Broadening Bioethics

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I. Introduction

The academic world is in love with academic structure, e.g., disciplines, fields, departments, programs, and schools. To some extent this is beneficial. Serious thought requires distinctions. Analytic methods rely on dividing and conquering the material under examination. Disciplines provide resources for these activities through their canons, methodologies, and vocabularies. They shape the questions that are asked, and help to define what counts as answers. Even when this love affair is not good it is often relatively harmless. Identifying with a discipline or department is like belonging to a guild or a union, or cheering for the home team. Some people like wearing a team uniform more than other people, but this is not a matter of great concern.

However, to some extent, this love of academic order is pernicious. It can be more like sophisticated (but still vicious) forms of tribalism than conformity to sensible epistemological canons. The love of institutional distinctions can distract or deflect us from the most urgent problems we face. These problems do not respect the order of battle imposed by university administrations and policed by college professors, graduate students, and professional organizations. They come to us in their own terms. Thus, if we want to make progress on some of these problems, we must follow where they lead, rather than attempting to impose on them our favored categories of thought.

In this paper we discuss the past, present, and future of bioethics. Bioethics has a fractured history: some thinkers have associated it primarily with health ethics and others have associated it primarily with environmental ethics. More recently, these lines have blurred, in part because questions about health and the environment are so deeply entwined. We discuss several ethical issues where questions about health and the environment play a central role. Some of these issues, like the ethics of food, have received a lot of attention in bioethics. Others, like the ethics of war, have not. We claim that we will have to expand the scope of bioethics in order to gain a more complete understanding of these issues.

II. The Origins of Bioethics

In the United States at least, bioethics has a clear if relatively unknown history. The term was coined by Van Rensselaer Potter, an oncologist of Dutch extraction, who spent his entire career at the University of Wisconsin. Within months the same term was being used in a quite different way by André E. Hellegers, a Dutch obstetrician-gynecologist, who was the founding director of the Kennedy Institute of Ethics at Georgetown University in Washington.

Potter characterized bioethics as a new discipline devoted to "the *science of survival*," which he saw it as a "bridge" between the two cultures of science and the humanities. His vision was to create knowledge that would make possible "a rational but cautious participation in the processes of biological and cultural evolution."[i] The ultimate goal of this discipline was "not only to enrich individual lives but to prolong the survival of the human species in an acceptable form of society."[ii] As an oncologist working at one of the most environmentally-minded universities in the world, Potter was quite sensitive to the environmental causes of cancer and the evolutionary context in which it occurred. He viewed human and environmental health as deeply entwined. He was an expansive, secular-minded thinker, whose vision of bioethics was global in scope. His last book*, Global Bioethics*, was subtitled, "Building on the Leopold Legacy," in homage to the great environmental thinker, Aldo Leopold, who was his colleague at the University of Wisconsin (though apparently they never met). While there is controversy about the extent to which Potter's views were entirely anthropocentric or whether or in what sense he regarded nonhuman nature as intrinsically valuable, there is no question about the breadth and expansiveness of his vision for bioethics.[iii]

André E. Hellegers was a Catholic obstetrician-gynaecologist who founded an institute in a Jesuit university that was initially devoted to the study of human reproduction and development. He came to the attention of the Kennedy family through his work on the Pontifical Commission for the Studies on Family, Population and Birth, created by Pope John XXIII during the time of the Second Vatican Council, and expanded by his successor Pope Paul VI. Although within the church Hellegers was regarded as a liberal, the institute he founded was guided by a Catholic moral agenda, primarily focusing on questions of reproductive ethics, and justice in the provision of health care. The "Georgetown model" (as it came to be called) introduced a notion of bioethics focused on concrete medical dilemmas, primarily in three fields: (1) the rights and duties of patients and health professionals; (2) the rights and duties of research subjects and researchers; and (3) the formulation of public policy guidelines for clinical care and biomedical research.[iv]

Potter was a loner in this field, and his periodic publications could not compete with the Kennedy Institute in influence. Bolstered by his base at the Kennedy Institute, an endowment provided by the family, a supportive university setting and a coherent intellectual agenda, Helligers' conception of bioethics

quickly became dominant. A similar vision of bioethics was also embodied by the Hastings Institute, founded in 1969 by Catholic philosopher Daniel Callahan and psychiatrist Will Gaylin. The Georgetown model was encapsulated in the 1978 *Encyclopedia of Bioethics*, which Callahan has called "the central document" that gives bioethics "a sense of coherence and direction," serving as a "rallying point" for all who work in the field.[v]

Whereas Potter saw bioethics as a new discipline that would combine scientific and philosophical knowledge, Georgetown saw bioethics as part of an old discipline, philosophy—in particular, as a branch of applied ethics.[vi] Potter was convinced of the potentially strong and influential links between science and ethics, but the Georgetown model emphasized the autonomy of ethics and its independence from science. [vii] While Potter called for broad, new thinking about the human condition, the Georgetown model sought to

> "resolve [concrete] moral problems" in the biomedical arena, through the coherent application of already-established and universally valid ethical principles.[viii]

III. **The Contemporary Landscape**

Times are changing, and the broader vision of Potter is gaining ground even though he himself remains relatively unknown. The New York University Center for Bioethics, for example, launched in 2007, "promotes a broad conception of Bioethics encompassing both medical and environmental ethics."[ix] Interestingly, the tide may have begun to turn first in Italy. In his "Global Bioethics Final Message," written just before his death in 2001, Potter wrote:

