutron generation. The same principles of neutron moderation and control of the chain reaction by regulation of the neutron economy continue to be central concepts of nuclear reactor design. In the era immediately following Fermi's breakthrough, a large variety of options needed to be explored. Alvin Weinberg, director of ORNL from 1955 to 1973, where he presided over one of the major research hubs during the development of nuclear power, describes the situation in his memoir, The First Nuclear Era: In the early days we explored all sorts of power reactors, comparing the advantages and disadvantages of each type. The number of possibilities was enormous, since there are many possibilities for each component of a reactor - fuel, coolant, moderator. The fissile material may be U-233, U-235, or Pu-239; the coolant may be: water, heavy water, gas, or liquid metal; the moderator may be: water, heavy water, beryllium, graphite - or, in a fast-neutron reactor, no moderator.... if one calculated all the combinations of fuel, coolant, and moderator, one could identify about a thousand distinct reactors. Thus, at the very beginning of nuclear power, we had to choose which possibilities to pursue, which to ignore. Among the many choices made, perhaps the most important choice for the future trajectory of nuclear power was decided by Admiral Hyman Rickover, the strong-willed Director of Naval Reactors. He decided that the first nuclear submarine, the LfSS Nautilus, would be powered by solid uranium oxide enriched in uranium-235, using water as coolant and moderator. The Nautilus took to sea successfully in 1955. Building on the momentum of research and spending for the Nautilus reactor, a reactor of similar design was installed at the Shippingport Atomic Power Station in Pennsylvania to become the first commercial nuclear power plant when it went online in 1957. Rickover could cite many reasons for choosing to power the Nautilus with the SlW reactor (SlW stands for submarine, 1st generation, Westinghouse). At the time it was the most suitable design for a submarine. It was the likeliest to be ready soonest. And the uranium fuel cycle offered as a byproduct plutonium-239, which was used for the development of thermonuclear ordnance. These reasons have marginal relevance today, but they were critical in defining the nuclear track we have been on ever since the 1950s. The down sides of Rickover 's choice remain with us as well. Solid uranium fuel has inherent challenges. The heat and radiation of the reactor core damage the fuel assemblies, one reason fuel rods are taken out of service after just a few years and after consuming only three to five percent of the energy in the uranium they contain. Buildup of fission products within the fuel rod also undermines the efficiency of the fuel, especially the accumulation of xenon-135, which has a spectacular appetite for neutrons, thus acting as a fission poison by disrupting the neutron economy of the chain reaction. Xenon135 is short-lived (half-life of 9.2 hours) but it figures importantly in the management of the reactor. For example, as it burns off, the elimination of xenon135 causes the chain reaction to accelerate, which requires control rods to be reinserted in a carefully managed cycle until the reactor is stabilized. Mismanagement of this procedure contributed to the instability in the Chernobyl core that led to a runaway reactor and the explosion that followed. Other byproducts of uranium fission include long-lived transuranic materials (elements above uranium in the periodic table), such as plutonium, americium, neptunium and curium. Disposal of these wastes of the uranium era is a problem that is yet to be resolved. Thorium When Fermi built Chicago PiIe-I, uranium was the obvious fuel choice: Uranium-235 was the only fissile material on Earth. Early on, however, it was understood that burning small amounts of uranium-235 in the presence of much larger amounts of uranium-238 in a nuclear reactor would generate transmuted products, including fissile isotopes such as plutonium-239. The pioneers of nuclear power (Weinberg in his memoir calls his cohorts "the old nukes") were transfixed by the vision of using uranium reactors to breed additional fuel in a cycle that would transform the world by delivering limitless, inexpensive energy. By the same alchemistry of transmutation, the nonfissile isotope thorium-232 (the only naturally occurring isotope of thorium) can be converted to fissile uranium-233. A thorium-based fuel cycle brings with it different chemistry, different technology and different problems. It also potentially solves many of the most intractable problems of the uranium fuel cycle that today produces 17 percent of the electric power generated worldwide and 20 percent of the power generated in the U.S. Thorium is present in the Earth's crust at about four times the amount of uranium and it is more easily extracted. When thorium-232 (atomic number 90) absorbs a neutron, the product, thorium-233, undergoes a series of two beta decays - in beta decay an electron is emitted and a neutron becomes a proton - forming uranium-233 (atomic number 91). Uranium-233 is fissile and is very well suited to serve as a reactor fuel. In fact, the advantages of the thorium /uranium fuel cycle compared to the uranium/plutonium cycle have mobilized a community of scientists and engineers who have resurrected the research of the Alvin Weinberg era and are attempting to get thorium-based power into the mainstream of research, policy and ultimately, production. Thorium power is sidelined at the moment in the national research laboratories of the U.S., but it is being pursued intensively in India, which has no uranium but massive thorium reserves. Perhaps the best known research center for thorium is the Reactor Physics Group of the Laboratoire de Physique Subatomique et de Cosmologie in Grenoble, France, which has ample resources to develop thorium power, although their commitment to a commercial thorium solution remains tentative. (French production of electricity from nuclear power, at 80 percent, is the highest in the world, based on a large infrastructure of traditional pressurized water plants and their own national fuel-reprocessing program for recycling uranium fuel.) The key to thorium-based power is detaching from the well-established picture of what a reactor should be. In a nutshell, the liquid fluoride thorium reactor (LFTR, pronounced "lifter") consists of a core and a "blanket," a volume that surrounds the core. The blanket contains a mixture of thorium tetrafluoride in a fluoride salt containing lithium and beryllium, made molten by the heat of the core. The core consists of fissile uranium-233 tetrafluoride also in molten fluoride salts of lithium and beryllium within a graphite structure that serves as a moderator and neutron reflector. The uranium-233 is produced in the blanket when neutrons generated in the core are absorbed by thorium-232 in the surrounding blanket. The thorium-233 that results then beta decays to short-lived protactinium-233, which rapidly beta decays again to fissile uranium-233. This fissile material is chemically separated from the blanket salt and transferred to the core to be burned up as fuel, generating heat through fission and neutrons that produce more uranium233 from thorium in the blanket. Advantages of Liquid Fuel 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 eUminating 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 subcriticai 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 poweroutage 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.

