

Here We Fight The Coldest War
*Environmental science & feminist autobiography
on the DEW Line*

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*is there anything i can do
about anything at all
except go back to that corner in manhattan
and dig deeper
dig deeper this time
down beneath the impossible pain of our history
beneath unknown bones
beneath the bedrock of mystery
beneath the sewage system and the path train
beneath the cobblestones and the water main
beneath the traffic of friendships and street deals
beneath the screeching of kamikaze cab wheels
beneath everything i can think of to think about
beneath it all
beneath all get out
beneath the good and the kind and the stupid and the cruel
there's a fire that's just waiting for fuel*

- from *Fuel*, by Ani DiFranco. Little Plastic Castle. Buffalo : New York 1998

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I

OVERTURE

*in which
the principal investigator introduces
a question & composes a methodology*

The goal is better accounts of the world, that is, 'science'. - Donna Haraway (1991)

Is this science? I offer this question as a tool with which you (my multiple audiences) can evaluate my major paper. The initial purpose of the paper was to tell some of the personal stories of science, more or less in reaction to the suppression of such stories in official science writing, where the third-person passive voice, numerical analyses, and technical focus reproduce our subcultural commitment to neutral objectivity. My initial purpose was rooted in the feminist premise that there is no such thing, a premise encapsulated by the old saw that the personal is political; that is, that what is not named (the subjective, the negative space) is vitally and intricately related to what is named (the objective, positive knowledge).

In most of my work at FES, I have found it easy enough to observe and write about how the personal/political becomes relevant to the science done. Almost all of my master's work has been focussed on the practices of natural science in the field. Like it or not, because of the more or less remote locations where such work takes place, private lives become part of the scientific work. Seeing this is particularly straightforward in biology, where human identities and their politics are often enough projected onto the organisms we study; we rely on our individualities, our language, our existing political consciousness – that is, our positive knowledge – as at least provisional epistemological frameworks for understanding both the human and more-than-human worlds. However, in my preliminary research for this paper, journals made during my 2001 field work for an environmental science project called the DEW Line cleanup, it was not always so obvious how my co-workers' personhoods were reflected in the scientific content of the work; their relatively infrequent talk of the nature of hydrocarbon plumes or soil stratigraphy was not quite as loaded as the more evidently anthropomorphic, and passionate, discourses of research biology. In this new work, I found I was listening as much to the presence of the personal and political in the science discourse as to its absence.

When I finally realized that what I was hearing was negative space, it occurred to me that the work I am currently involved in is almost *more* characteristic of any critical (popular or academic) cartoon painted of Science than any of the research science that I have yet done. In this science, where much of the work is not an individual inquiry into a personally and/or subculturally interesting question, but rather addresses a large-scale technical and social problem, the subject-object/self-other split at the heart of (feminist, environmentalist) critiques of science is exponentially widened. This split has been clearly articulated by scholars like Keller (1985, 1992) or Bordo (1999, in Lederman and Bartsch (2001)), famous in certain circles for developing psychoanalytic analyses of scientific objectivity, as well as critiques of its lack of accountability, maturity, empirical validity, and life. One of the implication of these analyses is that removed, standardized observation and measurement (in the natural or social sciences) is not sufficient as a means of producing better accounts of the world; involved, nuanced, individual experiences and narratives must also be considered and articulated. Coming out as a subjective scientist by articulating the personal dimensions of impersonality in an autobiographical text seemed the obvious alternative. So, in December of last year, I wrote a proposal that basically said I would add a sufficiently theoretical introduction and conclusion to journals made during my field science work, et voilà: I would become a master of environmental studies.

Anyway, it seemed promising. Problems, however, soon arose as I edited my field journals from their original to a usable computerized text. I edited pretty strictly for confidentiality, relevance and readability, trying to juggle these criteria in light of a wide array of potential audiences (academic, coworkers, intimates). I took out personal names of course, and ended up merging the journals from two geographically separate experiences so that it would be even harder to identify individuals. I also excised more than half the original text. The stuff that got cut out was some personal detail, some of my more extreme opinions, any information by which another individual could be identified by anyone but themselves, any controversial technical, political and/or sexual anecdotes that I felt could be held against me or anyone else.... Then, after giving it to someone implicated in one version of the text, I then found I had to apply an even more rigorous criterion: if I couldn't stand to be in the same room while having passages read back to me aloud by the person that they refer to, then the passage should be cut out. All that done, I felt confident that it would be practically impossible for anyone to figure out who I was writing about, and it seemed unlikely that me or anybody else would get into any trouble whatsoever.

I also seriously disliked the finished product. Not only because what I had done in the interests of confidentiality and self-protection had resulted in something pretty damned close to objective neutrality, but also because in the meantime I had been reading feminist autobiography theory. Some of the more

choice excerpts from a major anthology in the field, De/colonizing the Subject: The Politics of Gender in Women's Autobiography (eds. Smith and Watson, 1992), include the following:

Western autobiography...functions as an exclusionary genre against which the utterances of other subjects are measured and misread. (Smith and Smith, p.xviii)

The phallic American 'I' systematically denies its multiplicity and interconnectedness, masquerading as self-contained, independent subjectivity and imposing its will on others, often in the name of justice... Such an 'I'... is not merely a harmful illusion, it is a form of imperialism. (Quinby, p.305).

Phallic heroism promotes certain narrative orientations toward the world, experience and subjectivity. First among them is the celebration of her own unique destiny...[The autobiographer] privileges her own individuality and consequently makes little effort to decenter her own experience to incorporate experiences from the margins of her story. (Smith, p.416).

My contention is that autobiography is a field of self-representation that has historically promoted the normalizing and disciplinary form of subjectivity that, as Foucault points out [in the Subject and Power], we should target. (Quinby, p.298)

To say the least, I was horrified. The critics had a point, and I took it personally. I lost faith in the ethical, political and even academic value of the autobiographical text I had produced. I found that, in its edited form, my journals fell more or less within the tradition of masculinist western autobiography, in that they assumed the alienated heroic individual's (my) destiny as the appropriate subject and worse, assumed the subject's right (my right) to speak for others, of others, of events, without asking those "others" if they minded. The knots I had been tying myself into while editing, trying to produce a text that would responsibly protect all those people who had never asked me to write about them, had rendered my account of a real experience into a self-centred, smoothed-over, superficial collection of half-honest anecdotes that sometimes bordered on essentialism, and even racism. Moreover, they weren't nearly as interesting.

Part of the problem, I found out, as I recovered slightly and read on, was not only the constraints of the occupational context in which I am writing, but that I might have got caught in the (white middle class feminist) fallacy that one's personal stories can substitute *for* the political; in telling our "own" stories, we allow ourselves to separate from, and ignore, the much wider economic, social and macropolitical contexts in which those stories are embedded (Watson, in Smith and Watson (1992), p.147). While remaining convinced of the value of my journals as a personal exercise, I realized I had to put them aside for many of the same theoretical reasons that motivated my use of them in the first place: I did not want to reproduce the power of the univocal, static Word. Beyond the two rhetorical extremes of objectivity and subjectivity must lie other representations of experience.

These considerations motivated the current design of the paper, which is an attempt to represent a scientific experience in a way that does not reinscribe the self/other split manifested in the western literary traditions of science writing *and* autobiography. This paper now attempts to represent something more polyvocal and complex. It is about science on the DEW (Distant Early Warning) Line cleanup, which is a major environmental remediation project currently underway in the Canadian arctic. The cleanup aims to mitigate environmental damage caused on military radar sites installed during the Cold War. My paper will thus be, in part, about science in the service of various social-political-environmental agendas; about science in parts of the world that are signified as one of the last great wilderness frontiers, as American-Canadian military property, and as Inuit homeland; and about science practiced by young, white women in the company of many kinds of men. But while these complex interactions of people and place are important, they are the flesh of the paper, not the bones. Fundamentally, this paper is about socially responsible, respectful processes of knowing the self and other. Thus, while the remainder of the paper will provide quite a detailed case study of environmental science on the DEW Line cleanup, here I would like to spend a little time describing the politics of representation of the paper itself.

The paper now has five major parts. The first is what you are reading now: the Overture (*in which the principal investigator introduces a question and composes a methodology*). Here I have begun, and will continue, to foreground the central theoretical problem that I am working on in this paper. The problem revolves around how authorial commitments to subjectivity and objectivity get played out in written

representations of knowledge: how is truth and/or experience best represented? What does science, as a “better account of the world”, look like?

Part II of the paper is a Chorus (*in which the research assistant conducts a literature review*). This is something of an experiment in rewriting environmental history, as well as an introduction to the practice that forms the paper’s specific content. The Chorus is built around the historical narrative provided in the DEW Line Cleanup: Scientific and Engineering Summary Report (ESG/UMA, 1995), but also includes quotes from academic analyses of the project’s political history, popular, journalistic and fictional accounts of the DEW Line and its cleanup, and other more general works on the history and relationships of science, the north, the military, and environmentalism. Thus, the Chorus is both a litany of specifically relevant facts about the DEW Line as well as a creative, and selective, attachment of these pieces of history to broader discourses which will be explored in greater detail in subsequent sections.

Despite their differences in content and style, the texts I used to construct the Chorus have several noticeable commonalities. The first is that, with few exceptions, all texts are strongly anthropocentric: the non-human environment is considered in detail only if and when a human problem arises (e.g., difficulty in the DEW Line construction, or the political-ecological mess that prompted the cleanup). Even the technical summary report of the cleanup (ESG/UMA 1995), for example, gives no detailed description of the geology or biology of sites on the Line; the vast majority of this text focuses on human artefacts, with a one-page characterization of the Arctic ecosystem included in the third section of the report.

Secondly, the histories are almost entirely androcentric : in all factual accounts of the DEW Line history, only (Dr. Heather) Myers (2000) makes explicit mention of a prominent woman (Anne Carson, the Canadian diplomat who helped negotiate the 1996 US-Canada Military Sites cleanup agreement); otherwise, women in DEW Line histories appear extraordinarily marginal. Indeed, women only actually *do* anything in a fictional retrospective by a former radar technician on the Line (Flynn 2002), where they act as either current, potential, or former wives: one Inuit man’s wife teaches some technicians to ice-fish, another Inuit woman becomes a technician’s wife after waiting on him when he was sick, and the third (southern) woman steals her husband’s money and abandons their children while he is up north, prompting him to kill himself. Inuit people, while also often marginalized in DEW Line texts, actually appear more central as a group to DEW Line histories than women. The impression of the DEW Line as a masculine world is resounding.

Thirdly, histories of the DEW Line consistently have exactly two chronological focal points: its construction in the mid-1950s, and the beginning of its deconstruction in late 1980s through early 1990s. It is rare to find much except news briefs about the last five years or so of its clean-up. More interestingly, there is just as little detailed information available about the middle 30 years of site operation, again, with some minor exceptions. Very recent ESG work using aerial photos is now providing more historical detail over this period; this process has shown that the sites experienced tremendous fluctuations in infrastructure over decades of operation. However I have yet to see any detailed written histories that might accompany this period, internally or externally.

The Chorus I have constructed from the available texts generally reproduces an androcentric, anthropocentric and chronologically conventional narrative of the cleanup. However, reflecting my original aspirations, the quotes I use from non-scientific sources begin to fill in some of the silences in a standardized, third-person technical account, perhaps most notably the absence of social, economic and political history. Even with the limits imposed by the most readily available non-technical accounts of the DEW Line, there is still a rich history to the project that internal technical summaries systematically tend to leave out.

From the Chorus’ introductory history, I move to a more individuated present in Part III: Aria (*in which the field technician records some notes*). I did, in the end, and after yet another editorial session, retain parts of my field journals in this paper. I include these excerpts as a solo among other performative acts; that a voice is individual, subjective, heroic, western, privileged, and highly compromised by multiple editing processes, did not finally convince me that it should be entirely silenced. In fact, it was another essay in the anthology I cited before that encouraged me to include the excerpts, as a demonstration of exactly the politics of representation I encountered. Analyzing the “taming of the tone and the self” apparent in a comparison of before-and-after versions of Zora Neale Hurston’s autobiography (Dust Tracks on the Road (1941)), Raymond writes:

The editor (the publisher, the guarantor, the patron)...act as authenticator; he or she actively competes with the author for control over the production of the text. The resulting unequal

dialogue mirrors the racial, sexual and class tensions of society at large... the transition from handwritten versions to typed versions and finally to the printed text illustrates a gradual slippage from an original intent to the final acceptance of a public self/text mediated by editorial pressure. Editorial intervention and Hurston's awareness that she had to fit a certain mold in order to please shape the text, which becomes the site of a complex interaction between author and editor, between writer and audience... [T]he production of a fiction of the self is such that the question of the authenticity of Hurston's rendering of her life story is indeterminable. (in Smith and Watson (1992), p.56-7)

I have described the journal editing process sufficiently above to demonstrate the parallel here; suffice to say that what is included in the Aria is not a total, nor a totalizing, narrative. It is also one that, while an account of actual experiences, clearly makes the point that the text is not the actuality. There is a slippage, something fundamentally indeterminable, between accounts of the world and the world itself; into that slippage enter representations that are neither radically subjective nor absolutely objective.

In Part IV: Quartetto (*in which the scientist performs a multivariate data analysis*), I produce a detailed discursive analysis of environmental science on the DEW Line cleanup. I do this within a fairly standard academic style, i.e., through analysis of primary texts within an essay format, in reference to broader theoretical issues. I hesitated for a long time before writing this section of the paper, in part because I did not want to enter into the competitive quest for interpretative finality that lurks beneath the tone of so much academic writing, both in science and the humanities. Nonetheless, Part IV became necessary because I was afraid of the (slightly) more experimental parts of the paper being misunderstood, because of the authorial power of a relatively formal academic voice, and because this voice allowed me to theorize earlier claims in much more explicit detail and depth than possible when only manipulating historical and personal texts. That is, here I could analyze some of the remaining negative spaces, instead of just pointing to them. The "Quartetto" after which the section is named is made up of the four discourses I identify as central to DEW Line cleanup science: rationalism, romanticism, militarism and feminism. As I will introduce these at greater length in the opening to Part IV, I will only note here that the former two form the most readily demonstrated discourses of the cleanup, the third is more subtly present, and the last, feminism, is unnamed in project texts if not wholly absent in the project itself. The selection of these discourses as central to the project, and the evidence I provide in support of them, result in a construction that reflects part of the reality of the cleanup science as well as my authorial preoccupations; in some ways, the analysis I build in the Quartetto, from rationalism to feminism, reflects a reversal of the project's dominant textual politics. In other words, from Chorus to Aria through to the end of the Quartetto, there is a movement from the centre to the margins of existing project discourses.

Lastly, Part V: the Finale (*in which our investigator recapitulates the purpose and extemporizes on future research designs*). This is a short section, designed to parallel Part I. Here I will offer a few thoughts following the analysis and critique of the DEW Line cleanup and its science developed throughout the Chorus, Aria and Quartetto, and then return to the broader questions of representation I have raised in this Overture. In the end, this paper still comprises a relatively solitary and independent work developing out of, and responding to, personal experience; so, regardless of its performative polyvocality, the paper as a whole remains a kind of autobiography. What I think you may find interesting as a reader is reflecting on which parts of the paper you find most interesting, comfortable, and/or convincing to read. Such an exercise may tell you more about the politics of representation than any conclusion that I might offer.

Some final notes on audience. My primary mental audience in writing this paper has been the people I work with and for, we who are trying to clean up the DEW Line. Towards you, I offer this paper as a far-from-neutral investigatory report on some of the personal and political contexts of our technical work. Towards some of you, I would also like to direct a mild disclaimer: while it is critical, this paper is not meant as a personal or corporate attack. It has been brought to my attention several times recently that critical thinking and writing, while valorized in the academic circles I have been in for close on a decade, are not equally valued outside of such circles. Still: I also work on cleaning up the DEW Line. My interests, personal, material and social, are also at stake. As perhaps my anecdote about encountering feminist autobiography theory illustrates, I am myself not immune to the sting of academic critique. To a large extent this paper is an exercise in negotiating the tensions between the academic education I have had thus far, and the work setting that I have recently chosen to enter. I have been encouraged by my sense that these tensions are not unique, a conviction supported by some warm expressions of interest from coworkers. While the purpose of this paper (along with much academic work) is not to offer immediate

solutions, I have undertaken it with the belief that self-reflective, careful, and critical theorizing is both a good in itself as well as something potentially helpful for our ongoing practice.

My other primary audience is academic; towards you, I present this paper as a representation from inside a science practice, one that forms not only a claim to epistemological complexity within such practice, but also partakes of ongoing science studies conversations which seek non-dualistic representations of the world. My scholarly experience to date has suggested that these kind of inside representations of science are not yet common, a phenomenon that perpetuates inaccurate and unhelpful generalizations about science, both worldview and practice. Because the discursive terrain in which we work as academics is less determined, however, as well as farther from the immediate subject matter of most of this paper, I feel no pressing need for a proviso in your direction. For both audiences, though, I suspect parts of this paper will seem obvious, others obscure, some trivial. Nonetheless, for all our differences, we are both groups with a great deal of social, material and discursive privilege; for this very reason, perhaps it is worth addressing each other/ourselves.

II

CHORUS

*in which
the research assistant
conducts a literature review*

Through untold centuries, the Arctic slept in frozen solitude, inviolate in its chaste, cruel beauty. But man has now invaded the white wilderness in force; his technology has come to stay. **The original DEW Line was built by the United States Air Force at the height of the Cold War.**¹Conceived in 1952 by scientists meeting at the Massachusetts Institute of Technology, the DEW Line was built by 23, 000 U.S. and Canadian construction men directed by the Western Electric Company. Historians, scientists and science journalists have long been interested in such prominent Cold War topics as the rise of the military-industrial-academic complex... But only more recently have authors been examining how the aims, content, practices, technologies and locations of Cold War science reflected and contributed to the tense politics of that era.

The DEW Line consisted of a system of detection and warning radar devices which stretched across the breadth of the North American Arctic from Alaska to Greenland, covering a distance of roughly five thousand kilometres. For all practical purposes, the 2,000 miles between the MacKenzie and Baffin Island are uninhabited... Nowhere has man undertaken so difficult a construction job. "They've changed everything by building that", he said. "The Arctic will never be the same again". **The construction of the DEW Line was an enormous undertaking, given the extreme Arctic conditions, the technology of the day, and the overall magnitude of the project.** DEW Line sites used 46,000 tons of steel...75,000,000 gallons of fuel, 22,000 tons of food, and 12 acres of bed sheets. In all, 460,000 tons of materials were moved from the US and Canada to the Arctic by air, land, and water...Construction work needed to build housing, air strips, hangars, antennas and towers was done by subcontractors...[O]ver 7000 bulldozer operators and other tradesmen from the U.S. and Canada worked at breakneck speed under conditions so difficult it is a wonder the job was completed in such a short time. Isolated by minus-50-degree temperatures and blinding white-outs, they lived in tents, slept in their clothes, battled polar bears that invaded their camps. More than 35 men lost their lives erecting the \$600,000,000 alarm system. To offset these uncomfortable conditions were the excellent dining facilities and of course the outstanding pay. Then, as now, construction workers shipped to the Arctic wanted to get the job done and get home. The work week was six and a half days long.

Wherever possible, Eskimos were hired – at prevailing union wages – for DEW Line construction jobs. Although baffled at first by modern machines and construction methods, they were quick to catch on. Whether driving dog teams of bulldozers, they proved conscientious and dependable. Moreover, there were limited protections given to 'matters affecting Canadian Eskimos' and for 'objects of archaeological or historic significance' discovered during construction. When a DEW Line radar station went up along his accustomed route, he decided to stop to see what it was. The military men welcomed him not as a resident of the region but as a figure of arctic fable. They enthusiastically fed his dogs a stack of raw steaks. Each time the man came, they pounded him on the back and fed his dogs piles of steak. Their largess seemed so odd and his rapport with them so unrealistic he stopped coming. For months afterward, however, he had tremendous difficulty controlling the dogs anytime they passed near the place. **It was as rare to meet a southerner who did not condescend to the Inuit as it was to meet one who did not attack others for their condescension.** People are funny that way. Rarest of all was to meet an Inuk who felt in control of his or her life.

In the 1950s and 1960s the Canadian government used inducement and coercion to

¹ All text is composed of direct quotes. Each change in font represents a new text. All quotes in bold are from publications funded by the Department of National Defence, namely, those authored by the Environmental Sciences Group, Director General of the Environment, or the DND public relations department. The texts are listed in order of first appearance in Part VI (Curtain Call).

corral Inuit from hundreds of camps into settlements built on the infrastructure established by the military. The impetus for change came from the Government of Canada's program of social and economic development and had two main objectives: first, to gather the scattered Eskimo people together in settlements for administrative efficiency and complement the social services already existing in the rest of Canada, and second, to improve and organize the economy based upon the formation of Eskimo co-operatives... After school he found work back at the military installation - a DEW radar site - which at first seemed like a relative picnic. "I found out for the first time that even in white culture you are quite free. Except: the time you got to work and the time you go to supper." The post-war situation revived Canada's colonialist activity and the expanding economy of the times provided the means for it.

Sixty-three DEW Line sites were built: six Main sites, 26 Auxiliary sites, and 31 Intermediate sites. Forty-two of these sites are in Canada. "There shall be no disposal in the North of supplies or materials of any kind..." [was included] in Canada's formal agreement to allow DEW Line construction. **The sites, spaced across the 66th parallel at approximately 80 km intervals, were each equipped with a Doppler radar.** Each one is a complete, self-contained community, set in the middle of nowhere. Like any well-planned community in the U.S. or Canada, each station has its own electricity, water service, heating facilities, homes, work buildings, recreation areas and roads. **Additional long-range radar were placed at alternating sites, 160 km apart. The sites varied in size depending on the scope of their activities, but each required a minimum number of buildings and facilities in order to operate.** [A] collection of old machines here, a couple of hundred oil drums there, a stack of broken transformers yonder near a heap of concrete blocks. The refuse was strewn so far and wide it seemed like a territorial thing, like a monstrous cat urinating metal in the corners of the backyard.