> It was in 1988 that I published *Global Bioethics, Building on the Leopold Legacy*. In all the world there was just one person who saw the book, saw the opportunity and contacted me. It was Brunetto Chiarelli, Professor of Anthropology, University of Florence, Italy. In 1990 he invited me to give a lecture "Global Bioethics" in Northern Italy, in Trentino, a progressive community. I accepted the invitation and went there under the care of my son, Carl. It was my last trip outside the USA.[x]

The idea of broad bioethics is gaining currency because many of the most serious problems we face occur at the nexus of biology, technology, and power. Science and technology have given us the ability to prolong life to such an extent that in particular cases we must decide whether to use this power in light of concerns about the quality of the life that is being prolonged and the investment of fungible resources that would be required to do so. The invention and development of chlorofluorocarbons made access to refrigeration available on a mass scale, but these chemicals have also depleted the ozone layer that makes life on earth possible. As a result, we have had to decide how and when to retire these chemicals, and who is allowed to use them while substitutes are being brought on line.

Some of these problems at the nexus of biology, technology, and power pose problems of medical ethics. These include problems involved with death and dying, access to health care, and the increasing prevalence of obesity. Other problems at the nexus of biology, technology, and power pose problems of environmental ethics, such as ozone depletion, species extinction, and resource degradation. There are clear cases on both sides of the divide, but even these clear cases carry echoes from the other domain.

Consider the problem of obesity, which poses clear questions of medical ethics but also raises questions of environmental ethics. In the United States agricultural subsidies and trade restrictions result in the overproduction of corn, much of which is processed into high-fructose corn syrup, which is then used to sweeten a vast array of manufactured food products, increasing their caloric content, thus contributing to obesity. Other environmental factors such as the nature of the built environment, the geographical shape and structure of cities, and transportation planning also affect the prevalence of obesity. There is a clear correlation between urban sprawl and obesity, though it is controversial as to whether there is a causal connection.[xi]

Now consider ozone depletion, which poses clear questions of environmental ethics but also raises questions of medical ethics. As the ozone layer thins, the protective filter provided by the atmosphere is progressively reduced. Consequently human beings and the environment are exposed to higher ultra-violet (UV) radiation levels, and especially higher UVB levels that have the greatest impact on human health, animals, marine organisms and plant life. According to the World Health Organization a 10% decrease in stratospheric ozone is estimated to cause an additional 4,500 melanoma and 300,000 non-melanoma skin cancers and between 1.6 and 1.75 million cases of cataracts each year.[xii]

Some problems straddle the health/environment divide. For example, air and water pollution are paradigm environmental problems, but they have just as much claim to be considered public health problems. Indeed, when governments take action on these problems they are usually motivated by human health concerns though such actions also produce broad environmental benefits. A recent report from a British parliamentary committee claims that air pollution "reduces the life expectancy of everyone in the UK by an average of seven to eight months and up to 50,000 people a year may die prematurely because of it… air quality probably causes more mortality and morbidity than passive smoking, road traffic accidents or obesity."[xiii]

In addition to the fact that health and environmental problems often echo in the other domain and that some problems straddle both domains, there are other problems that are arbitrarily assigned to one domain or the other. For example, when genetic engineering is applied to *Homo sapiens* it is regarded as

provoking questions of medical ethics. When it is applied to all other animals it is viewed as raising issues of environmental ethics.

IV. Food

Some problems are so complex and dynamic that they exhibit all of these features at once. Consider the impacts of industrial animal agriculture. We currently breed, raise, and kill more than 60 billion animals each year for food, not including aquatic animals,[xiv] and that number will continue to rise as global demand for meat increases and the rest of the world continues to adopt western industrial agricultural models.

Some of the impacts of our food system primarily concern health but also have implications for the environment. For example, many farmers use antimicrobials on farm animals in order to make them grow faster and prop up their weakened immune systems.[xv] But this liberal, nontherapeutic use of antimicrobials makes it easy for antimicrobial resistant pathogens to develop. And, when these pathogens develop, our intensive confinement of farm animals makes it easy for them to spread.[xvi] The upshot is that we are all at increased risk not only of eating contaminated food but also of contracting infectious disease. Insofar as new, antimicrobial resistant pathogens pose a threat to other animals (thereby also posing a threat to the ecosystems that these animals inhabit), this health problem is an environmental problem as well.

Other impacts of our food system primarily concern the environment but also have implications for health. For instance, we consume large quantities of natural resources in order to produce the food that we eat.[xvii] Consider water and land: we use nearly 87% of freshwater in the US for agriculture[xviii] and we use a quarter of the ice-free terrestrial surface of the planet for livestock grazing.[xix] Additionally, we use huge amounts of fossil fuels in our food system: for example, we consume an average of three units of fossil fuel energy for each unit of food energy that we produce in the US, and that ratio can rise as high as 35:1 for industrial meat.[xx] And of course, insofar as our use of natural resources in industrial agriculture diverts them from other, more efficient uses (such as providing food and energy to a much wider population than we currently do), this environmental problem is a health problem as well.