#### We affirm: The United States federal government should substantially increase market-fixed production cost incentives for Liquid Fluoride 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.

#### 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.

#### 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.

#### Praxis can be hard, but planning action is essential for achieving our critical goals. The world is not reducible solely to discourse—subjectivity is also positioned within material circumstances that influence thought—this demands particular strategies for change

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!

#### A responsible politics must learn to appreciate the contours and crannies permeating existence. Singular, unitary, and whole accounts of being are inevitably unsettled in confrontations with alterity; they respond with hatred, reactivity, and violence. A responsible politics must cultivate a sense of *becoming*. Evaluate this debate in terms of competing responses to difference.

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.

#### The intellectual exploration behind the 1AC is not just another positivist or technoscientific epistemology—the aff employs thorium power and climate science not as matters of fact, but matters of concern, cultivating an ethic of care for difference

Latour ‘4 Bruno Latour, Professor and vice-president for research at Sciences Po Paris, “Why Has Critique Run out of Steam? From Matters of Fact to Matters of Concern,” Critical Inquiry 30, Winter 2004

Do you see why I am worried? Threats might have changed so much that we might still be directing all our arsenal east or west while the enemy has now moved to a very diﬀerent place. After all, masses of atomic missiles are transformed into a huge pile of junk once the question becomes how to defend against militants armed with box cutters or dirty bombs. Why would it not be the same with our critical arsenal, with the neutron bombs of deconstruction, with the missiles of discourse analysis? Or maybe it is that critique has been miniaturized like computers have. I have always fancied that what took great eﬀort, occupied huge rooms, cost a lot of sweat and money, for people like Nietzsche and Benjamin, can be had for nothing, much like the supercomputers of the 1950s, which used to ﬁll large halls and expend a vast amount of electricity and heat, but now are accessible for a dime and no bigger than a ﬁngernail. As the recent advertisement of a Hollywood ﬁlm proclaimed, “Everything is suspect . . . Everyone is for sale . . . And nothing is what it seems.” What’s happening to me, you may wonder? Is this a case of midlife crisis? No, alas, I passed middle age quite a long time ago. Is this a patrician spite for the popularization of critique? As if critique should be reserved for the elite and remain diﬃcult and strenuous, like mountain climbing or yachting, and is no longer worth the trouble if everyone can do it for a nickel? What would be so bad with critique for the people? We have been complaining so much about the gullible masses, swallowing naturalized facts, it would be really unfair to now discredit the same masses for their, what should I call it, gullible criticism? Or could this be a case of radicalism gone mad, as when a revolution swallows its progeny? Or, rather, have we behaved like mad scientists who have let the virus of critique out of the conﬁnes of their laboratories and cannot do anything now to limit its deleterious effects; it mutates now, gnawing everything up, even the vessels in which it is contained? Or is it an another case of the famed power of capitalism for recycling everything aimed at its destruction? As Luc Boltanski and Eve Chiapello say, the new spirit of capitalism has put to good use the artistic critique that was supposed to destroy it. 9 If the dense and moralist cigar-smoking reactionary bourgeois can transform him- or herself into a free- ﬂoating agnostic bohemian, moving opinions, capital, and networks from one end of the planet to the other without attachment, why would he or she not be able to absorb the most sophisticated tools of deconstruction, social construction, discourse analysis, postmodernism, postology? In spite of my tone, I am not trying to reverse course, to become reactionary, to