The Intermediate sites, each supporting only a Doppler radar, were the smallest stations and were originally designed to operate unmanned. It was soon realized that operational and maintenance requirements necessitated a permanent staff of four to six. *Of all the sad things in life/ There's nothing to compare/ The remote located radicians lot/ This thought is hard to bear.* **These sites were simple, consisting of a small five-module train containing a powerplant and temporary quarters. Can you imagine five men locked up in a small three-room house for six-monthly periods?** *There's nothing to do, no place to go/ Also, no means of getting there/ His companions are men, no women around/ Somehow this doesn't seem fair!* **In addition to the Doppler radars, each site maintained a runway, a small garage, warehouse, Inuit house and four small fuel tanks. Oddly enough, three out of every four DEW Liners are married. A two week unpaid leave was provided after 9 months of on-site duty. Now he's home and happy...almost/ For he'd forgotten what it was really like/ The wife nags more than he remembered/ And the kid is screaming for a bike!** **Advances in radar and communications technology eliminated the need for the Intermediate sites, and they were decommissioned in 1963. Those intermediate sites were breeding fruit cakes, loose screws and various certified dementia patients faster than personnel could find replacements. When the job is done and over with/ And it's his turn to go home/ He's gay, happy, can't hardly wait/ And swears never again will he roam!**

The Auxiliary sites, situated 160 km apart, each supported a 17 m high rotating radar as well as Doppler radar and consequently were somewhat larger than the Intermediate sites. The primary discussion was about the boredom of life on the Aux site. They were carbon copies, each was exactly the same. An Auxiliary site, operated by 10 to 20 personnel, typically consisted of one long 25-module building train containing operational rooms, radome, living quarters, heat, electrical power, a warehouse, garage and house for Inuit employees. In the Arctic today we do not attempt to adapt the human mechanism to the living conditions of what might as well be space. Instead we supply a capsule of earth-environment for the man to live in. All facilities at the site were situated as close to one another as local topography and individual operational requirements would allow. It felt like we were in a submarine. It always felt like this. People behaved as if the exterior atmosphere was composed of pure nitrogen.

The Main sites, 800 km apart, provided communication to the South and service to the smaller sites, in addition to supporting the same facilities as the Auxiliary sites. The station came

into the middle distance, alone on the plane. It was bathed in white light. The geodesic dome gleamed. What was this place? A spaceship? A forbidden palace? The shining crown of the white man's technological enterprise, charged by the belief that we could harness the very essence of the universe and bend it to our will.... Thus these sites were much larger, with up to 200 personnel, and contained two or more building trains consisting of 40 to 70 modules in total connected by passageways, as well as larger fuel tanks and POL (Petroleum, Oil and Lubricant) facilities, four or more warehouses and several garages.

The installations...proved - in the usual tradition of war - what could be done with a little will and a lot of money. Built over a period of 11 years at a cost of about \$3 billion, the North American defense frontier has the single job of warning of any Russian attack via the polar route. To add to these costs, it is estimated [that the] cost of the life of the DEW Line would be \$2,708.2 billion or \$57,056 million per contract year. **It was agreed that a "Distant Early Warning" System would be beneficial to both nations; the Americans would gain twenty minutes for retaliation or prayer or whatever and the Canadians, with the help of all those American bucks, would be closer to balancing the national debt.** Ottawa was extremely sensitive to the sovereignty matter. As a result, the original DEW Line agreement was rather detailed in this respect (Canada-United States 1955). It specified that the location and size of all sites and their attendant airstrips, roads and wharves would be determined by mutual agreement; plans would have to receive Canadian approval; Canada had the right to inspect construction work; Canadian contractors were to be given 'equal consideration' and preference was to be given to Canadian labour.... **Detection of aircraft approaching from over the Pole was reported to the North American Aerospace Defence (NORAD) Command in Colorado Springs, as well as Canadian Air Defence Command at St Hubert, Québec.** [However] In 1957, Canadian ministers needed a security check to get on site, and sites were not flying the Canadian flag. **The American generals only agreed to the use of Canadian civilians with the proviso that there be American supervisors and, in addition, Canadians had to be trained in American military procedures and further, that Canadian would be finely screened and checked for 'Red' affiliations.**

It [the DEW Line] became fully operational in 1957 after three years of construction, providing constant surveillance of the northern approaches to North America for 35 years. [However] the DEW Line was strategically largely obsolete by the time it stood ready to do duty. The flight of Sputnik in 1957 ushered in the era of inter-continental ballistic missiles (ICBMs) against which conventional ground-based DEW radars were useless. If you didn't know better you would think of these places as monuments to pointlessness...[but] short of war, the only accomplishment anyone expects from a nuclear weapons system is that it be better than the one before and lay the foundation for one after. Canadian interceptors, like the F-101 Voodoo shown above, have key assignments if an attack comes. But the recent [1963] refusal of Prime Minister Diefenbaker to arm these planes with nuclear weapons, the only way to make them fully effective, brought about the fall of his government.

With the closure of the Intermediate sites and one Auxiliary site in 1963, there remained 21 [out of 42] active sites in Canada, including 4 main and 17 Auxiliary sites. By the early 1970s even official Canadian policy statements acknowledged that the DEW Line served only a very modest military function: namely, to reduce the likelihood that the Soviets would *begin* an attack using bombers. **Administration of the 21 abandoned sites in Canada was eventually turned over to the DIAND (now Indian and Northern Affairs Canada) in 1976.** The detritus littering the arctic is obviously an indication of incredible waste. But, more importantly, it is an indication of growth. The more bits of snake skin you saw laying around, the bigger you know the thing had become...The development of the cruise missile [in the 1980s] is behind much of the military development of the arctic. Canada and the U.S. agreed, in a Memorandum of Understanding signed in March 1985, to update the existing radar system under the (North American Air Defence Modernization) NAADM Project. This signified the end of the existing DEW Line, and its replacement with the new, modernized North Warning System (NWS). Reagan and Mulroney signed to rebuild all Arctic military sites at a cost of \$1.5 billion, most of it paid by the US. There would be a new radar chain, new bases for jet fighters and various other

attendant hardware. The 21 active sites were subsequently replaced by 11 Long Range Radar (LRR) and 36 Short Range Radar (SRR) sites.

The North Warning System is now fully operational [1989-present] and is currently managed by the NWSO Directorate on behalf of both North American governments. This North Warning System is designed to provide long-range detection and coverage for drug interdiction support and tactical command and control. Drug smuggling interdiction is an ancillary mission to which the capabilities of our maritime and land forces have also been applied, and illustrates how existing structures and capabilities can be adapted to address new problems... In light of today's threat environment... little could be gained by increasing contribution in standard detection systems. Environmental security has, over the last decade, emerged as topic of discussion and vibrant debate. Largely in response to the end of the Cold War [1989], the termination of superpower rivalry, and the explosion of nationalisms, the academic and policy communities have sought to revise their conceptions of security. In keeping with this conceptual shift, the natural environment, and anthropogenic alterations of it, have been identified as important elements in the relations among states, communities, and individuals. **The concern for the quality of the environment is not new. More than a century ago, the Fisheries Act [1868] included environmental obligations. In the past ten years, environmental protection laws have become more stringent to respond to the concerns of Canadians.** At a time of defense expenditure cutbacks, ever-changing roles and responsibilities for the Armed Forces, official censure over racism and public criticism for homophobia and sexism, the Armed Forces feel beleaguered. The celebration of environmental protection successes is very important.

During the DEW-Line closure process, the sites were generally left in an orderly state, obvious hazardous materials removed and buildings locked up where required. When they shut our base down they left everything behind.... **This closure was not however the end of the process.** Oil was spilled into the soil. There was no place to store used oil so they just dumped it on the ground and it eventually got into the rivers and lakes. **There was concern that the construction and operation of the DEW Line sites had significantly influenced the local Arctic environment.** Fish died from it. **Obviously, acts of negligence at work may cause damage to the environment in different degrees of seriousness. Common sense must be used.** I don't know how many 24 volt batteries they used but acid was spilled into the soil too. The acid has a long lifetime and destroys the environment but they just dumped the batteries outside instead of destroying them elsewhere. **For example, wasting paper or water is negligent but is not likely to land employees in jail!** They had anywhere from four to six 5000 gallon tanks at every site. There is still lots of equipment and buildings at those sites including 350 foot (107 m) high towers with a satellite dish on top, caterpillars, graders, tractors, radios, carbon dioxide bottles, and waste that has affected the wildlife. **However, damages such as fuel spills or leaking underground tanks may be extremely costly to repair and may have serious consequences on different forms of life, including my own. This is why Canadians have demanded meaningful laws and appropriate punishment for such offences.**

Environmental bureaucrats suspected the blight but could not get the defence bureaucrats to fess up about what was actually on the sites. Between them, they mewed and memoed on the subject for several years. **Depending on the severity and the extent of the damage, Environment Canada may issue warnings, tickets or lay charges against the Department or against one or more individuals.** Finally, when plans to expand the radar system were being completed, then-environment-minister David Crombie wrote to then-defence-minister Robert Coates and said the chemicals had to be cleaned up immediately "if we are to avoid a major controversy". **In 1989, a MOU between DND and DIAND was signed, which provided guidance for the physical restoration of the closed sites. [A]lthough the extent of the physical disturbance could be readily determined, there was no precedent for assessing problems associated with chemical input into the unique environment of the North.**

How should we understand scientists' involvement in military-funded research? Critics tend to see it as naivety and/or a regretful succumbing to external pressures. Although these aspects are relevant, they obscure the decisive initiatives that scientists have often taken to propose research intended to solve military problems. **The Environmental Sciences Group (ESG) is a multidisciplinary team working on solutions to a wide range of environmental problems. ESG was established in 1989 at Royal Roads**

Military College to pursue studies such as those noted above and also to provide advice on environmental issues to the Department of National Defence. ESG's engineers, scientists, biologists and geographers have a range of experiences in risk management, the development of remedial technologies and applied research. [T]he Lab's scientific program drafted, redrafted, and debated the idea of "basic" versus "applied" research, so as to come up with an institutional research menu that offered a proper mix of the two. Basic research...entailed more than an administrative nicety. It existed as part and parcel of a laboratory culture that emphasized investigatory independence, the freedom to publish in the open literature, and often-time collaborative undertakings with researchers at non-government, non-military labs. **ESG obtains the resources for its work from a number of sources and operates on a nonprofit, cost-recovery basis. Current sponsoring agencies include: National Defence, Environment Canada, the Natural Science and Engineering Research Council, Toxic Substances Research Initiative (Health Canada), CRESTech (Ontario Center of Excellence) and others. ESG does not compete with the private sector but does occasionally participate in projects with commercial firms in a manner that is consistent with federal policies.** They led separate intellectual lives, but because of shared institutional affiliations, they sometimes existed in symbiotic relationships to one another.

Several broad sets of questions have guided the research agendas of the 'environmental community'. First, is the environment a security issue? The Cold War opened the national coffers for science, but it literally emptied them for R&D that bore on issues of national security. We estimate that there were probably 1,000 peaceful scientists in the Canadian Arctic in 1987...It was one of John Diefenbaker's vision of the North. What better way to exhibit, gain, maintain sovereignty than to have 1,000 peaceful scientists walking around the countryside? ...But I have one criticism: the Federal Government, since the early 1970s, appears to have redirected much of its support for long-term sustained research and systematic data-gathering to the solution of urgent short-term policy and political problems associated with non-renewable resource development of surveillance for defence. Certainly most scientists working in Canada's North would agree that there is a chronic shortage of funds to support polar research in Canada. There has also been a serious decline in the infrastructure that supports polar science. In a report to the federal government [1987], [Fred] Roots [then chief environmental scientist for the Canadian government] wrote that the military, with its endless resources and technology, was hoarding much of the physical knowledge about the Arctic. "It has moved many areas of important scientific research away from the influence of organizations and interests primarily concerned with the North to that of interest and organizations concerned with military power and global strategies...Much of the most sophisticated and significant arctic knowledge has become 'closed' and inaccessible to exchange among northern people and northern scientists at large." The new technologies which this funding purchased became available to space scientists in barter for the use of their name and image. Although the intelligence people were essentially in the driver's seat as far as setting schedules and equipment use-time priorities, the space scientists were able to negotiate terms of access which were beneficial to their research, and consequently to their professional careers. Was this all a deal with the devil or a happy compromise? **The file clerks and the typists...worked up individual forms declaring next of kin, burial plans, life insurance, payroll deductions, income tax withholdings, and the "Super Gold Star" secrecy act, which they swore to with hands on the Bible. When the papers were signed – press hard, four copies – \$., with a full Pepsodent smile, shook their hands and offered a welcome aboard to each man.**

1989/1990: North Warning System Environmental Study, Vols 1 –3... If you have been following the territorial situation, you will be aware that there is no party government in the Northwest Territories. **1990: Environmental Cleanup Study of 21 DEW Line Sites in Canada...**A major problem facing that government is deciding how they are going to govern and be governed. Some people say that Nunavut means "our land" ... **1991/1994: The Environmental Impact of the DEW Line...** It is not the government's land. No treaty has ever been signed and aboriginal title and right have never been relinquished...**Evidence for short-range transport of polychlorinated biphenyls in the Canadian Arctic using congener signatures of PCBs in soils....** On the other hand, some would say that the north is government land. **Effects of local and distant contaminant sources: PCBs and other organochlorides in bottom-dwelling animals from an Arctic**

estuary... After all, the government has been managing it for decades. 1993/4: Historical Ocean Disposal in the Canadian Arctic... We have two different opinions; that of the Inuit and that of the government... Collection and Analysis of Samples from Barrels at 11 North Warning Stations... Can the land be owned by two different groups? Implementation of the DEW Line Clean Up Protocol: Special Issues.... [A] variety of new claims-based management and government structures have been created for the Inuvialuit... The Government of Nunavut was formed as a result of the Inuit land claim; Nunavut was created in 1999 out of central and eastern North Western Territory.

Collectively, these studies have provided a detailed physical and chemical inventory of the DEW Line sites... The chemical inventory includes the results from the analysis of over 4000 soil/sediment/water, 1600 plant, and 500 marine/animal tissue samples, and represents the world's largest data base describing contaminants in the Arctic. The real import is that these effects are proliferating and scattering without anyone, including their inventors, knowing or understanding them. Among the contaminated buildings in Igloolik was a federal government scientific research station. The landfills were reported to be in poor condition, due in some instances to inappropriate siting, and also as a result of poor waste management. They had to be where they had to be, even if it meant building them on mountain sides, ledges or peaks. According to these reports, the sites were in good structural condition, but poor environmental condition, evidenced by the widespread disposal of waste and the presence of many areas of soil contamination. The twenty-one DEW Line sites returned to Canada in the late 1980s and early 1990s were, in short, a collective mess.

Since the radar sites span the breadth of the Canadian Arctic their impact on terrestrial and marine ecosystems cannot be overlooked. Only a small fraction (less than 5 percent) of the pollution entering Canada's North is from the DEW Line. The DEW Line Cleanup Protocol... provides a comprehensive method for the assessment of former DEW Line facilities and the implementation of practical cleanup plants that will be protective of the Arctic. Ironically... The United States now manufactures more DDT than when it was banned in 1972 for some uses. The United States sells the pesticide [DDT] to developing countries, and through airborne transport it finds its way back into the Arctic food chain. In accordance with the goal of the Arctic Environmental Strategy [1991] – “to preserve and enhance the integrity, health, biodiversity and productivity of our Arctic ecosystems for the benefit of present and future generations” - attention must be paid to local, as well as global, issues. Research continues, including studies on the health effects induced by contaminants, which focus on children because they seem to be the most at risk... In a couple of years, results will indicate whether the contamination has caused neurobehavioural effects. The Protocol recognizes that this restoration will not return the environment to a pristine state, but will at least remove most barriers to long-term natural reclamation.

An emotional and exhausting debate began on who should be responsible for cleaning up the mess, especially after concerns that the PCBs in the paint were harming the environment, and consequently the peoples, of Arctic Canada. [The Canadian Department of] Defence is responsible for the environmental aspects of the activities over which we exercise a direct influence, while enhancing global economic, social and environmental sustainability through its efforts in peace and security. Negotiations on the clean-up of the DEW sites... involving various Canadian and American departments, had been proceeding in quite separate tracks through the early 1990s. They were making little or no progress... The overarching theme of Sustainable Development Strategy 2000 is conservation of the environment by integrating environmental considerations into decision-making at every level. The breakthrough came in June 1996 when the American negotiators made a financial offer of US \$100 million payable over ten years. Canada eventually accepted this offer. The Americans also proposed that their share of the funding for the clean-up take the form of annual deposits into the Canadian Foreign Military Sales Trust Account, rather than a cash payment directly to Canada. This stipulation was quite shocking to many since the cost of Department of National Defense's \$300 million cleanup efforts will amount to Kevin O'Reilly, research director with Canadian Arctic Resources Committee stated, “Canada deal negotiated a bad–If the military brought ...how could the government actually agree with it?

.in this stuff, they should bring it out” This U.S. Department of Defense account is used by the Canadian armed forces to pay for military equipment purchased through the Pentagon. The Canadian military spends about US \$100 million or so per year on such equipment. Mostly this comprises spare parts, for example, for Canada’s squadron of CF-18 fighter-bombers – the planes which took part in the NATO bombing campaign in the former Yugoslavia. **The strategy publicly re-affirmed the long-standing commitment of the Department and the Canadian Forces to demonstrate responsiveness to, and responsibility for, environmental stewardship and protection of the national and corporate assets with which they are entrusted.** (This concern, of course, would seem to strip away the fiction that the money was being used to purchase military equipment). “The field of environmental protection covers the protection of the serviceman and his equipment against the adverse physical effects of his environment”...

The Department of National Defence has ran into many problems relating to the million additional cost of transporting and 50\$To eliminate the .up-organization of the clean the Department of National Defense approached Environment incinerating the PCB debris, to challenge the scientific basis of the landfill ban of PCBs and make an 1997Canada in January .exception for the PCBs at the DEW line sites**Environment Canada is charged with the responsibility of inspecting work places and sites of any government department to ensure that the laws protecting the environment are obeyed. This includes National Defence property.** After s requestextensive testing, Environment Canada refused the Department of National Defense' when National 1998Finally, progress was made in .concluding the material was too toxic to bury Defense Minister Art Eggleton signed an agreement on the environmental provisions for a .DEW Line radar sites that are located in Nunavut 15cleanup of **The assessment and cleanup of the abandoned sites is therefore the responsibility of DIAND, and is not the focus of this report.** However, they haven’t been able to come up with an agreement on the method of disposal for .PCBs yet

ing, the road to cleaning up the environmental mess has at leastAfter years of negotiat The employment rate is also getting a boost; many people, especially the Inuit, are getting .begun .training and jobs that they have been desperately waiting for“There’ s not much work around .here so we want to find a way to get the younger generation involved in one way or another” They want to take part in our research design. They want to set the agenda. These are the words that have been used. They want to be involved from start to the end. They should be consulted even in data-interpretation and surveys...That’s what they want, and that is it what you and I must be prepared to face. But beyond that, they want to encourage their young people to get into science, they want to develop managers, to become involved. **“Inuit across Nunavut are pleased that the DND has today declared its intention to clean up this problem on our land”, said Mr. James Eetoolook. “This agreement is a big step towards solving a problem that has lingered across the North, and it has taken along time to get this far, and there is still a long way to go.”**

In the middle of the twentieth century, we saw our planet from space for the first time. Historians may eventually find that this vision had a greater impact on thought than did the Copernican revolution of the sixteenth century, which upset the human self-image be revealing that the earth is not the center of the universe. From space, we saw a small and fragile ball dominated not by human activity and edifice, but by a pattern of clouds, oceans, greenery, and soils. Humanity’s inability to fit its doing into that pattern is changing planetary systems, fundamentally. Many such changes are accompanied by life-threatening hazards. This new reality, from which there is no escape, must be recognized – and managed. **The public and the Government of Canada have determined that the time has come for zero tolerance on polluters. As part of National Defence, I have an added responsibility for the protection of the environment because my job, directly or indirectly, involves the protection of my country from threats to its existence. Continuous pollution or environmental damages are insidious threats to the beauty, the integrity and indeed the existence of my country. Through my actions, I will contribute to keeping it strong and free and to maintaining**

its water, air and land in good condition for future generations. My superior will answer any questions I may have on how environmental protection laws affect my duties.