Still other impacts of our food system straddle health and the environment. Waste from factory farms contaminates local air, soil, and water, causing health impacts such as respiratory disease,[xxi] neurological problems,[xxii] and mental health problems[xxiii] as well as environmental impacts including soil and sediment erosion[xxiv] and “dead zones” in inland and marine water.[xxv] And the impacts of waste have only increased with deregulation: for instance, a few years after the North Carolina State Legislature deregulated hog farms, Smithfield spilled more than twenty million gallons of pig feces (as well as many other toxic chemicals) into the New River, causing untold damage to public health and the environment.[xxvi]

Another impact of our food system that straddles health and the environment is the widespread use of synthetic fertilizers and pesticides on crops, as well as the widespread use of genetically modified organisms (GMOs) designed to be resilient in the face of changing soil and weather conditions. While we still have much to learn about the long-term effects of GMOs, many people worry that eating genetically modified plants will do lasting damage to our health and that growing them will do lasting damage to the environment.[xxvii] Moreover, these concerns apply not only to plants but also to animals: for example, genetically modified fish routinely escape from fish farms and enter wild populations, raising questions about how they will affect aquatic food chains and ecosystems.[xxviii] At the very least, these are issues to which we can and should be applying the kinds of risk analyses that are commonplace in the medical ethics and environmental ethics literatures.

By far the most important health and environmental impact of our food system, however, is its contribution to anthropogenic climate change. We acquire most of the land that we use for agriculture through deforestation, and this practice of deforestation destroys not only many species and ecosystems but also carbon sinks, thereby releasing carbon into the atmosphere and making the planet less able to absorb future emissions.[xxix] Moreover, and more generally, we produce more greenhouse gases through industrial animal agriculture than through any other single activity. For example, livestock alone are responsible for 9% of the carbon, 37% of the methane, and 65% of the nitrous oxide we release into the atmosphere.[xxx] As alarming as these figures might initially seem, they become even more alarming when we consider the fact that methane traps heat much more effectively than carbon dioxide, and nitrous oxide traps heat much more effectively than methane.

Finally, of course, we might also regard the animal welfare impacts of industrial animal agriculture as a matter of bioethical concern, especially since livestock now make up 88%, by volume, of all animals on this planet[xxxi] – though, as we have seen, it is unclear whether bioethicists would prefer to think about this issue through the lens of health ethics, environmental ethics, or both.

Bioethicists have said a lot about the health and environmental impacts of our global food system, and they have also said a lot about some of the ethical questions that these impacts raise (e.g., questions about the ethics of food production and consumption). But they have not yet said much about many of the other, related ethical questions that these impacts raise (e.g., questions about the ethics of food politics, policy, activism, and advocacy). What we need is an integrated approach to the ethics of food that addresses all of these issues in an interdisciplinary and intersectional way – an expansion of the scope of bioethics that will take us in surprising new directions and lead us to build unanticipated new disciplinary alliances.

V. War

Some problems have enormous health and environmental consequences yet have been neglected in both areas. Although it has been clear that war poses both medical and environmental problems since at least 146 BCE when the Romans salted the fields around Carthage to impair food production, war is not typically viewed as posing problems of bioethical concern.

The American war in Southeast Asia (1959-1975) provides many examples of the interlocking environmental and health effects of military tactics. According to one review article, the American strategy in Viet Nam involved

> …truly massive rural area bombing, chemical and mechanical forest destruction, large-scale crop destruction, destruction of food stores, the destruction of hospitals, and large-scale population displacements--in short the massive, intentional disruption of both the natural and human ecologies of the region"[xxxii]

The best known of these tactics involved the use of various herbicides as defoliants. 20 percent of South Vietnam's jungles were sprayed with defoliants for various purposes: to reduce cover for enemy troops, to destroy food crops, to clear sensitive areas such as those around base perimeters, and to drive civilians into South Vietnamese-controlled areas. The most widely used defoliant was Agent Orange, so named because of the color of the striping on the barrels in which it was shipped. Agent Orange was a mixture of two phenoxyl herbicides, and at the time it was used in Vietnam it contained a dioxin (2,3,7,8 tetrachlorodibenzodioxin (TCDD)) as a byproduct of its manufacture. TCDD is a known human carcinogen, frequently associated with soft-tissue sarcoma, non-Hodgkin's lymphoma, Hodgkin's disease and chronic lymphocytic leukemia, and linked to other diseases and disorders including Parkinson's, heart disease, and high blood pressure. According to a recent *Nature* article, "millions of Vietnamese were likely to have been sprayed upon directly."[xxxiii] The Vietnamese Ministry of Foreign Affairs claims that 4.8 million Vietnamese people were exposed to Agent Orange, resulting in 400,000 deaths and disabilities, and 500,000 children born with birth defects.[xxxiv] In 1979 a class action suit was filed on behalf of American veterans exposed to Agent Orange against the chemical companies that manufactured it. The companies settled the suit out of court in 1984, creating a compensation fund while not admitting responsibility. The same year the US government passed a law recognizing Agent Orange related disability claims. Viet Nam war veterans from Australia, Canada, New Zealand, and South Korea have also won their struggles to be compensated for Agent Orange-related harms. The only population that has not won its struggle is the one that was most affected: the people of Viet Nam. In 2004 a case brought by the Vietnamese association of victims of Agent Orange/Dioxin was thrown out of US Federal Court on the grounds that Agent Orange was not considered a poison under international law at the time of its use by the US, that the US was not prohibited from using it as a herbicide, and that the companies which produced it were not liable for the method of its use by the government.[xxxv]

Unfortunately very little seems to have been learned from these events. Countries continue to fight wars both by attacking people and degrading environments, and the harms are multiplied by the interaction between them. The United Nations Environment Programme has a Post Conflict Center, which in 2003 rather optimistically produced a report about Afghanistan. It concluded that