regret what I have done, to swear that I will never be a constructivist any more. I simply want to do what every good military oﬃcer, at regular periods, would do: retest the linkages between the new threats he or she has to face and the equipment and training he or she should have in order to meet them—and, if necessary, to revise from scratch the whole paraphernalia. This does not mean for us any more than it does for the oﬃcer that we were wrong, but simply that history changes quickly and that there is no greater intellectual crime than to address with the equipment of an older period the challenges of the present one. Whatever the case, our critical equipment deserves as much critical scrutiny as the Pentagon budget. My argument is that a certain form of critical spirit has sent us down the wrong path, encouraging us to ﬁght the wrong enemies and, worst of all, to be considered as friends by the wrong sort of allies because of a little mistake in the deﬁnition of its main target. The question was never to get away from facts but closer to them, not ﬁghting empiricism but, on the contrary, renewing empiricism. What I am going to argue is that the critical mind, if it is to renew itself and be relevant again, is to be found in the cultivation of a stubbornly realist attitude—to speak like William James—but a realism dealing with what I will call matters of concern, not matters of fact. The mistake we made, the mistake I made, was to believe that there was no eﬃcient way to criticize matters of fact except by moving away from them and directing one’s attention toward the conditions that made them possible. But this meant accepting much too uncritically what matters of fact were. This was remaining too faithful to the unfortunate solution inherited from the philosophy of Immanuel Kant. Critique has not been critical enough in spite of all its sore-scratching. Reality is not deﬁned by matters of fact. Matters of fact are not all that is given in experience. Matters of fact are only very partial and, I would argue, very polemical, very political renderings of matters of concern and only a subset of what could also be called states of aﬀairs. It is this second empiricism, this return to the realist attitude, that I’d like to oﬀer as the next task for the critically minded. To indicate the direction of the argument, I want to show that while the Enlightenment proﬁted largely from the disposition of a very powerful descriptive tool, that of matters of fact, which were excellent for debunking quite a lot of beliefs, powers, and illusions, it found itself totally disarmed once matters of fact, in turn, were eaten up by the same debunking impetus. After that, the lights of the Enlightenment were slowly turned oﬀ, and some sort of darkness appears to have fallen on campuses. My question is thus: Can we devise another powerful descriptive tool that deals this time with matters of concern and whose import then will no longer be to debunk but to protect and to care, as Donna Haraway would put it? Is it really possible to transform the critical urge in the ethos of someone who adds reality to matters of fact and not subtract reality? To put it another way, what’s the diﬀerence between deconstruction and constructivism? “So far,” you could object, “the prospect doesn’t look very good, and you, Monsieur Latour, seem the person the least able to deliver on this promise because you spent your life debunking what the other more polite critics had at least respected until then, namely matters of fact and science itself. You can dust your hands with ﬂour as much as you wish, the black fur of the critical wolf will always betray you; your deconstructing teeth have been sharpened on too many of our innocent labs—I mean lambs!—for us to believe you.” Well, see, that’s just the problem: I have written about a dozen books to inspire respect for, some people have said to uncritically glorify, the objects of science and technology, of art, religion, and, more recently, law, showing every time in great detail the complete implausibility of their being socially explained, and yet the only noise readers hear is the snapping of the wolf’s teeth. Is it really impossible to solve the question, to write not matter-of-factually but, how should I say it, in a matter-of-concern way? 10