PROTECTING THE ENVIRONMENT IS MY BUSINESS

III

ARIA

*in which
the field technician records
some notes*

may 4 2001

i got the job.

june 14

4 days in.

monday i reacted against the 'reliability check' – the paperwork, the bureaucracy, and all the lack of accountability and inertia that accompany it. maybe my lack of documentable 'loyalty'(or my unwanted questions) will get me kicked out.

tuesday it was the vast amount of lab waste – plastic, metal, glass - we generated in our soil tests for tph, pcbs. this seems unacceptable not only here but especially in the north, where we are supposed to be cleaning up, not adding to landfills. told 'just the way it is' 'too expensive' 'disposed of properly' and even, admiringly, 'you're a rabble rouser' after lab. resorted to sloppy lab technique.

wednesday there was just my stupidity. stupidity is forgetting my lunch, getting locked out, wincing every time i see someone on campus in fatigues, stupidity is decorating beautiful land with weaponry. flowers, tanks, grass, cannons, lake breeze, bombers, pink flamingos, memorial arches to our glorious dead.

today, thursday, was a full day lecture from a kindly management and leadership consultant. eight hours of overheads, twenty-five experienced adults (my coworkers) sitting in rows staring to the front. a full day of putting labels like 'winners/losers' 'leaders/followers' etc. on people, as if permanent identities, as if even briefly true. and this room full of biologists and engineers apparently sucking it up, no tools to deconstruct it, no useful words like stereotype, like hierarchical, like dualistic. i offered mild dissent to this presentation in the form of a comment on how it seemed to not apply to my work experience so far, perhaps more applicable to corporate settings? was told, with gentle puzzlement, that it is meant to be universally relevant...

i wanted this. i wanted freedom from toronto, from school, lover, financial strain, instability. and i wanted this idea of a work group: interdisciplinary, adventurous, reasonably well-funded, non-profit, academic yet applied, environmental, young, friendly, lots of women, potentially cohesive. it also just happens to go with a homogeneous, conservative, technocentric culture operating under a military umbrella.

after all this complaint, yet another lawn ornament: the soldier by the forbidden parade square, a quiet bronze with tears slipping down his cheeks in the rain. how is it that institutions become evil, even if individuals are not? that individuals become rabidly angry with institutions? that with violence and anger is always grief? that so much conflicted indifference exists? and how can i let all this blow off in the 20 minute walk home?

july 8

two things i carry with me; the rest, i imagine, is disposable. the two things are my breath and my book. breathing and writing are the most steadfast companions that tie me and my sanity together. the two pieces, two activities, bind me to the land and bring me here.

here, i feel my soul relax. i recognize a coming home to a place where rules are better than in the place i have left. i feel like i could calm down here, that it might be possible to find peace. this i felt in town and looking out over the flat/undulating expanse of dry brown, green, grey, gold tundra underneath the big sky. light, of course, as they all write about, strikes you too; here the sun does move around the earth. a palpable return to geocentrism. i am glad to be travelling, so glad to at last arrive.

the peace, the arrival, however, is both promised and not accomplished. i don't think i could be at ease here specifically, at the radar station, and of course (secondarily) it will take some time to wind down, unhinge, relax, understand my true temporary freedom from family, friends, toronto, office. i am *in the field*... but also at this main station. these module trains on an enhanced beach rise, sitting in straight, straight rows. at one end, a large shiny white golf ball and two smaller half-balls are the important technical parts meriting the personning of this station: radar, of course.

the module trains feel like submarines, at least what i imagine they would feel like, hermetically sealed, humming corridors lit by fluorescents about 15" above my head. the trains are built parallel to one another: watching trains watching trains. internally, their segmented linearity provides a modicum of privacy but also a bare minimum of social space. there isn't enough room in the hallways to walk two-by-two, nor to stand and have a civil conversation. one can avoid yet not avoid people – you see and hear others constantly in passing, through the thin bedroom walls – but have no really comfortable places to linger together. the dining room is not available because the train culture prevents loitering there: we are told to eat and leave as fast as possible to allow for clean-up. the remaining communal spaces are all dominated by enormous TVs (always on), and/or are smoking rooms, with constantly whirling exhaust fans.

in all spaces, every inch of available surface is signified: CAUTION. sign in and sign out. please cover bed. bedlamps could be fire hazards, turn off. no smoking in bed. go to dining room if alarm rings. microwave can affect persons with pacemakers. exit. not an exit. do not back up vehicle: backing up causes accidents. speed limit 5 mph. no smoking within 100 ft. no trespassing government property authorized personnel only (these alone are translated into syllabics). CAUTION. even the air is signified: every morning a computer voice – “bitchin’ betty” – wakes us with the time and weather. just like 2001: a space odyssey. if only the trains would also levitate, float up and away into the ocean of space... it is in a way like we have landed from space, into space – dropped out of the non-time, non-place world of airports and holiday inns into what some call a moonscape, into these boxes and domes.

of course the trains are also extremely comfortable in their own way. there are the TVs, and we had fresh fruit (melons, grapes) with four kinds of fancy cakes for dessert today. the money that it takes to maintain this kind of comfort here is palpable, and staggering: at the co-op store in town, a no-name 2 litre bottle of pop is \$6, a pale head of cabbage \$11. the northern store is closed today (sunday) but open tomorrow – nunavut day – until 3 pm. but tomorrow, the co-op store is closed. so, a subtle difference in loyalties. the co-op store flies no nunavut flags that i see, but they have suspended two rainbow flags from the ceiling right behind the cashier. i smile at the welcome. in the lobby of the co-op store is an office with “the power company” on the door. power indeed, to supply electricity and heat to the residents here. everything hums, all year. the gravel roads are crawling with ATVs and construction vehicles, bristling with ground cables and telephone wires. a new school is being built, its shape a shiny tilted saucer roof sloped over a low, windowed first floor. this is the first fire-proof school to be built in the north; the previous four were burnt down. across the bay, an abandoned stone church – the original mission, now replaced by three aluminum-sided or wooden churches in the town proper: anglican, catholic, and perhaps baptist or evangelical.

in town, hardly any elderly people seen this sunny afternoon, but the streets full of the curious young – beautiful dark-eyed, smooth-faced kids thronging the store steps, always with candy or pop, smiling mouthfuls of silver and black teeth. kids with questions: “where is your baby? who is your dad?” sometimes, “where is your mom?” and always, “are you a teacher?” three little ones flying into my arms exactly as i'd been longing for, playing for a while. but then they wouldn't let go. i got frustrated and even if they could sense it, it was still fun for them to follow me, locked onto my legs. i gave in, went to their home. their mother – young, quiet, perhaps very tired – knew why i had come, and claimed her children by chasing them in the street. i wanted to talk more with her but it was awkward, neither of us fluent in the others' tongue. and she seemed so tired, her children (three? four?) young and strong and needy. how do people do this?

the adults at the store are short, and not surprised at us. i feel far less scrutinized than i did paddling

into a reservation in northern manitoba. this feels more cosmopolitan, more of a hub, a waypoint, a growing place, less isolated. the teenage co-op clerk had on a funky cap with long blond cornbraids falling from it. there are plenty of white people here, in the airport and the store. white men in line glanced at us with amusement, fear, recognition. i think both white women i saw in the store (both with young children) co-own tourist businesses – fly-in fishing/hunting resorts. this i guess because i see both drive off in large passenger vans with logos. later i meet the teachers, who are out exercise-walking. four women, two my age, two my mother's age, some have been here three or four years. white women meeting others on an arctic road, and my sense of exposure sky-rocketed. a lot rested of the question of, "and what do you think of this place?" suddenly it seemed that any southerner coming into this community would be subject to scrutiny, an object of hope, fear, expectation, possible loyalty. "and what do you think of it here?" that pregnant pause, eight eyes in four white faces watching...

walking back from town across the tundra, sun streamed through both canadian and american flags flying at the station boundary. we wandered and dawdled, marvelling. the rabbits are huge – bigger than the foxes. lapland longspurs, semipalmated plover and sandpiper, hoary redpoll, brant and oldsquaw on the many small ponds, roosting on rotten ice or cold, blue water.... no trees of course. no plant reaches knee-high; lichens and bare rock form a patchwork with hirsute wildflowers and arctic willow. corn on the cob for dinner, though, since it is july. after dinner we watch jackie chan and whoopi goldberg on the superstation. the advertisements are repetitive, and american. now i write on a wooden desk, feet on carpeted floor, drink lipton lemon tea from a china cup.

it is possible, of course, to fly anything anywhere, move one material culture far away from its 'origins'; only here i am more awake to the history of global colonization in every gesture i make, including the acts of writing and breathing. banal observations, the usual tensions. it is the eerie luxury, and the laughability of the "no trespassing, government property" signs out there on the tundra under the bilateral flags that make me rehearse these one more time.

i know why the structure – a defense against change, self, integration – an expensive, very dear, manifestation of anxiety. that's it! in a phrase: this north warning station, perhaps as all things military, is a disciplined, even beautiful, but violent manifestation of anxiety. the linearity, the regulations, the motivation – "north warning" for whom? – the claustrophobic trains filled with entertainment and rich, expensive food from so far, far away, the pale solitary men drifting – or marching - through their corridors...

outside, the peaceful, sundrenched land, the little flowers purple and gold. *in the field*, i have a kind of itinerant belonging, and horizons of beauty a few steps away, just beyond the end of the ferocious act of will that brought me - and this station - to this dot on a map. the clock ticks, the radiator hums, and outside the sun shines.

july 13

more fog, rain, damp, which pleases me. for some reason it's more comforting than the long-range views of flatland and big sky... perhaps because one feels bigger (or less small, anyway) and also consoled by ignorance: you can't fear what you won't see. i like the clarity of the far views, but they also demand an externality of vision that the fog reverses. the supply plane won't get in this morning....

i am somewhat resigned to this claustrophobia, although to me the stringent health and safety measures often seem more a measure of our fear of contact, and distrust of each other ("liability") than a real threat. given, freedom is illusory – traditionally living inuit were unfree in also having to watch out for death by bear, weather, accident or stupidity – but i wonder how much constraint their watchfulness imposed on their movement. beyond impossible comparisons, i wonder how much of this is locally necessary. i can't help but think of the movie that we were required to watch, in a chemistry classroom down south, which noted exactly one death due to polar bear in the north in the last several decades – or of the relatively local bear monitor saying he has never seen a bear his whole life, even when he hunted them! i heard the same man getting teased about shooting bears as we returned back from yesterday morning's work. there are a bunch of levels of mockery here...one is an older man teasing a younger man for guarding the women, and perhaps another is for guarding southerners against a non-existent threat, and making big money at it...somehow a familiar story....

but now the plane has come and gone, as has the fog – a clear, cold, windy night, the sun dipping to only a few degrees above the horizon, sky streaked with bright pink – a dramatic difference, already, from the barely pink wash of only a few nights ago. and an off-kilter satellite conversation of stiff, newsy clichés with my family, 23 min 02 sec, two co-workers as audience. my mother asks me to describe the land, and i am frustrated now by my failure to do it justice. it's flat, i say, very big sky, cold, the ice just broke up....

this the drastic change when the fog lifted: opening after lunch onto clear, clean, long views. suddenly the water is a rich blue motion, not the variegated white stillness of sea ice – this now pushed up in chunks, white jagged piles, near shore. i watch the white-caps, the white piles, while running the airstrip, and wonder if i would see a polar bear coming if it came. i look for large, yellowish, awkward-graceful animal movement, and stay on the ridge well above the shore. i've been cold enough today, and i find i don't need to prove my birthday with an arctic swim after all.

this looking, this new wariness towards shoreline (which everywhere else would be an inexorable temptation) is part of the re-education of my vision that takes place in this new context – both land and job. the land is (unlike cityspace) long-distance, with more subtlety of colour, of scale, a temporal warp and woof, a directional challenge – again as they have all said before. the job teaches me fear of bears. more interestingly, though, it re-educates my biologists' sight. i learn to see different soils, a taxonomy of soils: sand, gravel, pebbly, stony, clay, organic; fill, native soil permafrost, active layer; vegetation cover or not, the different root systems of moss, saxifrage, aven, willow, grass, sedge. this – geology! – deepens previous older natural history learning, expands my ability to see the land.

that would be enough to start, but the other, more radical shift, is the incorporation of contaminants into "natural history". the contaminated vision (or even, sense...) is an ability to look at these radar sites and see spills, sources, sinks, pathways of probable product migration and pooling, probable edges of plumes. this is an engineering vision, specifically an environmental engineering vision, that is much more fundamentally integrated than the natural historians', or even the ecologists'; these visions too often ignore human effects, simply because/ by demonizing them. (case in point: the dismissal of possible anthropogenic effects on beaver populations in my last research job – never studying the placement of the road in the rocky mountain valley where the populations were decimated, and its possible effects on hydrology; instead we looked almost exclusively at elk effects.) here i have to develop a more structural, mass physical vision, one that sees and analyzes topography more readily, that encompasses the substrate as well as the visible biota, and doesn't skip over human constructions as simply despicable, deniable intrusions on what would otherwise be beautiful, exotic scenery.

one of my co-workers can guess glycol from a stain i don't yet even see on the ground. in a building, around buildings, she sees the former occupants in interaction with products; people, of course, are part of the migration pathways she can see. it's not the perceptual shift lauren sewall might wish for ecopsychology...it takes me into dark, damp garages to study paint in an intimacy that the naturalists might reserve for lichens. but this one walks around the damp, dark spaces, picks a peeling flake off a wall with her bare fingers, and bends it. "ah", she says, "see how this is friable? how it doesn't break when i bend it?" i do see. "probably has pcbs", she says, tossing the chip away. she looks around again, analyzing, judging, categorizing, deciding. this is the vision i need to acquire in this job, one that encounters a construction (indoors or out), and based on a whole human history of landuse, sees what needs assessment, and assesses it. i need to know about human habits and how

contaminants move in soil and water – downward, mostly, and depends on whether it's hydrocarbons, metals (inorganic elements) or PCBs – and whether the hydrocarbons are volatile or not. and i also need to be able to see this land in winter, to see the effects of snow, wind, and cold on both the human habits and the soil-water-contaminant interactions. i can learn this engineering vision, some of it anyways, can acquire some of the power of this knowledge of earth forces, buildings, machines, the north. and, with some instruction, i can build a water-well out of PVC 1" pipe, mosquito netting, and duct tape!

still, i have some reservations, both admiration and fear towards the technically sweet. after listening to another engineer describe with lovely enthusiasm the experience of visiting northern diamond mines – the dogs, the security, the extreme ingenuity required to get diamonds out from 100 metres below an arctic lake, to extract a carat of pure carbon from a ton of soil – i snorted with laughter, “for diamonds! little bits of sparkling rock!” pretty, surely, but so is quartz, zircon, mica, the ocean under sunlight.... i acknowledged that it keeps some families fed. but kills others. i was then told that canadian diamonds, at least, are made "without blood": they are micro-etched with a maple leaf, polar bear, or beaver, so that the buyer can tell them from south african diamonds. but i think we are having different conversations. yes indeed the social and material settings are different in canadian mines, but the building of the dam itself will kill and displace thousands (millions) of organisms, and there will of course be accidents and security incidents. the numbers of human deaths may be very low, but there will be blood...

so these are my days. techniques: topography, stratigraphy, hundreds of numbered samples, a few pages of stained cryptic notes. textures: the blood blister from two hours hand-shovelling, the sound of sand grains in the glass jar lid, the sweet-edged clarity of late arctic sun making flesh from stone. and conversations that sputter out. from these, we expect to proclaim – later and far away – a certain true history of this piece of land. from this, i make a living.

july 19

sanderlings at the point, at last visited. despite the reeking smells of test pits there, the first place of silence, almost, in the corner of this land. the point! the old ship, the old house, standing both lovely and tragic, lives lived in this isolated spot, a place where births, deaths, everyday epics spun themselves out, leaving a broken home still standing, red paint faint on grey weathered walls, buntings in the eaves and white vertebrae scattered on the stones outside the door. the ship is called the *sea otter* and lies, quite dignified, in a soft, rotting bed of wine-dark algae, cut though with yellow sheets of drying kelp. (this, i discovered, is the “paper” i took for rotting trash down at the inner bay a few days ago). in this corner of quiet, i can suddenly hear the land and, quite briefly, i feel as if i might be here, really...

i hear cranes calling from far away, and once, a wolf howl, clear, more felt than heard, so faint is the response across the water. best of all, i hear the moving sheets of ice grind into each other, piling thick, melting chunks on top of each other, releasing crystalline granular masses into the sea. they look fragile, but won't break up with thrown stones (an irresistible pass-time). these little islands move, drift, across the mirror-blue water quite rapidly up close, but at a distance form a mesmerizing slow dance that, as the evening lengthens, becomes aglow in lavender, periwinkle, rose. the sea is a soft expanse of white purple and silver – so soft.... it is amazing how soft the land is – for all its renowned harshness, whose evidence is written in the tiny plants, the water cold as quick death, the broken rocks, there is deep, deep gentleness i can read tonight in the land here, a kind of simple kindness. don't know how to explain this but to call on the long-lit evening and even the bright days with a sun that doesn't tire....unlike florida, colorado, wyoming, even ontario heat, there is no relentlessness in the arctic summer.

other facets of the gentleness: arctic char are bright, deep green, flecked below with pink and silver, big beautiful ocean fish. we caught four below the diesel tanks, below land so contaminated they had to wear respirators to collect soil samples. the char, apparently, are only passing through – and so safe to eat. which we do, a lot. more fish stories: two inuit men (one on whom i have a little crush, for his quiet competence and brilliant smile) playing cards, studiously silent. i walk in and start talking to someone else about catching monster pike in manitoba; the cards slow, the heads come up, and then down they go again as the white folks natter on about something else.

suddenly there are only just over three weeks left here. i find i want it to never end, for my work to always be up here. i have no real desire to return to the south. i have no home there – why should i want to go back? but this, this partial belonging, an acceptance with freedom, a strange fractured family...

july 25

a busy day shipping samples – thousands – while the site hosted the PMO (project management office) tour. all seemed pleased, the work has gone very well, although the managers' pleasantries a bit stretched with fatigue. two weeks tomorrow, we all fly out. the PMO tour is sort of a quiet landmark, an outside perspective. at the end of today, we are tired, soft, relaxed. the last few days – longer – have been working late, barely recovering a sense of self before going to bed and rising to work again, short of sleep. but tonight i'm left at about 5:30 with nothing pressing to do. two late nights of birding the local small ponds and a good dinner leave me with little inclination to go abroad. i look at my calendar and remember with shock a wedding i have to attend this fall, and think with vague distaste about having to look for a place to live... things change even now, as i sit now not in my usual spot – uncomfortably scribbling on my cot – but in the storage tent, which, after the day's chaos, has been thoroughly tidied and now provides a sun-slanted place to write. the generator hums louder here (three tents closer) but it does drown out the voices next door.

this, it turns out, is part of the reason it's left on even when not needed: some like the muffling effect, it keeps them from being "forced" to listen to others. a function i never would have thought of, caught as i was in my resentment of the generator's ability to drown out my own voice, and the voice of others (birds, animals, "the land") that i want to hear. a difference in perception and desire: some don't want to hear people and i want to hear everything else.

besides, usually i want to hear what people are saying too, as just one means of gathering necessary and/or interesting clues. for example: this is a significantly different setting than research science, than biology. science here is not important. there is no great concern for statistical accuracy, no deep discussion of theory or reasoning behind what we do. indeed, it is almost taboo to discuss work at meals! what is of interest is speed, logistics, technical skill – not ideas. this (engineering? environmental assessment?) is a very material culture, with the occasional whiff of efficiency aesthetics: we are concerned with how to move things, how things moved, what people's bodies and machines can do, how, when, how fast. there isn't much mystery, no deep questions to wrestle with, just an area to figure out - with faulty equipment, haphazard chemistry, and relatively constant organizational chaos. note another massive difference from research is scale – money, people, distance, everything here huge relative to every research project i've ever worked on. basically it seems to come down to large-scale information and people management problems that trickle down to our everyday level and need to get solved, now. at the end of the day, some of the details – care, depth, doubt – get lost. perhaps this is part of its ease.

what is also culturally different (from research field biology, at least) is the almost total lack of recreational natural history interest – no serious "nature nerds" at all. i'm the bird expert here (!), with a very few taking an occasional interest in my observations. plants are slightly more popular with this crew - however, botanizing and even walking become more justifiable with a camera (or three) strapped around one's neck. fishing, on the other hand, is of more general interest. it seems to cross class and culture lines more easily than almost any other camp activity, although it has taken on a competitive male edge here that generally leaves the women out (except for cooking – and eating - the killings). then there is big game. everyone - male, female, white, inuit, northern, southern - pays attention here, although the inuit men the most obviously skilled at it.

optical gear seems to be of prime interest to the inuit for its use to watch for wildlife – the bear monitors spend their time scanning the far horizons for caribou (tuktu) and, if fortunate, muskox (umingmuk). (and of course bears (nanook)!) if someone spots something, it is announced on the radio, and sometimes work stops until everyone has had a look. binoculars with long-range capacity seem to be the optical technology of choice – i have yet to see an inuit person use a camera, or a computer, the time-freezing technologies favoured by the southern scientists.

a note on the ritual of binoculars sharing. now that i don't smoke, the binoculars substitute as a bonding artefact, along with talk of animals (at least one advantage here of my biology background). after sharing the binoculars with a monitor, we turn to talk of polar bears. now, this man's english is clear and fluent, but talking of polar bears he referred to them as people throughout the conversation. it took me a few sentences to understand this; he was talking about "how the people sometimes attack, sometimes aren't interested at all, even if they are only a few metres away, and how you might never see them until close." he said people several times, and then said, "they are very big and yellowish". so, the bears are people: have minds of their own, unpredictable behaviour, desires, movements. just the language use is striking...

it is still hard to write this way about the inuit people – always that frightening, lurking risk of generalization, northern orientalism, ignorance... i have an ideal way of life held dear in my mind/heart: living close to the land, understanding the agency of the more-than-human, using one's talents (and binoculars), body/mind/heart to get food, good food, in the best, easiest, healthiest way; being sincere, stream-lined, full of

joy, honest to core, direct, kind, strong, sincere, skilled, smart, articulate, flexible, adaptive, patient, observant, attentive...not many white people i know meet this ideal. we don't respect our animal selves, let alone others; we are often fat, slow, stupid of heart and mind and spirit for neglect of our body and environment. yet this critique, and the corresponding hope for better outside of my culture, somehow ties into a colonial imagination. sigh. i wonder how many years i would have to live here, and how much work besides just living here, it would take to rid myself of these stereotypes.

ah, hierarchy. in this community, there is also the subtle problem that the white women, us, me, have of trying to win the white (boys) game but also be "good" (women) by being domestically helpful. we can't be seen cooking or cleaning by the (white male) engineers, lest we lose potential authority in our working world. yet it feels odd – i at least feel tension, and several voiced the same in our after-dinner girl-talk – to not help out the inuit women in the kitchen. somehow this seems more complicated, more personal, than at the main sites where all the cooks are white (and mostly men). what's right? instead of actually washing dishes, we tidy the table, bring our dishes over, don't sit in the kitchen when the dish-washing starts. gender, class, race, labour... so what do i do with this? how will it change?