> …nearly 25 years of armed conflict, and four years of extreme drought, have created widespread human suffering and environmental devastation across the country. Warfare, lawlessness and food insecurity have made refugees of some four million Afghans--the equivalent to a quarter of the total country population at the time of the Soviet occupation in 1979. Infrastructure has been destroyed and many institutions and administrative systems have collapsed. The country is perhaps the most heavily mined in the world and large areas cannot be entered without risk. The nation's biological resources are being rapidly degraded by uncontrolled grazing, cultivation, water extraction, hunting and deforestation. [xxxvi]

Yet contrary to the idea of a "post conflict" Afghanistan, the recent US-led wars in Iraq and Afghanistan, which were ramping up when this report was released in 2003, have only intensified the destructive impacts of war in the region, providing us with yet another urgent reminder of how complex, dynamic, and interconnected health and environmental issues have become.

For example, consider some of the health impacts of US military action in Iraq and Afghanistan. As the Center for Constitutional Rights (CCR) discusses in a 2014 report for the Right to Heal Initiative, the US military used white phosphorous, a dangerous incendiary chemical agent, in several battles in Iraq, despite the fact that part of the rationale for the US-led invasion of Iraq in 2003 was that Saddam Hussein used white phosphorous against the Kurds in 1991.[xxxvii] This use of white phosphorous in Iraq is believed to have caused many civilians to suffer from "thermal and chemical burns, respiratory damage, circulatory shock, asphyxiation, and carbon monoxide poisoning," with possible intergenerational effects as well.[xxxviii] Additionally, the US dropped tens of thousands of cluster bombs in Iraq and Afghanistan and an unknown number of Mark-77 bombs – a functional equivalent of Napalm – in Iraq. Both kinds of weapons, like white phosphorous, have a broad range and are reportedly responsible for many civilian casualties. Meanwhile, unexploded cluster submunitions will continue to pose a threat to human and nonhuman populations in the region for years to come.[xxxix]

The CCR also reports that the US military used "between 440,000 kg and 1,000-2,000 metric tons" of depleted uranium (DU) in munitions and armor plating during the war in Iraq.[xl] DU is a synthetic radioactive metal that poses severe health and environmental risks. In particular,

> DU can result in harm to the health of humans in four ways, i.e. as (1) a toxic heavy metal; (2) a genotoxic (carcinogenic and mutagenic) agent from its chemical properties; (3) a genotoxic agent from its radiation; and (4) an endocrine disruptor. … Since the wars in Iraq, the incidence of infant mortality, birth defects and cancer in Iraq has sharply increased – a fact which many attribute to the U.S. military's use of DU.[xli]

To make matters worse, the US military used open air burn pits to dispose of most of its solid waste in Iraq and Afghanistan including fuel, weapons, munitions, biomedical waste, and more. Many of these burn pits operated 24 hours a day, 7 days a week, exposing military and civilian populations alike to multiple chemicals known to cause "cancers, liver toxicity and reduced liver function, kidney toxicity and reduced kidney function, respiratory toxicity and morbidity, neurological effects, … and reproductive toxicity."[xlii] And while there is currently no consensus about the exact role that burn pits played in increased cancer rates in the region, several independent studies have connected exposure to burn pits with increased constrictive bronchitis, respiratory problems, and cardiovascular problems. Collected anecdotal reports from veterans point to other, more severe symptoms as well.[xliii] (And of course, this is to say nothing of the severe mental health impacts of exposure to toxic chemicals, as well as of war more generally.)

Now consider some of the environmental impacts of US military action in Iraq and Afghanistan. As the Watson Institute for International Studies at Brown University revealed in a 2011 report on the Costs of War,[xliv] many of the chemicals used during these wars contaminated the soil and water, including depleted uranium, perchlorate (from rocket propellant), and benzene and trichloroethylene (from air base operations). This contamination is believed to have affected not only cancer and infant mortality rates but also the ratio of male to female birth rates in the region.[xlv] Moreover, the US military consumed an alarming amount of fuel and produced an alarming amount of greenhouse gases during these wars. For example, in a single month of military activity in Iraq in 2008, the US military is estimated to have consumed over a million gallons of fuel,[xlvi] as much as two thirds of which was used to transport fuel to other vehicles.[xlvii]

The wars in Iraq and Afghanistan have also impacted the environment through the destruction of forests, wetlands, and wildlife. US military action in Afghanistan produced millions of refugees, who, along with US-supported warlords, engaged in widespread illegal logging in order to obtain food, fuel, and other materials. This logging then led to deforestation, which led to drought, which – along with heavy military vehicles – caused toxic dust to spread much more easily than it otherwise might have.[xlviii] Deforestation and bombing have also disrupted migratory routes: for instance, the number of pelicans and endangered Siberian cranes who survived their migration through eastern

Afghanistan reportedly fell by 85 percent in 2002 alone.[xlix] Finally, the wars in Iraq and Afghanistan have endangered animals in other ways as well: for example, occupying soldiers and aid workers provide a lucrative market for the skins of endangered animals like the Snow Leopard, which has motivated Afghans to hunt these animals to the brink of extinction despite a hunting ban in place since 2002.[l]