#### Even if our aff does not resolve calculative thinking or our alienation from the environment, our advocacy of policy changes to address global warming is still essential. The scientific consensus around warming is not replicated in current politics. We should recognize and contest the destitution emblematic in warming denialism.

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Up to this point we have explored existential theories of responsibility, social ontology, and Heidegger’s philosophy of technology as each relates to global warming. But what about public policy; what about the formal laws that often dictate the norms and behavior of citizens within a society? As we discussed in the first chapter, a green revolution is in order. A green revolution will demand action that alters the state of our current nation and reevaluates our laws towards sustainability. According to Thomas Friedman, the green revolution will hopefully transform laws, thereby causing a dramatic change in the social consciousness of this country. Friedman said, in comparing the civil rights movement to a potential green movement, “Ultimately, it was about changing laws, so that no one had an option to discriminate, and it was those laws that ultimately changed the behavior and consciousness of tens of millions of people. But the civil rights movement started with citizen activism” (398). In order for such a green revolution to occur, as was the case with the civil rights movement, citizen activism in the form of a strong social ensemble resembling Sartre’s group must emerge. But, alas, we are forgetting an important part of this story: What, exactly, will these green laws entail; how will the government legislate sustainability? It is beyond the scope of this paper to speculate on the efficacy and economics of potential policies like a carbon tax or a cap-and-trade system. While new legislation certainly will not resolve Heidegger’s concerns about our loss of meditative thinking and treatment of things as standing reserve, it may still contribute significantly towards minimizing our greenhouse gas emissions and fighting global warming. However, before any law can ever realistically be pushed through Congress, a change in the attitude and beliefs towards our environment must occur. Pragmatism, a largely American philosophy, promotes the belief that we should seek to bring our diverse values, experiences, and perspectives into a harmonious pluralism. For pragmatists, policy serves as a powerful tool for meeting the challenges we experience in society. As Dr. John Stuhr, a scholar in American pragmatism, says regarding the pragmatist’s view towards philosophy: [I]t must be practical, critical, and reconstructive; it must aim at the successful transformation or amelioration of the experienced problems which call it forth and intrinsically situate it, and its success must be measured in terms of this goal. Thus, for the classical American philosophers, philosophy is primarily an instrument for the ongoing critical reconstruction of daily practice. (3) Philosophy must reside close to our experience and serve to change our environment in such a way that the problems plaguing society can be overcome through constructive activity. Thus, pragmatism is very much a “doer’s” philosophy and does not promote the traditional image of an intellectual lost in theory, detached from the world that surrounds him; rather, pragmatists wish to shake the very norms and rules of society if such a change is called for. But how can a pragmatic, policy-oriented approach to global warming that also accepts the plurality of attitudes, beliefs, and values in this country ever result in any action without undermining the very diversity of opinion on global warming? In other words, what sort of compromise, or harmonious pluralism, could possibly exist between people with fundamentally conflicting ideologies: those who adamantly believe in global warming and those who just as vigorously reject it? To make this question even more difficult to answer, research suggests that within the last decade a growing disparity between partisan ideologies over global warming has occurred. The trends indicate that Republicans are becoming increasingly skeptical of global warming while Democrats