the gender issues simmer on, helped by the heat and accompanying mosquitoes. in our free time, leaving the kitchen, we all retreat to our segregated tents to avoid the bugs. the lab, briefly, became recreational (chess-playing) space – but like the tea-drinking women’s group in the kitchen, this quickly evolved into a single-gender setting, and somehow intimidating, hard to penetrate. i remember borrowing a broom from the lab during one game, and rushing out in hurried apology. even a TV room (god forbid) would provide some more relaxed bisexual social space....

beyond this, frustrating to see a characterization, a solidification of “us” as a bunch of angry women. some women here do in fact strike me as angry, or at the least, often aggressive from anxiety, from accumulated frustration and social discomfort. and what do i do but write! surely i could be spending these writing hours in making alliances, creating positive social space, crossing the barriers that have been erected, take a few risks... but we leave so soon. it’s such a temporary community, like so many of my communities. for example. when a co-worker says to me, after listing my perceived attributes, “i’m surprised the men aren’t beating down your door!”, so many responses fly to my lips that i have nothing to say. so many responses, none of which fit my rules for politeness, for something remotely understandable in this community. many other interactions i have heard similarly constipated, resulting in a larger irritation: living in a shell of guarded, managed friendliness.

so i resort to mild eccentricity – meditating when i can, writing at “extreme” length – in the absence of other forms of release. this is the claustrophobia i’m talking about – ironic in this landscape – the collective norms against which difference and desire chafe fairly constantly. selves need to be held with gentle, relentless vigilance. hobbies must be collectively presentable, freedoms administered. the panopticon of a small, remote community in a treeless landscape, the restrictions of living with people who do not closely share values, beliefs, practices, cultures. that’s why we are so temporary, why it’s a strain, even a source of illness for some.

what makes this somehow worse for me is admitting that the psychological depth, profundity that i am still reaching for in this landscape also eludes me. the more powerful truth seems now in its resistance, subtlety, boring-ness. it’s a gentle land, somehow – ordinary and self-contained, prosaic even. yesterday, i felt the truth of post-structuralist worldviews weighing in on my “Nature writing”: it’s what you make of it, this (and every other) land. i hear annie dillard: that’s all there is, you know. just the humming. and this plainness. the rest is thinking, language, phenomena, rising and falling endlessly. all i make of the land, all the words, are phenomena.

my search for profound self-insight, deep relationships, nature-based epiphanies, has come up empty here, and the emptiness niggles me. i was expecting more, it turns out, from the famed arctic. but to make a romantic self-quest with this land as a backdrop seems overblown and untrue. when others roam the land in ecstatic wonder every night, losing sleep, calling the light “so pure”, “so intense”, this whole arctic experience “overwhelming” (“what do you find overwhelming?” “oh – oh – everything!”), i find myself gently removed from their feeling. i remember feeling that way – in wyoming, arizona, utah – places i often think of here, these flat dry lands evoking each other – but i don’t feel the same here. a loss, an aging, a shift in vision. where now to find poetry? not in the trope of the sublime, i’m afraid – and part of me mourns this departure.

it’s as if “the sublime” is present, an available reading of this landscape, one layer of visions, a certain symbolic set. simultaneously, there is a “poisoned paradise”, the “remote prison”, or perhaps “sort-of-native land” – a place to work and live in, if not quite home. this last is the closest to me now, and perhaps why i am attracted to the inuit and the other working northerners. it’s not new. it’s beautiful, sure, and i prefer to be here rather than anywhere else, but it’s not like poetic clothing i’m trying on anymore. it’s what i wear, fairly regularly, because it fits well enough – if a bit worn at the elbows and knees. i’m here, in part, because it once seemed exotic and because i know it’s exotic to friends and family at home; my ego falls back on the value of adventure story. but it’s not as interesting as it once was, to tell the story, because it occurs to me now that i can get to a place in two, three days, be anywhere in the world, observing different flora, fauna, climate, season, cultures – and writing home about it in similar terms. i could work on any number of worthy environmental projects, learn the job, keep counting, measuring, organizing and presenting data. there is a certain interchangeability here, the same experience over and over again.

let me try one more time. this fabled land is a place like all others which is to say that it is magical, beautiful and profound like all others – and that this magical profundity becomes ordinary, becomes self, when i work there. glimpses of it as fable, as exotic other, as the land of romantic dreams, fade in and out. as with people, i have double, triple, multiple visions of this place, and perception is in part effort, activity, “a certain precise tilt of the will”. all places are beautiful, even if some are also ugly and unhealthy, manifesting carelessness or disrespect instead of goodness and love. even the badly made places, the badly treated places,

have beauty in them. even the beautiful, remote places have aspects of ugliness, stupidity, frustration, agony. so, in a way, because of this multiplicity, all places are the same. so this dreamland, this arctic, shimmers with nothingness, the nothingness of my myriad thoughts, rising and falling, its gentle beach ridges, caked clay valleys, drifts of cotton grass, blue flat waters, big fuschia skies, offering and reserving itself to and from interpretation. some of it, literally, is impenetrable. and in this (my) lifetime, much of it is unknowable, undesirable. this is the knowledge of five years searching for answers in the land, listening for the mountains to definitively speak. there is presence beyond my thoughts, but that is as much as can be written intelligibly. and i only hit upon what heidigger and others have already tried to write. the writers resource the land the same as fishers and hunters and loggers; we resource experiences as the paparazzi and anthropologists resource people. silence is ok: an accurate mirror of a density of possible meanings.

aug 7

cold ended again yesterday. fun singing in the radome today, before the plane came, the radar antenna assembly spinning, humming around for accompaniment. also in the fiberglass dome, two dead dry birds – not singing. one a male cliff swallow, long out of its National Geographic range, perfectly preserved. the other a female bunting. i took the male, beautiful he is, a lonely story. the funny thing is finding them lying side by side dead: placed or chosen? and the other is pulling him out of my pocket, completely without intention, to the great startlement of co-worker. oops.

the radar station ran only 10 years ago, a US postal stamp schedule left in the train reveals. it should never have existed. someone points out that the buildings could be used – research or tourism or something – and i would personally like to see every usable piece carted off by the locals. but at gut level, i also want to see these enormities disappear, get demolished, erased. there is nothing large in this landscape but the landscape itself. to take these down is to return what feels like a proper scale to here. they are conquerors' buildings, built huge for reasons of stupidity, arrogance, anxiety in illinois. that each site is near exactly the same, from alaska to greenland, seems to prove the point. one of the engineers just photocopies his notes from one dew-line site to the next, making the few minor adjustments required. such is the archaeology of american dreams.

towards this same project, we are also stealing (legally) tons of soil, arctic soil. literally, we are taking the land and sending it south, jar by jar. will there be hell to pay, eventually, for this? will others, future others, shake their heads in righteous amazement as do we over the generously spilled fuel and PCBs on the dew-line, or the hundreds of dried specimens of extinct specimens now in museums? "they didn't know, had good intentions, didn't think, back then," we say. "we know better today, in our more environmentally enlightened age." echoes of these familiar refrains haunt quite a few of us, as the open sewage pond rises behind the bathroom tents, spilling down the pad slope to the tundra, as gasoline splashes off the ATV when we try to refuel with cold hands and miss (just a little), as we use plastic scoop after plastic scoop to fill jars of soil. these are things we know (already) not to do. the stealing of soil, on the other hand, is something we feel fully justified doing, its wrongness not yet even a possible meaning. we continue, bag by bag, jar by jar, to ship soil and water south.

someone points out that this could also be viewed, quite nicely, as a very, very slow way of cleaning up the contamination – shipping all the poisoned soil out as the inuit leadership (i am told) originally wanted. "but what", a northerner asks, "do you do with all that contaminated soil? it's not good enough for here but ok down there?" much of it, of course, is good clean dirt – under all our criteria. certainly not all. and i don't know what comes of all that soil and water in the long run, tons of it now lying catalogued in morgue drawers in a warehouse down south. i don't rightly know. but re-location – whether up here in landfills or down there in drawers - is not quite what i thought of as cleaning up. tidying, maybe.

the work day ends at 10:30, now just two days left unless the fog gives us a reprieve - that "extra" time, bated waiting, that i so love. time absolutely free of obligation, full of attention. a deep tiredness now, a tired wish for only this: that most of us would go away, the generators turned off, and i could stay a week taking camp down, eating at one table...

aug 12

addendum to previous: someone asked me how i was, standing outside friday morning waiting for the plane. i said, "i don't feel very well." he nodded, said, "you don't want to leave." i said, "no, i don't." the sickness cleared up on the first flight, replaced by quietness, until the first beer. but i will remember that man's easy intuition.

IV

QUARTETTO

*in which
the scientist performs
a multivariate data analysis*

The following essay represents a formal elaboration of intuition.² In this section, I will be moving back and forth from science practice to more generalized theory in order to develop a thick reading of the discourses of science on the DEW Line cleanup. To do so, I have chosen a small group of key texts located at various distances from the practice. Those closest to the project include three technical texts, namely Summary of the Environmental Impact of the DEW Line on the Canadian Arctic (ESG 1993), the DEW Line Cleanup: Scientific and Engineering Report (ESG/UMA 1995), and the ESG Field and Laboratory Manual (2001). Other relevant scientific references include Canada's Missing Dimension: Science and History in the Canadian Arctic Islands (ed. Harrington, 1990) and Arctic Biology by Fogg (2000). At one step removed from the practice are journalistic and academic commentaries on the DEW Line and its cleanup by McMahon (1988), Myers (2000), and Khan (<http://track0.com/cc/issues/1298dewline.html>), as well as personal and fictional histories of life on the DEW Line by Harris (<http://www.magma.ca/~lwilson/dewhist-a.htm>) and Flynn (2001) among others. I will also consider environmental policy documents produced by the project's sponsoring institution: primarily the Sustainable Development Strategy 2000 and Environmental Responsibility: What I Must Know by the Department of National Defence (Director General of the Environment). These will be complemented by academic analyses of military environmental policy given by Woodward (2000) and in Environmental Security: Discourses and Practices (eds. Lowi and Shaw (2000)). Three important works in northern anthropology, natural history, and ecology – Brody's The People's Land (1975/1991), Lopez' Arctic Dreams (1986), and Voices from the Bay (ed., McDonald et al., 1997) – will round out my discussion of the wider cultural and political contexts in which science on the DEW Line cleanup sits. Finally, although I will draw on these relatively infrequently, background informants to my discussion throughout are some classic pieces within environmental and feminist thought, namely "The Environmentalist's Dilemma" by Neil Evernden (1984/1989), "The Trouble with Wilderness" by William Cronon (1997), and, among other feminist science scholarship, "Situated Knowledges" by Donna Haraway (1991).

From these materials, I will construct a dialogue among four voices, or discourses: rationalism, romanticism, militarism and feminism. The first two, I will argue, form the dominant discourses of science on the project. Rationalism comes into it in two forms: empirical and administrative. The first, empirical rationalism, idealizes empirical truth, attempting to obtain universally reliable knowledge through systematic observation of external, measurable phenomena accompanied by deductive logic (i.e., the "scientific method"). The second, administrative rationalism, is a marriage of existing economic and legal goals to instrumental logic, and is aimed towards decision-making more so than absolute truth. As Dryzek (1997) defines it :

As a problem-solving discourse, administrative rationalism takes the political-economic status-quo of liberal capitalism as given. It then puts scientific and technical expertise, organized into bureaucratic hierarchy, motivated by the public interest, to use in solving environmental problems without changing the structural status quo. (quoted in Woodward (2001), p.212)

Both are forms of rationalism in that they subscribe to the ideal of a standardized, objective reality that (theoretically) applies to all subjects regardless of context. In the first section of this essay, I will present the argument that, despite ongoing tensions between empirical and administrative rationalism, the latter has come to dominate the DEW Line cleanup project, giving rise to a managerial environmental science.

Romanticism – the idealization of the beautiful, pristine and natural, and the heroic individual's pursuit of such beauty – forms the second foundational discourse of environmental science on the project. Romanticism is the ally of empirical rationalism, in that beauty, like true knowledge, is to be valued for its own sake as a formal good. Romanticism has an honoured place in elite forms of science, perhaps most especially remote-location and/or northern science; beauty and truth become ever more desirable because they are difficult to access (both physically and economically). Here the primary tension is that aesthetics and individual heroism may hold an informally powerful position in our environmental science, but they are officially subservient to objective rationality and to administrative rationality in particular. Nonetheless, I will raise the question of whether or not a clean-up of arctic radar sites would have occurred at all had it not been for this particular kind of northern romanticism, and also address some possibilities for how romantic elements can be seen in the project's science, responding to and representing as it does a

² For this phrase, I am indebted to Allen Greenbaum.

particular kind of north.

Two more layers add to the composition. I have defined militarism as an ethic of paternalistic nationalism, or the ideal of protecting the civilian public of a sovereign nation-state, through the application of physical and/or technological force. While not foundational in the sense that the environmental science we (as civilians) conduct on the DEW Line cleanup could and does occur without an overt militaristic ethic, this science occurs almost exclusively on radar sites with ongoing military activity, and is funded entirely by the nation's military. Thus, I will investigate the project for how it reflects specifically military, and Canadian, interests. In examining these, I will further argue that the science on the DEW Line does subtly partake in a specifically militaristic variant of rationalism and romanticism – namely paternalistic nationalism - producing a kind of sovereignty (or colonial) science.

Finally, I will consider feminism. Di Chiro writes that:

feminism aims to explore ways in which current practices in society might be changed in order to dismantle those gendered structures and ideologies that subordinate women and oppress and exploit women and the other major categories of race and class. (1987, p.27).

In the DEW Line clean up texts, feminism is a silent discourse, in that it makes no literal appearance. However, feminism is visibly important to the environmental science on the DEW Line since it is practiced primarily by women. Considering the western historical characterization of women as irrational, and the exclusion of women from romantic adventures (scientific and military), the predominance of women scientists in this project raises some interesting issues. These include not only an examination of our presence in managerial, northern and colonial science projects, but an examination of the relative absence of “others” (namely, Inuit but also non-elite whites) from science on the DEW Line cleanup.

I would like to note here that my identification of these four discourses and their relevant content are, while not arbitrary, certainly not definitive; nationalism, colonialism and the politics of race could readily be discussed under their own headings. These topics have appeared mostly under militarism and feminism in this essay for somewhat idiosyncratic reasons; my first serious thoughts on nationalism have been almost entirely in the context of military environmentalism, and much of what I have studied so far about colonialism and race has come under the rubric of feminist theory and history. Moreover, another analyst would likely find other discourses to discuss; perhaps someday I will have the pleasure of reading an entirely different analysis of the discourses of environmental science on military contaminated sites.

Rationalism and Managerial Science

My first week of work (see June 14) on the project showed quite clearly that I had entered the DEW Line cleanup project with an understanding that was at odds with the current dominant discourse, which I gradually pieced together as administrative rationalism. For now, let one term begin to illustrate this disjunction: environment. Environment was a word that, for all its ambiguity and deconstructive environmental thought over the years, I still read as a kind of political prefix meaning everything good, living, and green; moreover, it was a concept firmly entrenched in biology and ecology, that is, the natural sciences. This reflected the bias of my professional and academic experience: I had worked in biology and ecology (research and conservation) for close to five years before entering this workplace, and I had been a student of environmental studies as well as the life sciences for eight. I was quite ignorant of the use of “environment” in, for example, engineering and industry applications where it primarily refers to managing soil, water, and chemicals. Additionally, I was ignorant of the definition of the environment prescribed by federal legislation, and followed to the letter by DND-DGE publications such as their Environmental Responsibility document (“What I Must Know”, [http:// www.forces.ca/admie/dge/pam1e.htm](http://www.forces.ca/admie/dge/pam1e.htm)). In the latter, the definition is given as follows:

WHAT IS IMPLIED IN THE WORD "ENVIRONMENT"?

The water, the air and the land

These elements are essential to sustain human, animal and plant life.

Thus, the environment is the external, non-living stuff – water, air, and land - that supports life. The environment is *not* animals, plants, and people; rather, it is *for* their/our use. Furthermore:

I MUST KNOW THAT...

Government laws and DND policy require me to take **every reasonable step** to protect the environment and avoid damaging it....I am **personally responsible and liable** for the protection of the environment as I carry out my duties. As a member of the regular or reserve Force, or as a civilian employee, I am required to act with **due diligence** - or reasonable care - in my daily activities as directed by the environmental laws of my country.... If an accident causing damage to the environment should occur...**I am the one** who would have to prove in civilian or military court that I did exercise **due diligence** - or reasonable care - to protect the environment in performing my duties....The first thing I have to do is to report the damage to my superior, who will in turn report it to the designated person at my work place....If charges are laid, those **found not to have acted with due diligence may be fined or jailed**. If I am charged, legal representation may be provided at public expense, but **if convicted, any fine or jail term will be my own responsibility**. [emphases not added] ([http:// www.forces.ca/admie/dge/pam1e.html](http://www.forces.ca/admie/dge/pam1e.html))

So, environmentally responsible behaviour is motivated by rational, legal obligation in combination with the threat of financial or physical punishment. Additionally, it is to be enforced by hierarchical social relations; this is evidently a document produced by the higher-ups to police the lower-downs, in order to solve a problem of potential environmental liability. In short, the text exemplifies a resourcist administrative rationality.

As it turns out, both the definition of the environment and the ethic of administrative rationalism of the project's sponsor lend themselves to particular kinds of science, and to particular kinds of environmental cleanups. To demonstrate this, I would like first to trace the early development of the Environmental Sciences Group (ESG) and the DEW Line cleanup (DLCU) through two key texts – The Environmental Impact of the DEW Line on the Canadian Arctic: Summary (1993) and the DEW Line Cleanup : Scientific and Engineering Summary Report (1995) – before returning to an analysis of present work on the project. Specifically, I will make the argument that there appears to have been a marked shift from early empirically-dominated to currently administratively-dominated discourse in the project's scientific practices. The resulting managerial science is implicated in reproducing administrative rationality through providing technical authorization for the DEW Line cleanup.

The Environmental Sciences Group (ESG), founded in 1989, grew out of the work of an arsenic chemistry lab based at the Royal Roads Military College in Victoria, British Columbia which was doing related soil research in the North West Territories. The first environmental studies (1989-1990) by ESG were commissioned by the Directorate of the North Warning System (NWS), and were specific to NWS-active sites; the first assessments of the DEW Line facilities were, on the other hand, paid for by the United States Air Force and conducted by a private Canadian engineering firm (UMA Engineering Ltd, 1990-1). The results of both these assessments, along with workshops for Canadian federal agencies, led to an early DEW Line cleanup protocol in 1991. This promised removal or containment of contaminated soil depending on its concentration of PCBs or inorganic elements; closure of sewage outfalls and leaking lagoons; closure of landfills and containment of leachate at any concentration, and removal of visible surface debris (ESG 1993, Annex B).

In 1992, however, the Canadian Director General of the Environment (DND-DGE) requested a further environmental impact study from ESG on the DEW Line (ESG 1993, p.iii). Results from this study were published not only in a report format (The Environmental Impact of the DEW Line on the Canadian Arctic: Summary (1993), which I will examine here), but additionally in the scientific literature. The impact study aimed to “critically examine the environmental impact of the DEW Line on the Canadian Arctic” and “provides further confirmation that the DEW Line Clean Up protocol will achieve its objective of safeguarding both human and environmental health”(p.iii). Specifically, the 1993 report documents the hazardous contents of waste barrels on site, aerial redistribution on PCBs into soil up to 15 km. from radar sites, elevated PCBs and lead in plants at the same distance, locally toxic effects on plants on radar sites in highly contaminated areas, and finally uptake of lead and PCBs in marine animals at the bottom of the food chain near the DEW Line/NWS radar station in Cambridge Bay, Nunavut. The authors expressed strong concern about the local bioaccumulation of these contaminants up the terrestrial and marine food chains (p.63). While acknowledging that much of the pollution in the arctic was atmospherically transported from remote sources (Myers puts the DEW Line contribution at less than 5% (2001, p.42)), the impact study

makes a powerful argument for considering the radar stations as highly “significant” (ESG 1993, p.42-48). Although the authors never explicitly state to whom these sources might be significant, such significance is implicitly related to the stations’ locations; most are adjacent to communities, and thus have a higher chance of impacting human health than their total contribution to overall arctic pollution might suggest.

One of the remarkable things about the 1993 report – aside from the fact that it was the first study to rigorously examine the ecological impacts of the DEW Line - is its presentation of two key discourses of rationalism: empirical and administrative. Revealing is the following introductory statement:

In order to determine the best method of cleaning up these sites, it was necessary to first discover what problems were present, and then to set objectives that would be practical, cost-effective and protective of both environmental and human health. This [the first] chapter reviews the development of these objectives. The balance of the report examines the impact that the DEW Line has had on the Canadian Arctic (i.e., the necessity for clean up actions).(ESG 1993, p.2)

Thus, the paragraph implies, empirical science comes first, and, having demonstrated the necessity for cleanup, the administrative measures must follow. However, this statement seems more an authorial prioritization rather than an actual chronology; as the order of the report accurately reflects, the cleanup protocol was essentially determined before impact studies were conducted, if not before the summary assessments described above. But, as the final sentence indicates, the emphasis of this report remains on what problems were empirically present (the environmental impact) rather than the development and implementation of the protocol, a more administrative concern.

In this emphasis and in the presentation of the study results, the report remains strongly within the discourse of empirical rationalism. Unlike other early DEW Line site assessments, the 1993 impact report presents detailed data analysis as well as explanations of both field and mathematical methods in the actual text of the report (e.g., on p.44). Careful distinctions are made between key terms (e.g., contaminant versus pollutant (p.12), input versus impact (p.49), site versus remote background (p.24), ecosystem and permafrost (p.49)), evidently for the purposes of intellectual, rather than legal, clarity. Empirically specific conclusions are presented following systematic arguments, which reference previous studies, current data, and the wider scientific literature (e.g., on long-distance atmospheric transport of pollution, p.42-3). Indeed, the presence of the standards of the wider scientific community is notable in statements such as the following:

The data [from this impact study] collectively represent the largest body of information ever compiled on contaminants in soils and plants from the Canadian Arctic. Furthermore, the marine studies are among the first to assess contaminant impact near the base of the marine food chain. (p.24)

Such a statement derives recognizably from not only empirical rationalism as a method – i.e., quantitatively large databases produce the most statistically reliable knowledge – but also from the valuation of original knowledge and the accompanying prestige in the empiricist community of science.