It is hardly surprising that war should cause health and environmental problems, especially in view of the truism that the purpose of an army is to kill people and break things. However, it is useful to remember that even preparing for war is destructive. War preparations alone utilize up to 15 million square kilometers of land, account for 6% of all raw material consumption, and produce as much as 10% of global carbon emissions annually.[li] In the 1990s German military activities accounted for 4.3% of Germany's total CO2 emissions, while US military emissions were 42% of the US federal government's total emissions, making the military the single largest public greenhouse gas emitter in the US.[lii] Moreover, the production of weapons containing toxic chemicals has many of the same impacts as their use: for example, a 2009 study estimated that 4.8 tons of depleted uranium leaked from a weapons factory in Colonie, NY and contaminated soil throughout the area.[liii] And now, more than twenty years after the plant closed, researchers are finding DU in the urine of residents and workers as well as increased cancer rates in the area.[liv] Finally, the US military is exempt from a wide range of environmental laws including the Endangered Species Act, and regulations protecting migratory birds and marine mammals. According to the World Bank, 2.4% of global GDP is devoted to military resources. [lv] If this figure were even halved we could purchase an enormous amount of environmental quality and improved health outcomes.

Bioethicists have discussed the health and environmental impacts of food in great detail (while, as we have noted, discussing some of the ethical questions these impacts raise more than others). Yet they have not discussed the health and environmental impacts of war much at all. There is a natural explanation for this: when we think about the ethics of war, we quite understandably focus on the ethics of killing and torturing people. But of course, we should not allow our focus on these issues prevent us from also considering the ethics of making people sick and of polluting the land, water, and air, all consequences of warfare. A robust study of the ethics of war would incorporate research on the health and environmental impacts of war as well as on killing and torture.

VI. Climate Change

It is the problem of climate change – which, as we have seen, many of these other problems feed into or will be exacerbated by – that demonstrates most convincingly the importance of an environmental turn in bioethics. The consequences of climate change will be broad, deep, and persistent, and human health problems will be of central importance.

The most recent report of the Intergovernmental Panel on Climate Change shows that climate change will increase the incidence of vector borne diseases such as malaria, put more people at risk for malnutrition due to agricultural declines and loss of fish stocks, cause increases in pulmonary and cardiovascular events due to increases in ground-level ozone, increase the incidence of diarrhea due to drought and water shortages, increase cholera due to higher water temperatures, cause more allergies, and increase deaths and damages due to extreme events.[lvi] It is difficult to precisely quantify these effects because it is unclear what actions will be taken to mitigate and adapt to climate change, exactly how sensitive climate is to increasing concentrations of greenhouse gases, and what will be the regional and community effects of changes in global climate. While the signs are clear, the exact impacts are not. However, the World Health Organization has estimated that approximately 150,000 deaths per year are already occurring in low-income countries due to climate change caused crop failure and malnutrition, diarrheal disease, malaria and flooding.[lvii] This burden will almost certainly increase as the warming intensifies. As examples of the sort of events that will become more frequent and extreme we can look to 2005 Hurricane Katrina, which killed nearly 2,000 people and caused nearly $200 billion in damages on the Gulf Coast of the United States, the European heatwave of August, 2003 which killed nearly 40,000 people (more than half of them in Italy),[lviii] and the droughts in Darfur which UN Secretary-General Ban Ky Moon claims are implicated in the ongoing conflict that has cost several hundred thousand lives.[lix] The point is not that these events were caused by climate change (though perhaps they were), but rather that they are the sorts of events that will become more frequent as a result of climate change.

It is difficult to identify the climate change contributions to such disasters because they are always entwined with social and political conditions. Hurricane Katrina was so devastating in part because of the poverty of the city of New Orleans and the weakness of its public health institutions. While there are disagreements about which social factors played the most important roles in the mortality associated with the 2003 European heatwave (e.g., failures in administration, family care, etc.), there is no doubt that such factors were strongly implicated. As the warming to which we are already committed becomes more severe, feedbacks between social and political conditions and climate will intensify. The number of environmental refugees will grow, tensions between countries dependent on common, shrinking water resources will increase, and so on.

These concerns will arise from the expected warming of 1.5-4.5 C over the next century. However, there is also the possibility of the sort of abrupt climate change that has occurred at various times in Earth's history. For example, during the onset of the Younger Dryas, which occurred 12,900-11,600 years before present, temperatures dropped more than 16C, and when the Younger Dryas ended temperatures increased 10C in a single decade. In 2003 the Pentagon

commissioned a report on the impacts of abrupt climate change, which concluded:

> Humanity would revert to its norm of constant battles for diminishing resources, which the battles themselves would further reduce even beyond the climatic effects. Once again warfare would define human life.[lx]

Climate change is occurring. What is in question is its pace, extremity, and consequences. What is clear is that the poor and vulnerable who have done the least to cause the problem will suffer more than the rich and powerful who have done the most to disrupt climate. Such circumstances pose important questions of bioethics. For example, how does climate change affect our obligations to other nations and future generations? How much time, energy, and money should we invest in adaptation, i.e. in trying to adapt to the effects of climate change, and how much time, energy, and money should we invest in mitigation, i.e. in trying to mitigate these effects in the first place? And, perhaps most importantly, how can we motivate people to do the right thing, given that climate change is the largest collective action problem the world has ever faced?[lxi]