are becoming increasingly convinced of its reality.16 This trend was just recently epitomized in a bill (H.R. 910) authored by Republican Ed Whitfield, chairman of the Subcommittee on Energy and Power, that was approved and sent to the House of Representatives. The bill intends to prevent the Environmental Protection Agency from managing greenhouse gas emissions. According to an editorial in a major journal entitled “Into Ignorance”, during a recent subcommittee hearing on March 14, “Misinformation was presented as fact, truth was twisted and nobody showed any inclination to listen to scientists, let alone learn from them.”17 The article proceeds to say: “That this legislation is unlikely to become law doesn't make it any less dangerous. It is the attitude and ideas behind the bill that are troublesome, and they seem to be spreading” (266). These growing anti global-warming bills only exacerbate the political stalemate that continues to block progress and change. The “attitude” behind this bill—namely, that global warming either is not real or that it does not pose any sort of threat to us or our environment—exemplifies the very lack of distress felt in our society over this pressing issue. We again come back to this same question: how can we foster a plurality of beliefs and find a harmonious pluralism when political ideologies clash so fundamentally; how can government representatives make any sort of progress when such a blatant partisan divide exists? Unfortunately there is no easy solution to this problem. Many citizens feel demoralized and pessimistic precisely because of this very clear dissension within our government. Ironically, though, the scientific community is virtually unanimous on global warming; 97-98% of active climate researchers believe that climate change has resulted from human activities.18 Similarly, the Intergovernmental Panel on Climate Change (IPCC), the leading international body for the assessment of climate change, argued in a 2001 report that anthropogenic behavior has caused the rise in global temperatures. The IPCC, to which thousands of scientists contribute, stated in the report: “Anthropogenic factors do provide an explanation of 20th century temperature change...[and] it is unlikely that detection studies have mistaken a natural signal for an anthropogenic signal.”19 Some scientists, in fact, believe that the IPCC’s report erred on the moderate side and underestimated the effects that may occur from warming the planet.20 So, what will it take for the virtually unanimous scientific opinion to translate into political belief and action? In other words, what will it take to persuade Republican officials that global warming is real and caused by us? We have already mentioned the need for us to unite through a green revolution, but the strength of this movement is lacking right now due to this tension in public and political opinion about climate change. Ultimately, the pluralistic attitudes towards global warming must collapse into a more unified belief in its reality. As Trevors and Saier Jr. state in a journal article entitled “A Vaccine Against Ignorance,” lies against global warming continue to be disseminated even though the scientific evidence is “unequivocal.”21 The solution they propose: education. They say, “Humanity certainly needs to be immunized with a vaccine for ignorance, and we propose that the vaccine is education.” Thus, the last two sections of this chapter will investigate two necessary areas of education on global warming. The first area of education must be in public awareness; ensuring that the public has been exposed to the large body of scientific data that shows the anthropogenic cause of global warming. Once public awareness increases and people become better informed, a more unified societal attitude towards global warming that resembles a Sartrean group (rather than our current Sartrean collective) is more likely to emerge and politicians may then be swayed by public pressure and opinion. The other area of education must stress the need for a greater appreciation of our natural environment—it must remind us of our humble place within this earth’s dynamic whole, and call attention to the positioned, technological world that impairs an ethic of care towards our environment.