Thus, the latter statement would appear to appeal specifically to a scientific rather than, perhaps, an administrative audience. However, that an administrative audience is also present is apparent in the comments the authors make in the course of their empirical analysis, comments that would be somewhat out of place in a scientific paper, but make perfect sense in an administrative document. As noted above, the authors not only see their work as confirming the already-adopted protocol (p.iii), but also make reference to its practicality and cost-effectiveness (p.2). In reference to their waste barrel study, they argue that, “Since the eventual corrosion of these drums may result in the discharge of their contents into the surrounding environment, the lack of knowledge of their contents could present a considerable environment liability”(p.34); thus, the content of the corroding drums is framed not as an empirical discovery, nor as an ecological risk, but as a legal concern. Still, looking at landfills in general, the authors claim that:

The securing of landfills is preferred to complete removal for financial reasons, as well as for scientific ones – opening up old landfills increases the risk of (short-term) migration of contaminants into the environment and creates significant physical disturbance. (p.34)

Here, administrative and empirical rationalism are presented simultaneously, but this time with the textual

emphasis on the science. And in the end, the authors present their most powerful recommendation as a natural consequence of their empirical work:

It can be concluded that the DEW Line has had an influence on the Arctic environment, both from the perspective of physical changes and as a consequence of chemical inputs. Since the radar sites span the breadth of the Canadian Arctic their impact on terrestrial and marine ecosystems cannot be overlooked. **In accordance with the goal of the Arctic Environmental Strategy – “to preserve and enhance the integrity, health, biodiversity and productivity of our Arctic ecosystems for the benefit of present and future generations” - attention must be paid to local, as well as global, issues.** [emphasis not added] (p.83)

In such examples, empirical science flows directly to considerations that explicitly call attention to economic efficiency, legal liability and finally, existing federal policy instruments like the Arctic Environmental Strategy.

Given that the cleanup protocol had already been accepted in principle by various federal agencies (during workshops attended by DND, Environment Canada, Indian and Northern Affairs, Fisheries and Oceans, and the Government of NWT in October 1991 (p.iii)), to whom are such powerful reminders addressed? I think it noteworthy that the 1993 report was written before the DEW Line cleanup had secured full funding, and perhaps especially, before it had obtained American agreement to contribute to the cleanup. In light of this, the impressive empirical rigour and references to the external scientific community, *alongside* explicit use of administrative tools, make the 1993 report read very much like a document that was using all possible avenues of rationality in order to establish the project’s validity to a recalcitrant funding audience.

If so, it worked. As Myers writes, the original assessments (1989-1991) were budgeted at \$2 million – huge for a research lab, but nothing compared to what was coming (2000, p.123). Two years later, in the DEW Line Cleanup: Scientific and Engineering Summary Report (ESG and UMA Engineering Ltd., 1995), the total cost of the cleanup was estimated at around \$150 million dollars (p.VI-1). But in this report, the project discourse shows some noticeable changes. The report contains an abbreviated recapitulation of the early assessments and impact study, relevant regulations, and acceptance by the federal agencies, before the contributions of two new players are officially introduced: the engineering design by UMA Engineering Ltd., and consultation with northern residents. UMA – a co-author of this report – began developing a design and cost estimates for the cleanup in 1992, a process that was “essentially complete by December 1994” (p.I-1); about half the 1995 report consists of this engineering information. The acknowledgements notes that the report represents several years of “unique and successful collaboration between scientists and engineers” (p.i). (Interestingly, the 1993 impact report refers to the previous assessments conducted by UMA Engineering as “some corroborative data” (ESG 1993, p.iii)). Meanwhile, public consultations were occurring with one to two day visits to northern communities in the summers of 1992 and 1993, with one community (Cambridge Bay) revisited in 1994. These meetings took place “for the purpose of explaining the environmental objectives of the project and presenting the design plans for review.” (ESG/UMA 1995, p.I-1) Northerners from fifteen different communities across the Arctic were invited to express their “ideas and concerns” in such meetings, but the report notes simply that “although environmental issues were commonly raised during the meetings, it appears that most concerns had been addressed by discussions during the meeting” (p.III-27). No mention is made of health, human or environmental; rather, jobs are characterized as “the most important issue to all communities”, with their secondary interest in disposal of surplus DEW-Line materials (p.III-27).

The most dramatic change, however, is not so much the content of the report as a curious flattening of the overall tone; this report aims not to “critically examine” or even “confirm” the protocol – let alone stridently draw attention to environmental policy – but rather to “provide a summary of the project and a record of the decision-making issues involved in the development of the cleanup design as of December 1994” (p.I-2). Thus, the project appears to have moved from prioritizing the empirical identification of problems to a purely decision-making, or instrumental, phase. The most obvious evidence of these changes is not just the reduction of the impact study data (pages III-8 to III-16, with no methods or analysis), but the remarkably sparse description of the community meetings (one page total, p.III-27). Even if all the communities across the arctic did in fact unanimously approve the protocol, expressed exactly the same two concerns and never explicitly mentioned health issues, there is no discussion of how the meetings were held and no specific quotes from individuals. Additionally, the erasure of the on-site personnel (many

of whom have been long-term employees of the DEW Line and now the NWS) as a relevant part of the “community” affected by the DEW Line cleanup reflects an administrative outlook. Presumably, whatever concerns – or knowledge - these people would have to contribute to the project would have been subsumed through the internal hierarchy.

In 1993, the bureaucracy may have proposed a solution, but internal scientific expertise played an important role in (re)defining the problem and (re)validating said solution. That being done, the problem must now be solved. Thus in 1995, the “public” has duly reviewed the proposed solution, and engineering has entered the scene as a quasi-internal technical expert. The focus is now on observing due process while implementing the inevitable solution; in the meantime, we see a loss not only of some empirical detail but also of the politicized voice of scientific authors of the DEW Line impact assessment. In other words, in my reading, the period from 1993 to 1995 marks a distinct discursive shift to a far more dominant administrative rationality in project discourse.

The immediate goal (or at least the result) of this shift may very well have been one of increasing internal control over existing project knowledge, in preparation for the task of allocating internal, as opposed to obtaining external, funds. Notably, in 1996, a long-negotiated deal between Canada and the U.S. for partial funding of military site cleanups came to a “full and final settlement” (Myers 2000, p.124) and the first site investigations were underway in the western arctic. The 1995 ESG/UMA report was thus written at a time when the project, with an international profile and simultaneously on the verge of full-scale implementation, had probably its highest political profile to date; this combination of events no doubt aroused the anxiety of some of the new cleanup project managers whose responsibility it would be to actually do what the politicians were promising, with a finite and relatively small amount of external funding. In this setting, neither new environmental knowledge nor localized interpretations of environmental policy may have been very welcome. Empirical science, and scientists, were to work more closely now with the engineers, and re-focus their energies on co-operatively implementing solutions rather than descriptively identifying and contextualizing problems.

The dominance of administrative rationality in project discourse does not appear to have relented substantially since the mid 1990s. My observation from current experience within the project’s scientific arm is that, although within ESG and between ESG and other groups there remains substantial tension between variants of rationality, administrative concerns now run deep into the science that we do. For example, field sampling and lab analyses on the DEW Line follow standard methods employed to get the most empirically “true” results possible, and employ a number of analytical and mathematical quality assurance checks. However, our methods also openly incorporate economic considerations; in our soil sampling protocol, for instance, we are encouraged to delineate contamination accurately *because* this has direct consequences for the overall cost of the eventual cleanup. In some cases, though, instrumental concerns enter the science not just as a relevant concern but are front and centre; consider the following excerpt which opens the section in the ESG 2001 field manual on how to keep a proper field notebook:

It is ESG policy that proper documentation of all site activities shall be conducted at all times. These documents can then be entered in legal proceedings for communication between parties involved. These raw notes may also be required to provide accuracy of any follow-up memos or reports. This is one of the most important quality control elements of site investigation. Accurate and concise field notes are also vital when assembling a good report. (ESG 2001, p.22)

Our priorities are clear: these notebooks are required by *policy* and may enter *legal* proceedings, and are additionally important for producing a good, accurate scientific report. It is noteworthy that one of the points repeated in the ongoing instructions is that the ESG field team leader should be the only person to write in the notebook, as much as possible. Were we to follow all of these instructions, it might contribute to developing interesting, original empirical knowledge from which the observer, science or society in general might benefit - but clearly that is not the point. The point is that the contemporary ESG employee is supposed to be gathering empirical information within an appropriate policy framework, legal system, and occupational hierarchy, and should be prepared to do so in an almost defensive manner. The need for such defense, I would suggest, is typically less the field employee’s than that of her administrative employers.

The tensions between empiricism and administrative rationalism seen in the scientific methods on the DEW Line cleanup also play themselves out within the scientific cultures of the project. In the same 2001 field manual, ESG boasts of filling a “unique place” in both a university and government structure (2001, p.2); having moved in 1995 from the Royal Roads arsenic chemistry lab with eight people, ESG is

now a group of approximately 70-80 people, employed as civilian research assistants to the chemistry department at the Royal Military College of Canada. Nonetheless, despite this arrangement, and the fact that ESG continues to employ a small number of graduate students from RMC and Queen's University, ESG self-characterizes as:

a multidisciplinary team working on solutions to a wide range of environmental problems. ESG's engineers, scientists, biologists and geographers have a range of experiences in risk management, the development of remedial technologies and applied research. The group has particular expertise in environmental assessment – it has worked extensively as [a] technical authority for the evaluation of northern and remote sites. (2001, p.1)

While once again this self-description can at least partially co-exist with the pursuit of accurate empirical knowledge, as with the field notebook example, this is not the focal reference point. Instead, characteristic of administrative rationality, problem solving is ESG's central agenda; instrumental tasks with an obvious return such as risk management and technology development, before even applied research, are its strengths; and in case there was any doubt, the authors reassure us that the group's particular expertise is as a "technical authority" in site evaluation.³

A particularly interesting element of the above quote is that biologists and geographers are, apparently, neither scientists nor engineers. This returns me to the federal and DND-DGE definition of "environment" that I brought up above, and its consequences for what kind of science now gets done on the DEW Line cleanup. Defining the environment as water, air and land means that the foundational environmental sciences are hydrology, chemistry, and geology; hence, our environmental assessments consist primarily of chemical analyses of soil and water samples. Secondary in this picture are sciences like biology and ecology, and perhaps even more suspect are those disciplines like geography that so blatantly transgress the human/nature divide.⁴ While "multidisciplinary" is an accurate description of the backgrounds of ESG personnel, most of the work we currently do is environmental geochemistry and engineering, not biology or geography.

As one consequence for the DEW Line cleanup, the relative amount of project resources dedicated to detailed empirical studies of ecological and human health at and around DEW Line sites have been minimal. The early food chain studies, arguably foundational to the project, have not been systematically continued; ESG has conducted no studies on the impact of the DEW Line on animals actually *eaten* by local people, nor on comparative human body burdens of relevant contaminants, nor on the relevant human epidemiology in northern communities.⁵ While ongoing research at an NWS radar site in Saglek, Labrador

³ Interestingly, we are often mistakenly referred to by outside contractors and suppliers as the Environmental Services Group.

⁴ Notably, one can obtain a chemistry or physics but not a biology nor a geography degree from the Royal Military College of Canada; additionally, although multiple engineering degrees are offered, environmental engineering is not.

⁵ Additionally, to my knowledge, no studies at all have been done (or at least published) on the health of employees of the DEW-Line and/or NWS. While contaminant uptake by ingestion may not be a direct problem for this group, since their consumption of local game is likely minimal compared to local Inuit, there are a number of other potential health problems due to long-term work on the Line, including: radiation exposure, inhalation of air-borne PCBs (from paint particles) or asbestos (formerly used as insulation), problems related to obesity and lack of exercise, smoking, alcoholism, psychological problems, cold injury and mechanical accidents. Rates of cancer, sterility, cataracts (experimentally induced in rabbits by electromagnetic radiation), heart attack, sick-building syndrome, respiratory and skin ailments, cirrhosis, seasonal affective disorder, depression, suicide, and age of death in this population relative to a control would probably be worth looking at. I generate this non-exhaustive list through observation of the current lifestyle of workers on the Line, as well as written historical

(not a former DEW Line site, but with a similar history) does address the first of these three topics, the bulk of current DEW Line scientific work rarely consider plant, animal and human life in any detail.

As any ecologist knows, it is generally difficult and slow to study food webs, and in particular, to quantitatively demonstrate a convincing link between a source of contamination and its biological impact. Should such a link be demonstrated, it also could mean that someone has to care for and/or compensate those impacted. That the early studies showed such impact clearly and convincingly is a mark both of good empirical science and the unquestionable existence of such a link; as I argued earlier, it may have also helped the cleanup get funded. But the environmental assessment process that the DEW Line cleanup has subsequently adopted means that the project does not *need* to continue such ecological impact studies in exhaustive detail.⁶ Because “environment” means soil, water and air, the project can legitimately claim to be addressing an important aspect of environmental and human health, without ever directly addressing them. The environmental sciences that follow from such a definition are not only more likely to appear to give more certain “answers” than ecology or epidemiology, but they are not quite as likely to get the project’s current sponsors in political or financial trouble. They can also be practiced, in the case of DEW Line science, by people who know relatively little about the arctic, such as most young southern scientists.⁷ In short, the environmental sciences are far more amenable to rational administration than are the natural sciences: studying soil, water, and air is easier, cheaper, more efficient and less political than studying plants, animals and human life.

Moreover, when such elements are considered, it is typically done in a cursory manner through prescribed risk evaluation tables, which, while ecologically uninformative, are actually quite illustrative of the current relationship between science and administrative rationalism in the DEW Line cleanup. Consider the landfill risk evaluation tables. These were established in 1998 through negotiation between the Nunavut territorial government and DND, subsequent to the DND adoption of the generalized DEW Line cleanup protocol but prior to its implementation in the eastern arctic. One major evaluative category (out of three) in these tables is “receptor” risk, that is, assessing the risk to organisms who may be exposed to the contamination assumed to be present in all landfills. The lack of receptors like plants or animals near a landfill contributes to a lower landfill risk “score”. Landfills with the lowest total scores require the least (and in some cases, no) remediation. However, the lack of receptors near landfills may often be due to habitat destruction from the construction of the landfill and/or leaching from the landfill. That is: the lack of receptors may very well be an indicator of profound environmental disturbance. Thus, one would expect that, if the aim of the evaluation was to determine the need for remediation, then a landfill without nearby receptors, where that absence was demonstrably due to the landfill, would score very high. Since the opposite is true – we do not consider existing impact, and a lack of receptors can be used to justify no remediation – one might speculate that in such cases, the evaluation of receptor risk contributes to long-term maintenance of the disturbed environmental status quo (which is, incidentally, cost-effective in the short term).

Similarly, the lack of human use near a landfill, another sub-category of receptor risk, may be due

accounts that reflect an eerily similar pattern (e.g., in Flynn (2001), McMahon (1989) and LaFay (1958)).

⁶ That they are being continued is intriguing; among various explanations, including internal empirical interest and/or DND response to northern activism (likely a factor in establishing the risk evaluation process in the first place), this could also be read in light of the concept of “due diligence”, or preventative management of DND’s future liability. Notably, recent discussion of implementing more thorough ecological risk assessments has been, at least on paper, primarily motivated by the possibility that such assessments may reduce the escalating cost of hydrocarbon remediation, as much as by concern for the ecological risk. The colloquial terminology employed by some project staff developing business cases to present to the project administration for such assessments is whether or not remediation of such contaminated areas can be “risked away”.

⁷ This includes myself. I would also argue that at least some of this work can also be conducted by people who know little about science, i.e., most northerners. I will take this issue up in the final section of this essay.

to the lack of plants and animals to eat. In some cases, the historically estranged relationship between Inuit communities and the radar stations may additionally contribute to low human land-use; it may also be due to the fact that all the radar sites are posted with “no trespassing” signs. The latter technically makes the consideration of human use near a DND landfill irrelevant, although giving the category a “zero” would act to lower the overall landfill score. Of course, most of us calculating such scores know these signs are not always obeyed; however, it remains nearly impossible for a southern scientist, typically visiting the site for a short time with minimal contact with local people, to assess what level of human use these areas would have throughout the year.

Neither of these aspects are oversights in the construction of the risk evaluation process. Discrepancies in the evaluation of human landuse are to be corrected by a joint north-south review of the risk evaluations by technical representatives to the northern territorial governments and southern managers, once they have been filled out by the southern scientists. While undoubtedly this is better than no collaboration at all, it seems highly unlikely that such a review could substitute for joint on-site studies. Perhaps more significantly, the receptor scoring generally reflects the principle that the land is not to be returned to a “pristine condition”, and is therefore consistent with the “DEW Line cleanup philosophy”. One might also refer to the other aspects of that philosophy, stated (only) in the 1993 report, that “at least most barriers to long-term natural reclamation will be removed” (ESG 1993, p.30). This, however, would be less congruent with the administrative rationalism currently dominant on the project. Risk evaluation, rather than impact assessment, has become the ecology of choice on the DEW Line cleanup.

The current predominance of administrative rationalism in the DEW Line cleanup science has, I believe, two related root causes. The first is scale. Since those early investigations, the clean-up has become a big project in all dimensions - time, space, people and money - and it seems to still be growing. Cost estimates for the total cleanup are now about \$500 million dollars (Capozza 2002).⁸ As I noted earlier, what was once an arsenic chemistry research lab is now primarily an environmental assessment consulting group, working in conjunction with a large number of private contractors across, up, and down the country. The growth of the project has promoted differentiation of tasks between various specialist sub-groups, or what Lundholm (2002) calls the move from craft science to industrial science. Since the project has become so big, no one group can manage all technical (let alone logistical) aspects of the cleanup. Following from an industrial model, it seems likely that the protocol and other prescriptive tools like the risk evaluation tables have also come about because of the perceived need for standardization across a wide geographic space and large numbers of personnel, and to attempt to manage ecological as well as political variations between far-flung sites.

But it is not simply scale that can account for this shift in the project’s science; rather, it is also the thoroughgoing implication of the Environmental Sciences Group into an administrative culture beyond the laboratory (and university campus) boundaries: the federal bureaucracy of the Department of National Defense. I did not arbitrarily begin this section with a reference to the DND-DGE Environmental Responsibility document. Indeed, the dominance of the discourse of administrative rationalism in the project as a whole was made clear to me in conversation with a DND-DGE employee. I asked this employee why the military might fund such a large-scale environmental clean-up. He gave me a lengthy, earnest reply, which boiled down to the fact that, since DND is one of Canada’s largest land-holders (45% of the federal government’s total floor space, or 20,000 km² according to its website (http://www.dnd.ca/admie/dge/sds/SDS2_e.htm)), it is in the legal and economic interests of the military to maintain its real estate properties and so manage the large liability issues that go along with such ownership.⁹ Thus: the

⁸ The difference between the initial estimate in the Scientific and Engineering Report (1995) of \$150 million and the estimate Myers (2000) gives from the US-Canada agreement (1996) of \$246 million – nearly a hundred million increase in the space of a calendar year, both from official sources – give early evidence of the project’s escalating tendencies. Subsequent additions of hydrocarbon (fuel spill) assessment and remediation to the project through negotiated environmental agreements with the Nunavut territorial government, as well as federal regulatory issues such as PCB transport and fisheries habitat protection, have added to project costs.

⁹ DND property cannot, I recently learned from a fire safety video, be insured; this may further encourage a preventative maintenance approach.

DEW Line contamination of the environment is not a political, moral or even empirical problem, as much as it is a legal and economic one that requires administrative management.

This same answer is given in more general and official terms in the DND-DGE Sustainable Development Strategy 2000, the most extensive DND environmental policy document produced available on the internet (http://www.dnd.ca/admie/dge/sds/SDS2_e.htm). This opens with “Message from the Deputy Minister and the Chief of Defence Staff: Integrating Sustainable Development Principles into the Business of Defence”:

In our first Sustainable Development Strategy [1997] we declared our aim to demonstrate responsiveness to, and responsibility for, protecting the environment while ensuring environmental stewardship and protection of our national and corporate assets. Since then, we have turned talk into action through the actions of the employees of the DND and the Canadian Forces members who have made it their business to achieve that aim. (2000, p.ii)

The language of “development”, “corporate assets” and “business of defence” employed in this selection is noteworthy, and is reinforced in other sections of the report where the authors speak of having “a responsibility to maximize Canada’s return on its defense investments” (p.5) by undertaking green procurement, making sound land acquisitions, setting performance targets, etc. Such language echoes Dryzek’s portrayal (quoted earlier) of administrative rationalism governed by the “structural status quo” of technoliberal capitalism. Characteristic of federal and international environmental policy, the language of sustainable development began to achieve mainstream prominence in the 1980s with the Brundtland report (1987), and “purports to reconcile two old enemies – economic growth and the preservation of the environment – without significant adjustments to the market system” (Escobar 1996, p.46).

Does the DEW Line cleanup operate as a “development” project, both literally and in the critical sense as suggested above? The cleanup does view itself as an economic development project, transferring southern government dollars and benefits north through the hiring of local contractors and training of Inuit in construction jobs; the economic co-operation agreements signed between the various northern regional bodies and DND have quotas for minimum Inuit employment on the project. DND (and other) media reports on the cleanup tend to emphasize how the Inuit welcome such economic opportunities (e.g., see Sept.1998 DND press release at http://www.dnd.ca/eng/archive/1998/aug98/nanavut_n_e.htm; also Khan, <http://track0.com/cc/issues/1298dewline.html>).¹⁰ To complete my analysis of administrative rationalism, however, I would like to focus for the moment more on the environmental aspects of the term “development”. Here I will return to the second term that notified me that I had entered the project at odds with the dominant discourse: “cleanup”. My initial reading of “cleanup” was actually the removal of all military radar installations and associated materials from the north, and subsequently natural reclamation of the land. I did not see this as a development project; indeed, in some ways I thought that the DEW Line cleanup was a de-development. This reflected both my former ignorance of all things military (and federal) in Canada, and a romantic wilderness ideal of the pristine arctic to be discussed in subsequent sections.