VII. Concluding Cautionary Remarks

We have been suggesting that since the invention of the word 'bioethics' in 1970, there have been, in the United States at least, two quite different conceptions of its subject matter. The Georgetown model, rooted in Catholic moral theology and relatively narrow in focus, has been dominant, but the more expansive notion associated with Potter is attracting increased attention. What we want to suggest now is that in the late nineteenth and early twentieth centuries, long before the invention of the word 'bioethics', the substantive overlap between ethics, health, and the environment was recognized in the public health movement (also known as the sanitation movement) and in the nascent environmental movement.[lxii] We illustrate this by discussing an important public controversy that began in the 1920s.[lxiii]

In October 1924 an incident at a Standard Oil refinery in New Jersey commanded the nation's attention. Five workers went violently insane and then died from a mysterious poison they were making. The poison was tetra ethyl lead (TEL), an anti-knock, octane-boosting gasoline additive discovered by General Motors researchers in 1921 and introduced commercially by the Ethyl Corporation in 1923.[lxiv] When it became widely known that this poison was being added to gasoline, and that other workers had died in similar refineries, a vehement controversy broke out. Several states and the city of New York quickly banned leaded gasoline. Public health scientists, such as Dr. Alice Hamilton, the first female Harvard Medical School Professor and Dr. Yandell Henderson of Yale, spoke out against TEL. Henderson presciently observed:

> Breathing day by day of the fine dust from automobiles will produce chronic lead poisoning on a large scale…Perhaps if leaded gasoline kills enough people soon enough to impress the public, we may get from

> Congress a much needed law and appropriation for control of harmful substances other than foods. But it seems more likely that the conditions will grow worse so gradually and the development of lead poisoning will come on so insidiously ... that leaded gasoline will be in nearly universal use and large numbers of cars will have been sold that can only run on that fuel before the public and the government awaken to the situation.[lxv]

The Ethyl Corporation denied that TEL posed a health risk to the public since it is diluted in gasoline, and denounced Henderson as a disgruntled scientist who had tried and failed to get a consulting contract from the company. Ironically, Thomas Midgley, Corporate Vice President, discoverer of TEL and most frequent company spokesman on its behalf had himself suffered from lead poisoning the previous year. He wrote that "I find that my lungs have been affected and that it is necessary to drop all work and get a large supply of fresh air." [lxvi]

In response to the controversy, the United States Public Heath Service convened a conference on the risks of TEL, and subsequently appointed an expert committee to study the matter. The Ethyl Corporation agreed to take TEL off the market until the committee's report was submitted. The committee's charge was to examine the health impacts of TEL, not to compare its risks and benefits to those of alternatives. Despite their prominence, neither Hamilton nor Henderson were appointed to the committee.

In January 1926, the committee issued its report. While calling for more research and complaining about lack of data, the committee concluded that there were "no good grounds for prohibiting the use of Ethyl gasoline."[lxvii] Ethyl officials announced that they had been vindicated, and after agreeing to warning labels on leaded gasoline, began to market it again in the spring of 1926. For three generations these warning labels would appear in virtually every gasoline station in America: "Contains lead (tetraethyl) and is to be used as a motor fuel only. Not for cleaning or any other use." By the late1930s leaded gasoline dominated the American market and had made great inroads in Europe. By the late 1940s leaded gasoline had become the global standard.

The 1950s brought rising concern about air pollution, as well as evidence of widespread exposure to lead. Studies by Clair Patterson and others showed that atmospheric lead levels were 1000 times the pre-industrial baseline, and that the amount of lead in the blood of most people was orders of magnitude greater than pre-industrial levels.[lxviii] Still, the automotive industry resisted all attempts to control pollution. In January 1969, the federal government charged the four major US auto companies and their trade association with conspiracy to delay development and implementation of air pollution control devices. Out of fear that the internal combustion engine itself would be outlawed or restricted, GM president Ed Cole changed course and in early 1970 announced that, beginning in 1974, the company would install catalytic converters on its new cars. Since

exposure to lead completely disables catalytic converters, this was a decision to abandon leaded gasoline as well.

The manufacturers of leaded gasoline felt betrayed and continued to resist, but by 1986 leaded gasoline was finally phased out in the United States. However, the manufacturers continued to market their product heavily outside the United States, especially in developing countries. It took another fifteen years before leaded gasoline was effectively phased out in the European Union, and longer still until it was phased out in most of the rest of the world. By 2007 the only countries in which leaded gasoline was used extensively were Yemen, Afghanistan and North Korea, though leaded gasoline is still available in parts of Northwest Africa, Europe, the Commonwealth of Independent States, and the Middle East.

From 1927 to 1987 about 68 million young children in the United States had toxic exposures to lead from gasoline, resulting in brain damage, cognitive deficiencies, hypertension, neuropathy and, sometimes death. As many as 5,000 Americans died annually from lead-related heart disease prior to the country's lead phase \out. [lxix] No wonder Dr. Alice Hamilton, who foresaw these consequences, said to Charles Kettering during the May, 1925 Public Health Service conference on the risks of TEL, “you are nothing but a murderer." [lxx]

As we have shown in this paper, bioethics has a complicated and variable history. Some have associated it almost exclusively with medical ethics while others have had a much more expansive view. When we look to the future, there are many issues that may lie at the intersection of health and the environment that should be viewed through the lens of a broad bioethics. The power of large corporate interests to control governance and affect outcomes is an issue that is gaining increasing attention in both medical and environmental ethics. The power of large pharmaceutical companies over patient care and on the very nature and structure of health care delivery systems is now widely recognized, as is the role of the fossil fuel industry in structuring the discourse and inhibiting significant action on climate change. Whatever the trajectory of the particular issues that we have discussed, the environmental turn in bioethics represents both a recovery of the history of the field and a welcome resource in a world in which both human health and the environment are being compromised on a daily basis by the nexus of power and technology.[lxxi]

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[i] V.R. Potter, “Humility with responsibility-A bioethic for oncologists: Presidential Address,” *Cancer Research* 35 (1975), p. 2299; see also, V.R. Potter, *Bioethics, Bridge to the Future* (Englewood Cliffs, N.J.: Prentice-Hall, 1971), pp. 42-54.