But while the 1993 report sees one of the goals of the cleanup as removing “most barriers for the long-term natural reclamation” (ESG 1993, p.30), it defines the DEW Line cleanup as “the physical restoration and chemical remediation of those parts of the DEW Line that are no longer required for the operation of the North Warning System”(ESG 1993, p.2). In effect, the cleanup entails the development of more landfills, in order to contain demolished buildings and contaminated soil. Contaminated soil is not, for the most part, remediated but is relocated – buried by clean fill or in on-site landfills, or, less commonly, shipped south for incineration. Moreover, out of 63 original DEW Line sites built by USAF from Alaska to Greenland, 42 will not be cleaned up because 21 of those are outside of Canada and 21 are now under DIAND rather than DND jurisdiction, and DIAND is not implementing a cleanup. Additionally, 16 of 21 remaining (DND) DEW Line sites that will be cleaned up will continue to have active radar installations in the form of the North Warning System. Although the NWS stations are more or less

¹⁰ That this is not a wholly unqualified response is suggested by an anecdote related as a cautionary tale by a former project manager during a cultural awareness training session. Early on in the project, feeling somewhat self-congratulatory, he walked up to an Inuit employee sorting debris for a landfill excavation. “Great to have work, eh?” he said. “Yes”, was the reply, “if you like picking through someone else’s garbage”.

automated and require less infrastructure than the original DEW Line, the NWS required the construction of new buildings on the former DEW Line sites. Lastly, 10 out of 21 of the “abandoned” (DIAND) DEW Line sites have been re-developed for the NWS, and 15 *entirely new* northern radar sites have been established within Canada for the NWS since the closure of the DEW Line (see “Site Table” in <http://www.magma.ca/1wildson/dewine.dtm#D> for a complete listing of the status of former DEW Line and current NWS sites). In other words: three-quarters of the original DEW Line sites are not being cleaned up, most of those that are being cleaned up are still operational radar sites, and the total environmental burden attributable to radar sites, as well as their sheer numbers, have increased in the north since the Cold War officially ended and the cleanup began.

Given this, the title “DEW Line cleanup project” seems somewhat inaccurate. In context of the above policy document, the cleanup seems to fall more within a larger process of ongoing radar site development in the north, perhaps suggesting the title of North Warning System Development Project – Environmental Aspects instead. This is apt in a critical as well as an empirical sense; the rational management of existing contamination (i.e., the cleanup) does not eliminate the ultimate source of environmental disturbance (the military installations themselves), a point I will take up further in my discussion of militarism. As Dryzek points out, the structural status quo is maintained.

In accepting and/or becoming implicated in this kind of cleanup – recall again that the DEW Line cleanup Protocol was substantively in place before full-scale scientific investigations had been done – I would say that environmental science has had to adopt an administrative rather than an empirical rationality. That is, empirical science has become dominated by managerial science. As the technical experts who support and advise the DND bureaucracy, our task is not to develop sustainable development policy or its protocols from empirical evidence, i.e., we do not control the administrative rationality, but we do receive, manage and in turn, reproduce it. Our job now as environmental scientists is to implement the cleanup protocol by finding materials and soils that need to be landfilled, and those that do not, whether that be by soil sampling or ecological risk evaluation. Differences among us in our perceptions of contamination and environmental risk are not technically relevant, because they are not rational within the existing administrative framework. Indeed, they may not be rational within an empirical framework either; however, they are certainly less so when what is “practical” is predetermined.

This is not to say that, despite my ignorance, I walked into this work totally innocent and was subsequently victimized by reality; nor is it to say that empirical science has been victimized by the prevailing administrative discourse or political economy. Indeed, we have both reaped substantial material and intellectual benefits by continuing to exist at the fringe of an extremely well-funded manifestation of administrative rationalism. Rather, it is to highlight two points: one, discourse matters; and two, the disjunction between my initial perception of key terms like “environment” and “clean-up” gave me grounds to notice things that others who had understood more clearly the nature of the institutions and the work might have lacked. It led me to trace back the development of the DEW Line cleanup, which includes the eclipse (if not erasure) of empirical science by managerial science due to the logic of scale and the dominant institutional discourse. Lest this leave you with the impression that the cleanup project, or my discrepant perceptions within it, are doomed, let me cite Evernden: “The rental fee for the tools of respectability is a kind of emotional lobotomy. But as it happens, many nature advocates are poor surgeons, and the job was left unfinished” (1984/89, p.11).

Romanticism and Northern Science

What are the elements of my discrepant perceptions? Among several is an unofficial, but important, discourse that I share with many others on the project: romanticism. The rationalist discourses of technical writing often leave the reader (and/or writer) with the impression that there is no room in science for aesthetic longing, loving relationships with study subjects, or the pursuit of mystical, enlightening experiences. Barry Lopez summarizes this perception, reflecting on a government outpost on Cornwallis Island occupied solely by scientists:

We desire not merely to know the sorts of things that are revealed in scientific papers, but to know what is beautiful and edifying in a faraway place....Whenever we seek to take swift and efficient possession of places completely new to us, places we neither own nor understand, our first and often only assessment is a scientific one. And so our evaluations remain unfinished. (1986, p.228)

Yet from listening to scientists speak of their work in the arctic, both before and during my participation on this project, the representation of science practice as merely a rational, efficiency-driven enterprise does not seem to hold. In my second interview at ESG, for example, I was asked why I was interested in the job. I promptly replied that the arctic was something of a holy grail for me *as a biologist*, and received a nod of sympathetic, even amused, response. The phrase “holy grail”, it turns out, is remarkably apt when considering the history of western interactions with the arctic – including those of scientists. We are (at least privately) inclined to see ourselves as undertaking the difficult, dangerous quest for scientific knowledge of the land, as well as for what is beautiful and edifying in a faraway place. In this section, then, I would like to explore some of the specific intersections of northern romanticism and science on the DEW Line, both in its informal discourses as well as in scientific texts. Considering the wider tradition of northernness in western science and culture, I will argue that romanticism informs the overarching purpose of the DEW Line cleanup and provides some important resistance to bureaucratic instrumentalism on the project. However, I will also make the case that contemporary DEW Line science partakes of a tempered romanticism that produces a domesticated north – for worse, or possibly, following Cronon, for the better.

In *Arctic Dreams*, Lopez writes that, “As temperate zone people, we have long been ill-disposed toward deserts and expanses of tundra and ice. They have been wastelands for us; historically we have not cared at all what happened in them or to them” (1986, p.12). This sort of depiction of the north is especially obvious in popular representations of the DEW Line, where, if they can be called romantic, it would seem that only the difficulty-and-danger part of the quest narrative came through. The *National Geographic* journalist LaFay (1958) describes the arctic using the adjectives brutal, lonely, chaste and cruel; *Life Magazine* correspondent Mydans (1963) called it hostile, bleak, empty and unnatural (!). In a recent recreation of life on the DEW Line in the Cold War era, Flynn recreates this trope with a striking passage, where the throb of an engine is described as a “life-rhythm. An alien thing in this land of icebergs” (2001, p.38). Only advanced scientific technology, it is implied again and again in such genres, has saved Man from Nature – or, as frequently, can conquer Nature for our hero Man. Mydans actually writes that

above all you felt the pervading fear that man does not belong here, that in the horrendous cold he can survive only by cautious planning, indeed conniving...In the Arctic today we do not attempt to adapt the human mechanism to the living conditions of what might as well be space. Instead we supply a capsule full of earth environment for the man to live in. (1963, p.27)

So: the arctic is not part of the environment: unnatural and empty, it “might as well be space”.

Evidently, Mydans does not consider the Inuit as part of the community of “man”, since they do not require a capsule of earth environment to be supplied to them. (Indeed, the Inuit are not mentioned once in this particular 1963 *Life* article.) More recent authors are more likely to admire the Inuit for having “survived” (not lived) in the arctic for millenia without such technology, something of an aberration but a potentially brilliant one. McMahon, for example, a Canadian journalist writing on the DEW Line at the end of the Cold War, characterizes the arctic as “the exposed skull of the planet” (p.121) and “the landscape of the nuclear winter” (p.171), asking “What did it mean to reign over this? Incredible resourcefulness or infallible machines” (p.121).

The hostility projected onto the arctic landscape in these texts could very well have reflected the particularly belligerent mentality of the Cold War. Arctic science of the Cold War period was, as Jones-Imhotep has argued, also strongly invested in a “malevolent North” image (2002). In the late 1940s and 1950s, he suggests, arctic nature was seen to resist the aspirations of “total science”, in that human-operated meteorological instruments installed by the military failed to produce reliable scientific knowledge about the arctic because of the effects of the climate on the operators. Again, such a conception carries through to more recent writing. In his introduction to the physical background of arctic ecosystems in *Arctic Biology*, Fogg draws an overt parallel between “man’s” difficulties in the arctic and those of the rest of the natural world, saying:

With all his ability to create his own environment man does not find it east to cope with either midnight sun or a night of several months. To a greater or lesser extent other organisms also have problems in adapting to the polar night. (1999, p.1)

Fogg goes on to note the “severities and complexities of polar habitats”, the “hostility” of the frigid climate,

and the “surprising variety, amount and activity of living things” (also p.1); his book is motivated, he writes, “from the interest in finding out how living organisms manage to exist under the apparently adverse conditions” (p.vii).

These popular and scientific texts are key in a consideration of the DEW Line cleanup, because, to some extent, they reflect the cultural attitudes of the people who built and inhabited the sites, and who are now orchestrating their cleanup. If the quotes above are at all representative of western/southern attitudes towards the north (and I think they are), they present a solid justification for massive technological intrusion on the land, and its accompanying environmental damage: Man’s survival. But the cultural (and temporal) specificity of such an attitude is readily apparent. Having not experienced the fullness of the arctic climate, and lacking close relationships with those who have, I would not claim that northern environmental conditions are conducive to easy living for people or other organisms; however, I would point out that a temperate zone reference point in both popular and scientific descriptions of the north is entrenched, usually undeclared, and not necessarily the most accurate. One does not see, for example, writing in either genre about the ease of temperate climates, or the overabundance of species and individuals that manage to survive under such warm, crowded, relaxed and gentle conditions – although one might, again, see such descriptors applied to tropical regions. Moreover, while I have read that Inuit people both acknowledge the physical difficulties of their traditional lifestyle and feel ambivalence towards the new, southern, technologically-dependent lifestyle (Brody 1975/1991, p.142), the few discussions I have had with northern residents on this subject indicated that they actually prefer the environmental conditions with which they live to those of the temperate zone. This is not too surprising, but it does underscore the bias of our (popular and scientific) representations of the north.

But there is, of course, another side to temperate zone images of the arctic. Lopez notes that although polar regions have often been “wastelands” to us, European explorations with the arctic over the last thousand years - both commercial and scientific - continued “fatal shipwreck after shipwreck, bankruptcy after bankruptcy...One looks in vain for a rational explanation” (1986, p. 311). His explanation rests not on rationalism, but on the “desire and imagination” for wealth and fame in the western mind. Lopez includes this rather materialistic explanation in a chapter entitled “The Intent of Monks”, which fundamentally celebrates the heroism of the individual men who pursued individual, institutional and cultural dreams in the face of incredible difficulties – and who continued as much because of the dream of beauty in the landscape itself as for a realized gain.

Along with the “malevolent North” image, this aspect of arctic mythology has found fruitful ground among scientists throughout the history of western science, perhaps particularly because western science has always contained a romantic quest narrative: the heroic pursuit of universal truth, or what Haraway calls (echoing Lopez) the “colonial imagination” of science (2000, p.9). Margaret Cavendish, for example, a natural philosopher of the 17th century, wrote a speculative piece about an (accidental) scientific expedition in the arctic (“The Description of a New World, Called the Blazing World” (1666), reprinted in Bowerbank and Mendelson (2000)). But arctic science has not been solely an armchair exercise, perhaps particularly in the last two hundred years. Harding (1998) has written extensively on the links between colonial expansion and scientific exploration, most notable during the Victorian era; Hevly (1996) writes that nineteenth-century science saw heroism and “muscular exertion” (i.e., field work) become an important ingredient in supporting theory in glacial physics. In a recent article on science in the Canadian Arctic Islands, Christie notes that “even today the old idea reappears that is more respectable, or supportable, if a little “science” is done... Perhaps, however, when you get down to it, institutional scientists are nothing more than closest adventurers masquerading as scientists!” (1989, p.37). Even Fogg waxes eloquent on this aspect of arctic lore, saying in his preface that:

A great attraction in studying polar habitats is that...it takes one into wild, physically challenging, and hauntingly beautiful places. Fortunately for those who want to indulge themselves in this way there are sound scientific reasons to support their applications for the necessary funding. (1999, p.vii)

Here, Fogg lays claim to both core elements of the arctic romanticism: its physical difficulty as well as its sublime beauty.

If this pursuit of beauty is so prevalent in western science narratives, where is it in popular DEW Line writing? LaFay’s use of the word “chaste” may faintly echo it, but at least in the early Cold War popular writing on the DEW Line, this aspect of arctic mythology is absent. The absence might be partly

explained by the intensity of war-time propaganda, but perhaps also because these were popular rather than scientific texts; mainstream western culture may not have inherited quite as powerful a romantic tradition as elite scientific discourse, with its overlapping truth/beauty quests. But more contemporary popular representations like McMahon's also transmit the duality; he writes (in 1988):

The arctic sits in the living room of the urban Canadian psyche like one massive Eskimo seal carving.... The Arctic, I think, embodies this sense of righteous purity for Canadians... The arctic is pure. The Arctic is innocent. The Arctic is clean. And the Arctic is ours. It is us....Every country has its mythological territories. Canada has the arctic, the glistening white half of our sanctimonious soul. The myth is strong enough that, by association, it can even scrub the filth from nuclear weaponry. (p. 204-207)

So, McMahon delivers the full "holy grail" trope: the arctic may be barren, difficult and dangerous (as his earlier quotes illustrated), but it is also pure, pristine, and even spiritually transformative. McMahon's words here also make an overt link between cultural romanticism and the DEW Line cleanup: this powerful idea of purity. (Note that McMahon was writing just as the Cold War was ending, and the cleanup beginning). It seems likely that part of the appeal of the DEW Line *cleanup* to sponsors, employees and the public alike is the reference to that romantic ideal of the sacred, pristine arctic; cleaning up far more polluted industrial sites in urban southern Ontario would simply lack the moral resonance with the Canadian public that goes along with cleaning up the arctic.

But this use also brings up an immediate tension; as mentioned earlier, a romantic interpretation of "clean" (dewy?) does not apply to the cleanup implementation, where "clean" refers to concentrations of contaminants being below a certain numerical criteria, and/or contained in a landfill, rather than not present at all. The project, while likely benefiting from its charismatic name, has also had to overtly defend itself against expectations generated by the associated romanticism. This is evident in disclaimers such as the following: "The Protocol recognizes that this restoration will not return the environmental to a *pristine state*, but will at least remove most barriers to long-term natural reclamation." [emphasis added] (ESG 1993, p.30) This would not have to be said if there wasn't a widespread expectation (internal or external) that "clean" meant "pristine". Another immediate tension that arises by invoking romantic ideals is not just "impractical" expectations of what a cleanup might mean, but that the project itself draws attention to the very fact that the arctic is no longer pure, wild, free nature. Cleaning takes place only when something has been messed up, and implies a very human, domestic, proprietary sort of activity.

Such tensions are felt perhaps most keenly by those who encounter it as I did with not only a conventional interpretation of the word "clean" but also with romantic ideals, and actual experiences, of northern adventure. These are not, unsurprisingly, uncommon among us. Informal internal conversations at ESG often revolve around how much we (as field scientists) love being in a beautiful, remote place, and how we feel more ourselves, healthier, happier, clearer, stronger, and even more spiritual "up there" – despite the also-much-discussed strain of long hours, inclement weather, trying logistical problems, interpersonal difficulties, etc. While we are required to take pictures of contamination and debris for work reasons, many of our personal photographs show a marked preference for wild, non-human nature: pictures of the wide tundra expanse (without the radar station or barrel dump), the sculpted ice islands on the ocean (omitting the beachside POL tanks), caribou, muskoxen and the exquisitely coloured wildflowers (often most plentiful in the nutrient-loaded sewage outfalls) are all commonly posted in our cubicles and on our screen-savers. Finally, none of us are unaware of the impressive public cachet that the location of our work brings us in conversations with (other) southerners.

But our aesthetics come into immediate physical confrontation with the experience of conducting an environmental assessment of contaminated military sites; our science addresses a nature that is neither wild nor pristine, but degraded and colonized. We live in unavoidably obvious dependence on distantly-produced goods and technologies (i.e., if the plane doesn't get in, we don't have any food). We are almost never out of sight of human constructions. Indeed, with the exception of the plane rides in and out, we generally have little to no opportunity to see any part of the arctic that is not contaminated or human-dominated, as our daily field schedules are typically very busy and/or our ground movements restricted. So there is a disappointed, or frustrated romanticism that happens for those of us with expectations of having special access to pure, wild, free, non-human nature – a disappointment perhaps most acute among environmental scientists steeped in the romanticism of empirical western science.

How are these tensions negotiated? One way is through recourse to a tempered, protectionist

romanticism; this is the move made subtly in official project discourse, and marks a very distinct shift from the traditional arctic mythology, popular and scientific. The characterization of the arctic in ESG reports briefly reiterates the old idea of a barren, dangerous north, echoing Fogg almost exactly by saying that “only a few specialized organisms are able to adapt to the harsh conditions” (ESG/UMA 1995, p.III-2) and that “the radar sites are the focal point for a surprising amount of ecological activity” (ESG 1993, p.52). But under the title of “Environmental Problems in the Arctic”, the 1995 Scientific and Engineering Report continues at length:

The Arctic ecosystem is far more sensitive to environmental influences than is a southern, more temperate system....The Arctic environment is also susceptible to physical disturbances. Most Arctic soils are considered fragile due to the presence of permafrost... Removal of, or damage to plants may also result in permafrost disturbance. Restoration of normal conditions including recolonization of vegetation takes many years. The recognition of the unique character of the Arctic environment implies that standards considered protective of the environment in the South might not be applicable in the Arctic. (1995, p. III-3)

Here, then, the arctic is “sensitive”, “fragile” and “susceptible” to disturbance, including colonization; the characterization necessitates, as the section concludes, stringent environmental standards to protect such a land. This language resonates in part with the “holy grail” mythology, evoking a kind of reverence, but in a quite different way than awe-filled respect for the savage or sublime. The difference is that the arctic is no longer to be conquered or worshipped: it is to be cherished and, above all, protected.

Thus, our presence and actions in the north are justified not by the quest for truth or beauty, nor because of the immediate need to survive, but because “we” caused injury, and therefore “we” need to (and can) solve it by undertaking specific therapeutic interventions. (Our presence may additionally be justified by our individual quests for fame and fortune, but this doesn’t make the official collective discourse). Interestingly, this move away from an absolute ideal of wild, pristine nature parallels the move that administrative rationalism makes away from an ideal of absolute empirical truth, the new discursive locales being more practical and realistic in both cases. Relatedly, such a move contains a justification for expert oversight. While I will discuss this further in the next section on militarism, I would like to note here that the new protectionist romanticism contains a view of the past southern humans as inherently faulty and/or subservient to the northern climate at best, and ignorant or even deliberately destructive at worst. As explained in the 1993 ESG report:

Most important was the recognition of a consistent waste disposal pattern at all of the sites. This included the expected spills around fuel handling facilities, and in landfill/dumps. Contamination of other areas, although not initially obvious, was consistent with behaviour attributable to the rigors of the climate. For example, it became apparent that many substances, including PCBs, had been “poured down the drain” or in areas adjacent to buildings. It was also noted that the vast majority of the contamination was “historical” in that it had been introduced in a less environmentally “friendly” era. (1993, p.16)

Although the common portrayal of environmental awareness as a very recent – and elite - phenomena in Euro-American culture is being contested (e.g., by environmental historians Crane (2002) and Egan (2002)), the previous quotes from *National Geographic* and *Life Magazine* do support this kind of generalization about historical environmental attitudes on the DEW Line. Perhaps more important, though, is that this quote contains a story of progress to an era that is not only environmentally superior, but also one in which the north no longer has quite the same “expected” impact as it once did on (whose?) behaviour. In such a domesticated north, where immediate physical threats are implicitly of less pressing concern, we can now afford to be more “friendly”.

The discursive shift to a domesticated north is one that is directly implicated with actual science practices and products. Jones-Imhotep, in his environmental history work on arctic meteorology, has located a process of domestication of human and non-human nature in the north through the automation of meteorological instruments on military sites; the “malevolent North” image eventually waned as more and more reliable representations of the arctic climate were produced through tightening the machine-nature interface during the Cold War (2002). The environmental assessments we conduct on the DEW Line cleanup seem to follow this pattern, reproducing a disempowered and increasingly automated arctic. The

text of most assessment reports consist largely of litanies of soil sample numbers highlighting exceptionally contaminated results, sandwiched between brief descriptions of local topography and rote remedial recommendations that apply to sites scattered across large tracts of land.¹¹ The ultimate deliverable of an environmental site investigation, however, is fast becoming an AUTOCAD (automatic computer assisted drawing – a standard engineering software program) map of the site linked to a computerized database of analytical results. The map shows buildings, topographic features, and sample numbers colour-coded to indicate whether they are contaminated or not. Clicking on a sample number brings up details of the analytical results for that sample from the attached database. We can also import aerial photographs and geophysical (magnetic) ground surveys into the drawings to show how sampled areas overlap with vegetation, drainage patterns, historical constructions, and buried metallic debris. Our goal is to mouse-draw accurate boundaries of contaminated areas on the computer map using all these data; there is a recent move towards using an additional software program to automatically calculate these boundaries (for reasons of greater precision and standardization between users), although this has met with little success so far. These AUTOCAD maps have other limitations – they are static, surface representations of contamination that moves in multiple dimensions, and, relying almost entirely on geochemical and topographic data, they contain no information about wildlife or human land use – yet done well, they are very technically sweet. They allow for a compact, portable, and relatively complex representation of a great deal of information; what took several years, many people and thousands of dollars of effort in the field, lab and office can be placed on one CD, loaded up on a laptop, projected on a boardroom screen in a hotel conference room, and, technology willing, scrolled around at will.

The domestication of the arctic and increasing automation of our northern science returns me once again to the problem of administrative rationalism and the relationship between empirical rationality and northern romanticism. My observation is that many scientists on the project remain secretly motivated by romantic ideals of the long-term restoration of the pristine arctic, even after getting over the initial discrepancy between expectation and experience. Maintaining our romanticism necessitates, of course, some continuing cognitive dissonance, and, where possible, piecemeal resistance to more instrumentalist approaches on the project. I suspect (because I know it to be true at least in my case), that such resistance takes place most often through relying on empirical rationality, which does not tend to be condemned out-of-hand as a form of romantic idealism. As scientists, we would like to obtain total truth, even if we acknowledge the impossibility of that ideal; one of the reasons, I would argue, that we are nervous with incomplete knowledge is because the decisions made on such knowledge may be not only empirically incorrect but, in the long run, ugly. If we do not find all the contamination on a DEW Line site, analyse the data properly and map the boundaries accurately, and finally (and almost anti-climatically), develop a textual interpretation of this information based on what we know of the dynamic relationship of the contamination, topography and land-use, then that contamination will not be cleaned up. That is, under the current decision-making regime, without as much scientifically accurate knowledge as possible, and without highly mobile representations of it that can be distributed to scattered decision-makers, the sites may never see the removal of barriers to the natural reclamation of the land.

Still, expressing our romanticism as an obsession with empirical accuracy leads us into more conundrums. For example, precise (and expensive) scientific investigation of the sites is justified at least in part because it allows decision-makers to know what *not* to clean-up; we could find, sample, and map all kinds of disturbed areas very rigorously, but if the samples are not contaminated by the project criteria, and/or the contamination is evaluated to pose low risk, then no cleanup is required. To what decisions do our technically sweet, two-dimensional computerized representations lead, conveying as they do an overwhelming impression of thorough knowledge of a contaminated site? And although the beautiful AUTOCAD maps appeal to our empirical romanticism (i.e., in the pursuit of total knowledge), the total automation of our knowing is not a move that all technical personnel on the project embrace. At what cost

¹¹ For example, the following phrases could apply to any site in Nunavut under investigation for hydrocarbon contamination: “there are few receptors in the area; people occasionally use the area and may come into contact with contaminants; the receptor risk is therefore considered moderate; the fuel contamination should be excavated to TPH concentrations <2500 ppm or to a depth of 0.5 m, whichever comes first, and the area backfilled and regraded”.

do we pursue absolute mathematical accuracy (e.g., the calculation of contaminant boundaries by mapping software) against our better “field sense” – our tactile, qualitative, personal knowledge - of where such boundaries lie?

But the move to a *domesticated* north seen in recent project discourse and practice does not necessarily entail a move to an *absolute, automated* north; to acquire empirical knowledge of a place does not necessitate that it becomes completely known, nor remote-controlled by either machines or administrative rationality. Indeed, I will argue here that there is a third alternative to romanticism *versus* rationality, an alternative which relies on a reconceptualization of the human place in nature that accepts, even celebrates, domesticity, including its limited, located instrumentalism. The journals I have included in this paper begin to suggest this third alternative. However, here I will explain it more thoroughly with reference to William Cronon’s “The Trouble With Wilderness” (1997), an especially insightful critical analysis of the romantic tradition of wilderness in western thought and its relation to contemporary environmentalism. In fact, I have been applying Cronon’s more general analysis of wilderness to DEW Line science throughout this section; the connections will be apparent below as I review his argument and conclude my own analysis.

Wilderness, Cronon writes, has a two-faced legacy in western thought from Biblical sources: “One might meet devils and run the risk of losing one’s soul in such a place, but one might also meet God. For some that possibility was worth almost any price...”. (1997, p.32) In the nineteenth century, Cronon argues that elite European understandings on wilderness shifted to the rely more and more on the latter definition, resulting in the romantic emphasis on accessing the sublime wilderness experience through the rejection of modernity (e.g., urban civilization, machines, etc.). In a parallel shift, late-nineteenth American traditions of wilderness began to exhibit a nostalgia for the receding frontier, the wild places where individuals and/or democratic communities were forged. The two traditions – romanticism and frontier nostalgia – fed directly into twentieth century environmentalism, via the conservation and preservation movements. Wilderness needed to be saved because it provided a means of accessing enlightenment and/or the national spirit. The trouble with wilderness preservation, however, is that it was typically predicated on forceful ejection of native peoples from their homes and subsequent careful policing of the land by the modern bureaucratic state.

My “holy grail” approach to the arctic is clearly informed by such a romantic wilderness ideology, as are many of the popular and scientific texts on the arctic from which I have drawn. This is what allows DEW Line scientists to imagine a special form of enlightenment, freedom and community in the field, and especially in the north, Canada’s wilderness frontier (recently called “the *real* Canada” in a workplace seminar I attended). But the trouble I came to have with “our” wilderness was not so much that I found the actual land to be hostile but that my experience wasn’t sublime, and fraught with that sense that there was no legitimate, non-paradoxical place in my ideology for the work we were doing or the experience I was having. However:

Only people whose relation to the land was already alienated could hold up wilderness as a model for human life in nature, for the romantic ideology of wilderness leaves precisely nowhere for human beings actually to make their living from the land. By imagining that our true home is in the wilderness, we forgive ourselves the homes we actually inhabit. In its flight from history, in its siren song of escape, in its reproduction of the dangerous dualism that sets human beings outside of nature – in all of these ways, wilderness poses a serious threat to responsible environmentalism at the end of the twentieth century. (p.40-1)

Working a highly regulated, contaminated piece of the “wild”, in an often divisive and uneasy community, in the constant company of noisy machines, I was effectively prevented from taking that “flight from history”. Thus, I read Cronon’s words after last field season’s romantic failure with a start of recognition:

Most of our environmental problems start right here, at home, and if we are to solve those problems, we need an environmental ethic that will tell us as much about using nature as about not using it....Calling a place home inevitably means that we will use the nature we find in it, for there can be no escape from manipulating and working and even killing some parts of nature to make our home. (p.45-7)

The incorporation of contaminants into one’s vision of natural history, of conflict among one’s co-

residents, and of machines into one's interactions of the land, is therefore a process of intimacy – of domestication - that is not necessarily at odds with responsible environmentalism. Indeed, if Cronon is right, domestication is exactly the origin.

Most important, though, is that domestication is also not necessarily a move towards increased instrumentality; note Cronon's caveat:

But if we acknowledge the autonomy and otherness of the things and creatures around us – an autonomy our culture has taught to label with the word “wild” - then we will at least think carefully about the uses to which we put them, and even ask if we should use them at all. (p.50)

In considering this for science on the DEW Line, I would argue that this means we do not need to resolve the death of the Malevolent/Beautiful North by rebirthing it as Environmental Victim, and therefore we do not need to assume that our new relationship is one of total administered techno-protection of the Other from our own evil. Nor does it, I think, mean that all southern whites should pack up and leave the north and only pay attention to environmental issues in the south. Rather, I think it means that we need to ask if the specific places we are producing through the DEW Line cleanup are good homes, both for us while we are living there, and for those who are more permanent residents.

Colonial romanticism itself offers at least one means of trying to answer this question. McMahon, in summarizing the historical process I have outlined above, makes the following suggestion:

We can now see the paradox between our understanding of the land and the landscape. This harsh place, it turns out, is the most sensitive barometer of change on the planet. As we learn to read it we realize it is telling us that we will not be able to survive unless we find a way to understand the world as the Inuit do. (1988, p. 185)

This is a proposition rife with dangers, but still I think a valuable one; it is worth at least asking the question of what the long-term residents want to do about the DEW Line and its mess, and being prepared to accept and implement the recommendations that they might give. However, as Cronon's entire argument points out, romantic inquiries into the nature of the Other do not necessarily translate into effective environmental practice; they are simply not sufficiently situated. Here I would like to return to Lopez' remarks at the opening of this section about how scientific accounts leave the reader with an “unfinished” evaluation of the land :

Whatever evaluation we finally make of a stretch of land, however, no matter how profound or accurate, we will find it inadequate. The land retains an identity of its own, still deeper and more subtle than we can know. Our obligation toward it then becomes simple: to approach it with an uncalculating mind, with an attitude of regard. To try to sense the range and variety of its expression – its weather and colours and animals. To intend from the beginning to preserve some of the mystery within it as a kind of wisdom to be experienced, not questioned. And to be alert for its openings, for that moment when something sacred reveals itself within the mundane, and you know the land knows you are there (1986, p.228).

There is something in this attitude that I would recommend for science on the DEW-Line cleanup. Although attempting to understand and respecting the knowledge of Inuit (both traditional and contemporary) about their land is important, I think it both more crucially overlooked and more readily available for us as southern scientists to explore our own heritage and how it gets worked out in our interactions with specific parts of that land. In western romanticism is a quest for beauty and truth in the land that opens onto a possibility of approaching what Lopez calls the mystery and sacrality *within the mundane*. In our empirical rationality lies an equally romantic quest for truth and beauty – the colonial imagination's “holy grail” - which opens onto the same possibility. While perhaps not “transformative” or “enlightening” in the climactic sense implied by western quest narratives, and while not necessarily easily articulated amongst us scientists, we encounter the autonomous presence of the land everyday. This applies to both northern and southern settings but *may*, because of our romantic heritage, flourish in a landscape that, Fogg tells us, “provides particularly favourable opportunities for investigating basic ecological relationships”, making it “somewhat easier to identify the critical factors operating in the environment” (2000, p.1). Thus, in our northern science I would tentatively recommend a domesticated romanticism. We

need to continue to pursue truth and beauty *through* careful observation of where we are living, and how we make a living. Careful observation is, of course, *how* we as scientists are supposed to make our living.

Militarism and Sovereignty Science

Rationalism and romanticism form the dominant official and unofficial discourses of science on the DEW-Line Clean-Up. There are, however, two less obviously influential discourses present that deserve discussion. In this section, I will discuss the first of these: militarism. By militarism, I mean an ethic of paternalistic nationalism, or the ideal of protecting the civilian public of a sovereign nation-state, through the application of physical and/or technological force by a specially trained, elite segment of society (the military).¹² Lowi and Shaw explain the specific roles of the military as “securing borders, projecting force and influence, and responding to national threats and adversaries” (2000, p.3). Associated with such roles is a culture that emphasizes physical and technical competence; relies on competitive and hierarchically regulated organization (“fight to win”, “the rule of law”, and the “chain of command”); and for whom values such as security, safety, order, discipline, obedience, diligence, duty, honour and responsibility have fundamental motivation power (see, for example “Your Goal – An Officer in the Canadian Armed Forces”, from which this list of key words is substantially drawn (www.rmc.ca/military/rmcgoal.html)). In this section, I use the word “military” to refer both to the Department of National Defense and the Canadian Armed Forces; DND is the administrative arm of the CF. Although this usage is not entirely faithful to the internal usage (“military” referring only to active military personnel, in contrast to civilian employees), to my knowledge both the DND and the CF employ military personnel as well as civilians, and both support the military ethic I outline above.

A discussion of militarism is particularly relevant, of course, since the DEW Line cleanup is both funded and managed by the Department of National Defense (rather than, say, Environment Canada, or even the private sector companies that built, supplied, operated and polluted the radar sites). I also find the subject interesting because, while the science on the DEW Line cleanup is currently conducted exclusively by civilians hired through a private contracting company¹³, it is, with the exception of upper management, the *only* branch of the project which takes place exclusively on military sites. Thus, in this section, I will discuss the relationship between science on the DEW Line cleanup and military environmentalism. I began this discussion in Part II (Chorus) of this paper, loosely based around the “background” section of the 1995 ESG/UMA DEW Line cleanup summary report. Here, though, I will build the discussion by illustrating how the DEW Line cleanup partakes of a general geopolitical security discourse, and more centrally, of a particular discourse of military environmentalism where paternalistic nationalism gets added to administrative rationalism and protectionist romanticism. Specifically, I will argue that the military has taken on the DEW-Line cleanup for the following official reasons: its moral as well as legal and economic responsibilities; and for the following unofficial reasons: its indirect contributions to sovereignty projects that further the colonial interests of the nation-state.

Upon entering the project, I was persistently puzzled by the Department of Defense’s sponsorship and management of large-scale environmental science. My understanding of the military was admittedly based on scanty personal experience, although one of my more memorable encounters with military personnel added to my skepticism. Staying at a friend’s home on the military base in Oromocto, New Brunswick in August of 1999, I was privy to a dinner conversation in which a serviceman expounded at

¹² This is a fairly (and intentionally) dry definition of militarism; other aspects of contemporary North American military ethics might include an ability to justify killing people and other organisms who are typically not directly threatening the security of a nation-state. It might also include the phobic mentality that supports extraordinarily expensive arms races; Di Chiro (1987) gives an extensive discussion of the costs of such resource allocation. However, for my purposes here, I am looking more at the specific interactions of militarism with the DEW-Line cleanup, rather than critiquing a militaristic worldview and its material consequences as a whole.

¹³ There are several officer cadets (i.e., military students) who work with ESG, but primarily on non-DEW Line cleanup work.

length on how peacekeeping and disaster relief, while they may look good in the press and are important jobs, are really not what the military is supposed to be doing: training, preparing for war and waging it as need be. He made it abundantly clear that such work was a side-line at best, and a distraction and drain of already strained resources at worst. This man's opinions (regardless of whether or not they are representative) have remained with me as I have tried to grapple with my own questions about the purpose and priorities of the DND. If the military should not be involved in peacekeeping and disaster relief, then what in the world is it doing in an environmental cleanup? Surely this is at least one more step removed from traditional military work. My questions are echoed in Lowi and Shaw's introduction to the anthology Environmental Security, Discourses and Practices: "Should we encourage the 'greening' of militaries? Are they credible as environmental activists?" (2000, p.3)

In considering such questions, I have mentally returned to that New Brunswick kitchen to imagine what exactly that man would say about his employer allocating millions of dollars annually to environmental research, assessment and remediation. The DEW Line cleanup is reputedly the largest environmental cleanup ever undertaken in Canada – as mentioned earlier, about CD \$500 million at current estimates. The American military, who built the DEW Line sites, agreed in 1996 to contribute US \$100 million, placed in a Military Sales Trust Fund, as a credit that DND could use to purchase military equipment from the U.S. Nonetheless, this amount is supposed to go towards the cleanup of Cold War legacies built by the Americans on Canadian soil: two military bases (Argentia and Goose Bay, NF), a pipeline (Haines-Fairbank, NWT), and the 21 DND DEW-Line sites. The American contribution will not come close to covering the costs; the Argentia cleanup alone is currently at about CD \$81 million (CBC radio new report by Gary Roberts, June 5, 2002). Moreover, Myers (2000) points that the resources available to clean the twenty-one former DEW-Line sites now owned by DIAND "have received perhaps \$10 million over recent years, and have no committed funding from Ottawa" (2000, p.131). Myers goes on to ask a key question: "What explains the priority attached to the clean-up of the DND sites as compared to those turned over to Canada in the 1970s [now managed by DIAND] and compared to other northern contaminant issues?" (2000, p.131).

One reason seems obvious enough: the DND has unique means, both economic and political. The DND has the third largest federal departmental budget, about \$12 billion in 2002-3 fiscal year.¹⁴ Estimating at \$14 million a year for the cleanup over its approximately 35 year span, and a stable DND budget (recent federal allocations to security suggest that it may however increase), the full DEW Line cleanup would then take 0.12% of the DND annual budget.¹⁵ Yet while the cleanup makes up only a tiny fraction of the DND annual budget – with or without the American contribution – it would be a much larger percentage of the Environment Canada annual budget (\$720 million) or even the relatively large DIAND annual budget (\$5 billion). Moreover, DND has a special relationship with the U.S. co-funders. The U.S.- Canada deal on the cleanups was unprecedented; the U.S. federal government has not agreed before or since to pay for remediation of contamination caused by their military infrastructure on foreign soil, although they have done extraordinary damage in other places of the world.¹⁶ From what I can gather about the 1995-6 U.S.-

¹⁴ After Finances and Human Resources. The 2002-3 Treasury Board Main Estimates give a total of \$154 billion for the federal departmental budgets. Finances gets \$69 billion (45%), Human Resources gets \$30 billion (20%), and DND gets \$12 billion (8%). The other 21 federal departments split the remaining \$43 billion. (see http://www.tbc-sct.gc.ca/media/nr-cp/2002/0228_e.html)

¹⁵ The main work of the clean-up will take about fifteen years (1995-2010) and then there will be 20 years of monitoring the landfills. The bulk of the money will be spent in the first 15 years, as monitoring involves much less personnel and time. Thus, in the first fifteen year the percentage of the annual budget will be larger (perhaps as much as 0.5%, or \$60 million a year) while in the monitoring phase, the percentage may drop to as little as 0.01%, or \$1 million a year. I have calculated an estimated yearly average for simplicity's sake, as more detail does not substantively change the argument made above.

¹⁶ A particularly well-documented and damning example of this is given by Wypijewski in "This is Only a Test: Missile Defense Makes Its Mark in the Marshall Islands" (Harper's Magazine, December 2001).

Canada negotiations from published literature (the actual records are classified), the agreement to help fund the cleanup was essentially brokered between the two defense establishments and their respective technical experts, with the occasional diplomat or politician helping it along (Myers 2000). This deal was leaked to the press and roundly criticized by non-governmental activists like Kevin O'Reilly of the Canadian Arctic Resources Committee (Khan, <http://track0.com/cc/issues/1298dewline.html>); in an unusual office conversation, a co-worker has quoted O'Reilly as asking ESG personnel whether or not "we were trading bombs for cleanup". While this is a legitimate question (which I will take up later), perhaps another relevant question is whether or not the U.S. would ever have agreed to contribute \$100 million to DIAND, Environment Canada or any other Canadian agency besides their trusted military friends. Recent analysts like Myers have treated the financial arrangement as a fiction required for political reasons, and one that sets an interesting international precedent; while I have no way of ascertaining exactly how this money is channelled or used, the political expediency, and implications, of this arrangement are apparent.

Two of several possible implications is that militaries are now seen to be effective brokers of international environmental agreements, and, therefore, that the environment is viewed as a legitimate security issue. This is clearly a recent phenomenon, but not an untheorized one; as Lowi and Shaw write:

Environmental security has, over the last decade, emerged as topic of discussion and vibrant debate. Largely in response to the end of the Cold War, the termination of superpower rivalry, and the explosion of nationalisms, the academic and policy communities have sought to revise their conceptions of security to include non-military threats and non-state actors, so as to more effectively explore and understand underlying issues that impact new (international) relationships. In keeping with this conceptual shift, the natural environment, and anthropogenic alternations of it, have been identified as important elements in the relations among states, communities, and individuals (2000, p.1)

Indeed, as the above paragraph suggests, were it not for drugs and terrorism, environmental crises could have almost filled the void left by the end of the Cold War. In this vein, Ross argues that "the 'greening of the Pentagon' can be seen as part of a wider agenda establishing environmental security as a new doctrinal cornerstone for the U.S. defence establishment, in compensation for the loss of the old Cold War enemies" (cited in Woodward (2001), p.215).

Unsurprisingly, this agenda has infiltrated the Canadian military. In 1997, an official articulation of environmental security concepts was produced by the DND in its first Sustainable Development Strategy; this document contained the following words:

[O]ur contributions to sustainable development are anchored in our larger mandate to defend Canada and Canadian interests and values while contributing to international peace and security. A world with a weakened environment, fractured societies, and economic uncertainty for billions of people is an unstable world. It is a world in which Canada's interests are at risk... It is in our interest to prevent that from happening. (http://www.dnd.ca/admie/dge/sds/SDS2_e.htm)

Interestingly, the security rhetoric of the 1997 Sustainable Development Strategy, although briefly referenced in the 2000 version of the Strategy, is not highly visible in the latter document (http://www.dnd.ca/admie/dge/sds/SDS2_e.htm). Instead, this is dominated by administrative and corporate language, i.e., the "business of defense" theme noted earlier, rather than visions of environmental and/or political apocalypse. By 2000, DND portrays itself as steadily increasing its own long-term managerial compliance to the environmental policy framework established in 1997, through, as one example, gradually implementing environmental management systems congruent with industry standards like ISO 14001 (2000, p.10).

Such a shift echoes, to some extent, the movement of the DEW Line cleanup technical discourse to increasingly administrative rationality from the mid-1990s. It may also loosely follow the simultaneous decline of mainstream public interest in environmentalism from its high-point in the late 1980s (when the discourse of sustainable development was born (Escobar 1996)), and the rising power of multinational corporations, with the accompanying corporatization of public and political discourse. That is, political

security and the environment went out, while apolitical business and the environment came in.¹⁷ However, the corporatization of military environmentalism, like the instrumentalization of our environmental science, exists in tension with an alternative ethic. Even if the policy-makers now spin national defense as (whose?) business, the military cannot get too cosy with a free market worldview where equal individuals behave in accordance with their own economic self-interest, this invisible hand somehow making sense out of chaos. Here I would like to point out that *administrative* rationalism (in this case, as opposed to purely *economic* rationalism) is particularly amenable to a militaristic mentality. If there remains tension between administrative rationalism and militarism, likely because of divergent definitions of security, risk and defense, both discourses rely heavily on a hierarchy of authority that purports to respond to the generalized public interest. Indeed, the peacetime militarism of the DND bureaucracy may be all but indistinguishable from other governmental agencies' administrative rationalism. As Sandilands has suggested, "in the absence of war, management" (2002, personal communication): while maintaining a moralistic patriotism and the ubiquitous chains of command, the institutional preoccupation with national defense shifts from immediate physical security and geopolitical risk to that of economic security and liability management, the latter being a discourse very familiar to many large bureaucracies.