[ii] *Ibid.,* p. 67.

[iii] For discussion of various views about the value of nature see Dale Jamieson, *Ethics and the Environment* (Cambridge: Cambridge University Press, 2008), chapters 3 and 6. We are indebted to J. Baird Callicott for bringing Potter to our attention, and to Peter J. Whitehouse for

deepening our appreciation of Potter. For more on Potter's legacy, see with Peter J. *Whitehouse* "Van Rensselaer Potter: An Intellectual Memoir," *Cambridge Quarterly of Healthcare Ethics* 11 (2002), pp. 331–334

[iv] LeRoy Walters and Tom L. Beauchamp, ed. *Contemporary Issues in Bioethics*, first edition (Belmont, CA: Wadsworth Publishing Company, 1978), p. 1.

[v] As quoted in Warren Thomas Reich, "The Word "Bioethics": Its Birth and the Legacies of those Who Shaped It," *Kennedy Institute of Ethics Journal*, 4, 4 (December 1994), p. 330.

[vi] Potter, *op. cit*., 1975, p. 2297; Beauchamp and Walters, *op. cit.,* p. 49.

[vii] Potter, *op. cit*., 1971, pp. 49-53; Beauchamp and Walters, *op. cit.,* p. 1.

[viii] Warren Thomas Reich, The Word "Bioethics": The Struggle Over Its Earliest Meanings," *Kennedy Institute of Ethics Journal* 5, 1 (1995), p. 21 (referencing Beauchamp and Walters, *op. cit*., p. 33).

[ix] http://bioethics.as.nyu.edu/page/aboutus. See also Andrew Jameton & Jessica Pierce, *The Ethics of Environmentally Responsible Health Care* (New York: Oxford University Press, 2004), and subsequent work by Jessica Peirce, available at http://jessicapierce.net/publications.htm.

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[xi] R. Ewing, R. Brownson, & D. Berrigan, "Relationship Between Urban Sprawl and Weight of United States Youth," *American Journal of Preventive Medicine* 31,6 (2006), pp. 464-474; Jean Eid, Henry G. Overman, Diego Puga, & Matthew A. Turner, "Fat city: Questioning the relationship between urban sprawl and obesity," *Journal of Urban Economics* 63 (2008), pp. 385–404.

[xii] http://www.who.int/uv/uv_and_health/en/index.html

[xiii] http://www.publications.parliament.uk/pa/cm200910/cmselect/cmenvaud/229/22902.html

[xiv] This estimate is based on data available at FAOSTAT; available at http://faostat3.fao.org/faostat-gateway/go/to/home/E

[xv] World Health Organization, "Antimicrobial resistance: global report on surveillance," 2014, pp. 59-62; available at http://apps.who.int/iris/bitstream/10665/112642/1/9789241564748_eng.pdf?ua=1

[xvi] Saenz RA, Hethcote HW, Gray GC. "Confined animal feeding operations as amplifiers of influenza," *Vector Borne Zoonotic Dis* 6 (2006), pp. 338-46.

[xvii] The Pew Commission on Industrial Farm Animal Production, "Putting Meat on the Table: Industrial Farm Animal Production in America," 2008; available at http://www.pewtrusts.org/our_work_report_detail.aspx?id=38442. This report directed us to several of the other sources cited in this paragraph.

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[xx] The Pew Commission on Industrial Farm Animal Production, "Putting Meat on the Table: Industrial Farm Animal Production in America," 2008, p. 29.

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[xxvi] Environmental Protection Agency, "Animal waste disposal issues" (1997); available at http://www.epa.gov/oig/reports/1997/hogtable.pdf

[xxvii] See The World Health Organization, "20 questions on genetically modified foods," for a good summary of the ethical questions posed by GMOS as well as for an optimistic view about the health and environmental impacts of properly regulated GMOs; available at http://www.who.int/foodsafety/publications/biotech/20questions/en/

[xxviii] Krista B. Oke, Peter A. H. Westley, Darek T. R. Moreau, and Ian A. Fleming, "Hybridization between genetically modified Atlantic salmon and wild brown trout reveals novel ecological interactions," *Proceedings of the Royal Society B.* 280: 1763 (2013), pp. 1471-2954

[xxix] Nicholas Stern, *The Economics of Climate Change: The Stern Review* (Cambridge: Cambridge University Press, 2007). See also Britaldo Soares-Filho et al., "Cracking Brazil's Forest Code," *Science* 25 (April 2014): Vol. 344 no. 6182 pp. 363-4 for a case study in how deregulation is causing an increase in deforestation, with potentially disastrous consequences.

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[xxxi] Anna Lappe, *Diet for a Hot Planet* (New York: Bloomsbury, 2010), p. 27

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[xxxiii] Jeanne Mager Stellman, Steven D. Stellman, Richard Christian, Tracy Weber & Carrie Tomasallo, "The extent and patterns of usage of Agent Orange and other herbicides in Vietnam," *Nature* 422 (17 April 2003), pp. 681-687 available at: http://www.nature.com/nature/journal/v422/n6933/full/nature01537.html

[xxxiv] As reported here: http://www.theglobeandmail.com/archives/article697346.ece

[xxxv] For more on this topic, see Arthur W Galston, "Falling Leaves and Ethical Dilemmas: Agent Orange in Vietnam," in *New Dimensions in Bioethics: Science, Ethics, and the Formulation of Public Policy* (Kluwer Academic, 2001), 109-124.

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[xxxvii] The Center for Constitutional Rights, "The War is Not Over for Iraqis and U.S. Veterans: Seeking Accountability and Reparations for the United States' Illegal War and Its Lasting Trauma" (January 2014), p. 18; available at http://righttoheal.org/2014-right-to-heal-report/. The next two paragraphs draw heavily from this report.

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[xxxix] The Center for Constitutional Rights, "The War is Not Over for Iraqis and U.S. Veterans, pp. 20-2.

[xl] *ibid*, p. 22

[xli] *ibid*, p. 23

[xlii] *ibid*, p. 26

[xliii] *ibid*, p. 27

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[xlvi] Associated Press, "Facts on Military Fuel Consumption," *USA Today*, 2 April 2008; available at http://www.usatoday.com/news/washington/2008-04-02-2602932101_x.htm.

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[liv] David Rose, "'Safe' uranium that left a town contaminated," *The Observer*, Saturday 17 November 2007; available at http://www.theguardian.com/world/2007/nov/18/usa.nuclear

[lv] http://www.google.com/publicdata?ds=wb-wdi&met=ms_mil_xpnd_gd_zs&tdim=true&dl=en&hl=en&q=world+military+spending

[lvi] Available at http://www.ipcc.ch/report/ar5/

[lvii] http://www.who.int/mediacentre/news/notes/2009/climate_change_20090311/en/index.html

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[lix] http://www.washingtonpost.com/wp-dyn/content/article/2007/06/15/AR2007061501857.html. The mortality figures are contested, but for the best recent estimate see Olivier Degomme & Debarati Guha-Sapir, "Patterns of mortality rates in Darfur conflict," *The Lancet* 375, 9711 (23 January 2010), pp. 294–300 (doi:10.1016/S0140-6736(09)61967-X).

[lx] http://www.mindfully.org/Air/2003/Pentagon-Climate-Change1oct03.htm, In its 2010 Quadrennial Defense Review the Department of Defense formally identified climate change as one of the trends posing security challenges for the future; available at www.defense.gov/news/d20090429qdr.pdf.

[lxi] See Dale Jamieson, *Reason in a Dark Time: Why The Struggle Against Climate Change Failed – And What It Means For Our Future* (Oxford: Oxford University Press, 2014) for discussion of many of these issues.

[lxii] For more on this overlap see Robert Gottlieb, *Forcing the Spring: The Transformation of the American Environmental Movement*, revised edition (Washington D.C.: Island Press, 2005.

[lxiii] In telling this story we have benefited from the work of William Kovarik, especially his unpublished paper, "ETHYL: The 1920s Environmental Conflict Over Leaded Gasoline

and Alternative Fuels," available at http://www.radford.edu/wkovarik/papers/ethylconflict.html; and Jamie Lincoln Kitman, "The Secret History of Lead," *The Nation*, March 2, 2000; available at http://www.thenation.com/doc/20000320/kitman/single#12.

[lxiv] The Ethyl Corporation was created by General Motors, Standard Oil of New Jersey (Exxon), and E. I. Du Pont de Nemours. In 1962 the Ethyl Corporation was sold to the Albemarle Paper Manufacturing Company, which then changed its name to the Ethyl Corporation. Albemarle borrowed $200 million in order to purchase a corporation 13 times its size in what was the largest leveraged buy out up to that time. It is widely believed that the sale was motivated by General Motors' concerns about TEL-related liability.

[lxv] New York Times, "Sees Deadly Gas a Peril in Streets; Dr. Henderson Warns Public Against Auto Exhaust of Tetraethyl Lead; Worse than Tuberculosis," April 22,1925, p.1.

[lxvi] As quoted in Jamie Lincoln Kitman, *op. cit*. Midgley worked under the supervision of Charles Kettering who in turn was supervised by Alfred Sloan. Kettering and Sloan are known today mainly for their good works, especially for their roles in founding New York's Memorial Sloan–Kettering Cancer Center. Midgley later discovered dichlorodifluoromethane (Freon) which is responsible for a large fraction of the ozone depletion that we have experienced.

[lxvii] U.S. Public Health Service, "The Use of Tetraethyl Lead Gasoline in its Relation to Public Health," Public Health Bulletin No. 163, Treasury Dept. (Washington: GPO, 1926).

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[lxxi] We have benefited from presenting early versions of this material at the launch of NYU's Center for Bioethics and at a meeting of the International Society for Environmental Ethics. We have also benefited from discussions with Leah Todd about the health impacts of war as well as from discussions with William Ruddick about the past and future of bioethics. This paper is a revised and expanded version of Dale Jamieson, "The Question of the Environment," in *Trattato di Biodiritto*, diretto da S. Rodota and P. Zatti, *Ambito e Fonti del Biodiritto*, a cura di S. Rodota and M. Tallacchini. Milano: Giuffre Editore (2010): 37-50.

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