Thus on the DEW Line cleanup, a peacetime DND project, we see a great deal of the administrative rationalist side of the DND (as I discussed in the first section of this issue). But while the environment as a traditional security issue does not come out in any obvious way in the cleanup, it remains in something of a geopolitical elephant in the environmental room. For example, one of the curious things about working as a scientist on the DEW Line cleanup is that the North Warning System (NWS) is generally not part of my consciousness; most of the work that ESG does on the NWS is undertaken by our cartographic group, who currently work out of a separate building. Indeed, our entire group is located on the margins of the Kingston military campus, in three small buildings between the tennis courts and the lake. Both the NWS and Director General of the Environment head offices are in Ottawa, and we typically have little to no contact with active military personnel. Even on active radar sites in the north, where DEW Line cleanup and NWS personnel live and eat in the same buildings, my experience has been that our interactions are minimal, and frequently strained when it comes to sharing resources.

But the DEW Line and the NWS are not separate systems, despite changes in technology, infrastructure, administration and contractors. As noted earlier, 16 out of the 21 DEW Line sites being cleaned up by the DND have been converted to NWS sites. Moreover, and despite the end of the Cold War, the sites do the same thing: like the DEW Line, the North Warning System is part of the North American Aerospace Defense (NORAD) Agreement, and thus provides ground-based surveillance data to NORAD head-quarters in Colorado Springs. The Federation of American Scientists indicate that data currently gathered at Canadian radar stations play an ongoing, constant role in informing American military tactical control and command, that is, if, when and where weaponry (nuclear and otherwise) will be deployed around the world (<http://www.fas.org/nuke/guide/usa/airdef/an-fps-124.htm>). Therefore, Canadian arctic radar installations, past and present, are part of the support systems for weapons of mass destruction. Remembering this, even our focus on legitimate, pressing, and (relatively) local environmental concerns becomes almost suspect, a clever re-direction of our civic attention and resources. What, I have wondered, is the military environmentalism that accommodates spending a half-billion dollars on carefully constructing landfills in the arctic, while the sponsoring organization simultaneously assists in dropping bombs over eastern Europe, Afghanistan, and other parts of the world?

In Woodward's analysis of the environmentalism of the British military, she notes the dominance of a "balance" metaphor, where military operations need to strike a "balance" between the separate, equal, competing claims of environmental protection and environmental disturbance. (Woodward, 2000). The Canadian military also deploys this discursive strategy to accommodate the obvious tensions in military environmentalism; as seen in the 2000 Sustainable Defence Strategy: "Defense is committed to ensuring that our activities are performed in an environmentally sustainable manner that achieves the mission without compromising the well-being of future generations" (2000, p.5). But the document leaves the unavoidable impression that balancing mission achievement with environmental sustainability is a peacetime and domestic activity: almost all the strategies it invokes apply exclusively to training grounds and military bases on Canadian land. I will shortly develop the nationalist aspects of this environmentalism;

¹⁷ After the destruction of the World Trade towers, though, it now seems that security *and* business are in.

note for the moment, however, that there is a conspicuous silence in DND environmental policy on the applicability of their environmental ethics to war events (and perhaps even to international “peacekeeping” activities). Thus, the Canadian military may have once discussed the environment as an international security issue, but it now contains it almost entirely as a domestic, managerial concern.

The DEW Line protocol, balancing practicality and cost-effectiveness against the need for human and environmental health, also invokes the cost-benefit logic of the balance metaphor. More to the point here, however, is how it also utilizes the compartmentalization strategy. The connection of the Canadian military to global environmental injustice is not much discussed among our scientific, civilian group. This, I would argue, is part of the functionality in assigning the environmental work of the military to people who, by and large, have not and will never witness first-hand the direct consequences of warfare. This avoids the worst of the cognitive dissonance (and resistance) that should occur in people who both make the mess and have to clean it up. The intellectual separation of the DEW Line cleanup from the North Warning System, and ESG from DND, is a tidy division of past from present, domestic from international, civilian from military, academic from administrative spheres of information and responsibility. Yet this compartmentalization still leaves DND with substantial financial and bureaucratic control over the project we undertake, since a large amount of environmental technical expertise (science and cartography) remains completely dependent on military financing, as well as in-house. Moreover, while none of the work we do on the cleanup is classified and intellectual control is not exercised over any research project ESG undertakes, my personal experience has been that working on military sites at all times, knowing that my entire salary comes from the Department of National Defense, and being required to undergo a security check, medical surveillance, and carry a civilian identification card at work do tend to exert a perceptible level of influence.

What is the point of arm’s length control over an environmental cleanup, in particular, over its scientific arm? Why not contract that entirely out too? This is not, it turns out, an atypical relationship between a military sponsor and science. A recent historical analysis by Cloud, for example, of the “clandestine reconfiguration of the strategic earth sciences” (2001, p.231) during the Cold War generated the following model of scientific knowledge production:

The Shuttered Box traces its lineage from the metaphor of the ‘black box’...In our adaptation, the box is equipped with shutters and represents an arena of exchange between classified and unclassified institutions and their domains. The shutters allow successful passage of people, money, ideas, technologies and data back and forth between the disparate domains, but without ever providing direct sight or communication between the realms....The Shuttered Box as a metaphor of knowledge production is a potentially important tool for examining the zone between nominally disparate civilian and military scientists, institutions and organizations. (2001, p.240)

Holding this model in mind, I would like to draw from another Cold War science scholar to illustrate some striking parallels between the Environmental Sciences Group and the U.S. Naval Research Laboratory (NRL) by Keuren (2001). Noting that the “national mobilization created by the Cold War conflict ensured a mutual inter-penetration of science and the military that continues to the present” (p.206), Keuren describes how the NRL underwent a “dramatic shift in both its physical scale and in the breadth of its research” during and immediately after World War II (p.209). Like ESG, the NRL experienced rapid growth in tandem with a new security discourse and, as Keuren further documents, the conscious reconceptualization of the ideal balance between basic and applied research, and development of complex collaborative relationships between the naval lab and non-government, non-military labs. In his conclusion (“Cold War, Hot Science”), Keuren writes:

The Cold War opened the national coffers for science, but it literally emptied them for R & D that bore on issues of national security.... Although the intelligence people were essentially in the driver’s seat as far as setting schedules and equipment use-time priorities, the space scientists [at the NRL] were able to negotiate terms of access which were beneficial to their research, and consequently to their professional careers. Was this all a deal with the devil or a happy compromise? (2001, p.223)

There is a certain resonance between the way Cold War science became organized to serve strategic purposes, as described by Cloud and Keuren, and the current arrangements on the DEW-Line cleanup.

Moreover, Keuren's answer to his final question (that it depends "on one's stand on the necessity of pursuing intelligence and security issues during the Cold War", but "it is clear that science came out ahead because of the barter" (p.223)) might equally apply to our group.

While the above comparison suggests some interesting questions about how the DEW Line cleanup could be implicated in traditional security scenarios, suffice to say that the hierarchical and segmented way of organizing labour that came to apply to military-funded science in the Cold War is now characteristic of the science on the project.¹⁸ But the comparison also raises a second major reason as to why the DND might be funding this project: public relations. Perhaps we are not trading cleanup for bombs, but good press. Science, after all, has a certain prestige in our society, a prestige advanced in no small part by military sponsorship during the Cold War. The military may wish to support in-house environmental scientific expertise, and to develop its environmentalism accordingly, simply because it makes the institution look good. Recall that, immediately preceding the nominal end of the Cold War, mainstream environmentalism was at a high point. It is this public relations (rather than security-substitute) aspect that Woodward notes in the shift in U.K. military priorities throughout the 1990s:

At a time of defence expenditure cutbacks, every-changing roles and responsibilities for the Armed Forces, official censure over racism and public criticism for homophobia and sexism, the Armed Forces feel beleaguered. The celebration of environmental protection success is very important. It grants an organisation that feels itself maligned and besieged by constant political and cultural change an opportunity to show its activities in an unusually positive light (2001, p.210).

Again, the Canadian context echoes this; in contrast to environmental security rhetoric of the 1997 Sustainable Development Strategy, the DND-DGE Environmental Responsibility document invokes public concern as a key factor in the new military environmentalism. Noting that while certain aspects of federal environmental awareness goes all the way back to nineteenth-century legislation, the document cites environmentalism's entry into the Canadian military consciousness somewhat more recently:

The concern for the quality of the environment is not new. More than a century ago, the Fisheries Act [1868] included environmental obligations. In the past ten years, environmental protection laws have become more stringent to respond to the concerns of Canadians. (<http://www.forces.ca/admie/dge/pam1e.htm>)

This period has seen the passage of the Canadian Environmental Protection Act (1988), the establishment of ESG (1989), and the passage of the Canadian Environmental Assessment Act (1994) and of course the beginnings of the DEW Line cleanup – so although there is no inevitable connection between federal law and the concerns of Canadians, the military response to federal legislation is clear.

The specific case of the DEW Line cleanup may offer several reasons why public relations would be particularly necessary, the most obvious being the relatively high profile of the military and of the environment in northern affairs. The cleanup may have at least partially been, as McMahon (1988) has argued, a response to northern controversy over installing the new radar chain given the visible environmental legacy of the last one. (He asserts in fact, that the trade-off was one of the DEW Line cleanup for the NWS (1988, p.141)). The spin benefits are not, though, wholly regional; given southern (middle-class) Canadians' romance with the north, and perhaps cultural guilt about European-Aboriginal relations, there is really no better setting for national public relations. The emphasis on environmental and

¹⁸ Note, however, if the Shattered Box model does indeed apply to knowledge production within current military practices, it is unlikely that I or many of my civilian co-workers would know of any strategic applications of our work let alone be able to control them. One might, for example, if one were so inclined, speculate on the relevance of our "increasingly spatial" work to GIS-guided missile defense systems, particularly in providing accurate ground data at landmarks in the meteorologically problematic polar regions, or the generation of internal environmental science capacity in preparation for environmental apocalypse scenarios.

economic “co-operation agreements” with territorial governments, and consultations with Inuit communities, as opposed to consultations with on-site staff or even southern taxpayers, can be explained in this light.

But I think there is more to the DEW Line cleanup than a public relations stint, just as there is more to the militaristic ethic than administrative rationalism: there is also a passionate nationalist romanticism, evident in at least some sectors of the military. The language of the Environmental Responsibility document, while as previously argued shows a particularly resourcist, punitive and classist worldview, does contain one positive statement that calls explicitly on nationalist sentiment:

The public and the Government of Canada have determined that the time has come for zero tolerance on polluters. As part of National Defence, I have an added responsibility for the protection of the environment because my job, directly or indirectly, involves the protection of my country from threats to its existence. Continuous pollution or environmental damages are insidious threats to the beauty, the integrity and indeed the existence of my country. Through my actions, I will contribute to keeping it strong and free and to maintaining its water, air and land in good condition for future generations.
([http:// www.forces.ca/admie/dge/pam1e.htm](http://www.forces.ca/admie/dge/pam1e.htm))

This is the only document I have yet seen from DND, aside from the one phrase invoking the Arctic Environment Strategy in the 1993 impact reports authored by ESG, that refers to natural beauty and integrity as part of environmentalism. Unique here is the word *free*. The oblique reference to the national anthem (“True North Strong and Free”) is psychologically ingenious, and very striking in this context; not only does it allude to the arctic mythology that southern Canadians hold so dear but it also sits cheek-by-jowl with a representation of *human* behaviour as anything but free. Further embedded in the language of federal legislation (“water, air and land”), sustainable development (“in good condition for”), physical (“insidious”) threat to the nation-state, and even the war on drugs and other sins (“zero tolerance”), this statement contains perhaps all the essential elements of contemporary Canadian military environmentalism. While this combination of discourses is fairly complex, the emphasis here is clearly on the individual soldier’s paternalistic responsibility to protect the nation – indeed, to heroically sacrifice one’s personal freedom for the freedom of the nation. Even if this kind of romanticism needs to be carefully managed by military educators (by, as Woodward (2000) has suggested, placing the role of “guardian of the wilderness” in the context of the “balance” metaphor among others), there has been a clear internal attempt to bring military environmental impacts into line with a protectionist ideal.

Myers (2000) picks up on this new, moralistic theme in her analysis of the US-Canada agreement to fund the DEW Line cleanup. In response to her own question about why some sites might get worked on instead of others, she initially suggests that “fixable” environmental problems get solved first, and that the DND sites are more easily managed than other contaminated sites in Canada. While relevant to an administrative rationalism, this does not fully explain the allocation of federal resources relative to the DIAND sites, as the DND sites (if not the worst in the nation) are probably more contaminated than the DIAND sites because they have been in use longer. Myers then suggests that generalized Canadian anti-Americanism may also have helped Canada doggedly pursue (and get) the international agreement; again, this begins to reflect nationalist interests, but both DND and DIAND DEW-Line sites still could have been included in the international agreement. Finally, Myers briefly hints at a third possibility :

perhaps, a recognition of the irony that the contaminated bases problems is the result of military operations intended to protect North America (albeit not offering much protection, environmental or otherwise, to the Canadian North itself). This link between environmental and military security ought to be investigated more closely (2000, p.132).

Although Myers does not identify who recognized the irony of the contamination problem, the general portrait of military values I painted above, as well as the environmental responsibility document’s clarion call to stand on guard for the Canadian North, suggest that those within the military may have been those who did. Indeed, it may have even been those closest to a nationalist *military* (rather than corporate or even administrative) worldview who took this on. One would assume it would be at least difficult for a person and/or institution holding the ideal of defending the public of Canada with honour, honesty and integrity (etc.) to ignore how the DEW-Line did not succeed in doing this. By Cold War logic, there may have been

some convoluted strategic benefits to Canada in building the DEW Line, but in simpler protectionist thinking, the project fails by almost all criteria: Canada initially rejected its construction for economic as well as sovereignty reasons (Myers 2000) and subsequently had limited access to sites (McMahon 1988 and Flynn 2001); when operational it gave only those in southern parts of North America scant warning of approaching bombers (*Life* 1963); it became rapidly technically obsolete, as publicly acknowledged by Canadian federal agents in the 1970s (Myers 2000); and of course, its operation did substantial damage to Canadian land and posed a past and current threat to northern Canadian peoples (also recognized internally, such as in the 1993 ESG report).

Potentially, such considerations *could* be ignored, as history is rife with the dislocations of idealism and action. However, that idealistic intentions from within the Canadian military did in fact motivate the cleanup is supported by a conversation I had with another DND employee about why the institution was undertaking the clean-up: “People!” he said emphatically. “People made it happen!” In this man’s view, decision-makers’ sense of environmental and social responsibility, not merely the land-owner’s economic or even legal obligations, had motivated the DEW Line cleanup. While it is relatively easy to be cynical about this response (and I strongly suspect that it is particularly genuine in individual and informal rather than institutional and official discourse), both the sincerity and experience of its speaker lead me to credit this kind of idealism with some weight. Moreover, this attitude was recently demonstrated more widely within the project as, facing escalating costs, the entire project management undertook a “values engineering” exercise; despite a rather stunningly administrative title, the result of this exercise was that the management found no way to cut back further on costs because of the *values* they felt the project represented.

It is worth taking a closer look at project documents, I think, to illustrate some of these values, in particular to highlight the nationalist variant on romantic protectionism. As previously noted, protectionist language is particularly evident in the description of the arctic ecosystem in the section of the 1995 ESG/UMA report entitled “Environmental Problems in the Arctic”, where the arctic was portrayed as not only extraordinarily vulnerable, but in need of suitably diligent care: “The recognition of the unique character of the Arctic environment implies that standards protective of the environment in the South might not be applicable in the Arctic.” (1995, III-3; see page 24 of this essay for the quote in full). Despite the irony available in such passages – one possible environmental standard implied by such a characterization is the removal of all military infrastructure from such a sensitive, fragile environment – the overarching message is not in the least ironic:

The DEW-Line Clean-Up Protocol provides a comprehensive method for the assessment of former DEW Line facilities and the implementation of practical cleanup plans that will be protective of the Arctic. It is designed to leave the sites in an environmentally safe condition, and places a special emphasis on preventing the migration of contaminants from sources such as leaching landfills, sewage facilities and spill areas, to other parts of the Arctic ecosystem, especially the food chain. The Protocol complies with the existing CEPA and Fisheries Act regulations and with the DND/DIAND agreement. In addition, it establishes stringent guidelines that apply in a broader context to the Arctic environment. (1995, p.III-20).

This last paragraph is another fascinating example of how various discourses – administrative, empirical, and militaristic – can mingle and overlap. The administrative rationalism heads the paragraph off with that key word “practical” (as in cost-effective), as well as the reliance on regulations, agreements, and guidelines (rather than, for example, evidence or morals). “Practical” additionally pulls on an ethic of hard-nosed pragmatism characteristic of military rhetoric; interestingly, Clark (2000) notes that “national realism” was a dominant ideology of the entire Cold War period, where American pragmatism was elevated relative to Soviet ideologism, in military and political through academic and scientific spheres. The militaristic discourse is then further represented by key words like Protocol, protective, safe, and stringent. Finally, science is present in terms such as ecosystem, assessment, contaminant migration, and food chain. This last term, while common in older ecological studies, also overlaps with hierarchical concepts characteristic of both administrative and military discourse, as arctic food relationships can be effectively represented as circular webs rather than linear chains (e.g., in McDonald et al. (1997), p.20).

For my purposes now, I would like to focus in on how the institutional context of this project allows for particularly rich readings of protectionist language. For example: in the above quote, it is stated that the Protocol will be “protective of the *Arctic*”. The Protocol, through a few well-built landfills on 21

radar sites strung across 3,000 km of the 70th parallel, most of which will continue to experience direct anthropogenic disturbance, will protect the entire Arctic. The 1993 ESG report also documents that, while the local contaminant inputs of the radar sites might have underestimated and understudied impacts on human health, the scientific literature consistently reports that local sources contribute a small amount of total contaminant load in the arctic (1993, p.42). The Protocol's landfills will not address global inputs in any way, so it is rather curious that the Protocol should be said to be protective of the entire north polar region. Of course, the writers of the Protocol didn't mean that this practical clean-up plan would *literally* protect the entire arctic, I'm sure, but this is one of the places where a recognizable (un)consciousness appears to slip unnoticed into a more technical discourse. It would seem, almost, that the authors are referring here more to the living DEW Line rather than to the localized cleanup of now-defunct technology. The living DEW Line, after all, theoretically protected the entire polar region with invisible electromagnetic surveillance, which, by Cold War logic, protected the "broader context" of the entire world... Could the cleanup discourse be *that* haunted by an internal recognition of the Line's past failures?

Conscious or not, such a phrase proclaims an unmistakable message: we *will* take care of the problem. We will make good on our promises. We will (finally) make this dangerous place safe. Safe from what? Safety for whom? And for how long? Safety, to take the Protocol literally, is the accurate assessment and indefinite containment of contaminants in order to assure food security for the local people and other organisms.¹⁹ In other terms, the cleanup is the identification and capture of a threat followed by the construction and enforcement of permanent borders to protect the civilian nationals. These borders will be built and monitored with the most advanced technology, allowing those in charge to detect any new incursions. These are, however, not borders trying to keep an external enemy *out*, but borders trying to *contain* a (more or less) internally generated threat: a new geopolitical security environment indeed. Have we moved past the joint task force against nature into retaliatory chemical warfare against our big, bad southern neighbours, in a somewhat belated attempt to reclaim our piece of pure Canada? The north transformed from hostile to fragile, are we now at war with "ourselves" and "our" artefacts?

Here we run into many of the same contradictions as with other forms of romantic generalizations: for example, in order to wage either war, we need to do harm to that which we would protect (by sampling, soil removal, landfill construction, etc.), and in the meanwhile, we continue to rely on the systems that produced the threat in the first place (e.g., NORAD and fuel-dependent site operations). Moreover, on the question of time, it seems unlikely that, even using temperature and climate change models as the project's engineers do, that landfill construction is really an eternal solution to the hazardous waste "legacy issues" (as the landfills are called); most of that waste will be hazardous longer than the existing political, technical and geological conditions under which the landfills are built. After reading the history of the DEW Line, I have to confess that it is difficult to imagine that even the most beautiful engineering projects will actually serve the purpose for which they were designed; innovative permafrost-dependent landfill designs are at best low (not zero) risk constructions.²⁰ Finally, no matter how perfectly the Protocol isolates the DEW Line contaminants from the local food chain, the more immediate problem remains that 16 of the 21 cleaned DEW Line sites are still in use for the North Warning System (along with 25 other arctic sites). Beyond the physical disturbance that the cleanup entails, and ignoring for the moment the global issues, the long-term local environmental impacts of the NWS compared to the DEW-Line remain to be seen; although the military appears to be actively taking measures to improve their ongoing environmental

¹⁹ This could also be interpreted as safety for the DND from environmental liability and related economic costs and legal punishment; while this is often enough emphasized within the project itself, I will leave it aside for the time being.

²⁰ The zero risk alternative – to remove, sort and re-use or remediate all debris and contamination on the DEW Line sites – would be incredibly slow and expensive, and would also require a great deal of technical innovation, since our current knowledge of how to extract and remediate contaminants is scanty. (Indeed, the real zero-risk alternative is not to make things we can't un-make). More important, I think, is that the zero-risk alternative for the DEW Line cleanup is currently politically impossible; my understanding is that this was the original goal of the Inuit leadership, but that the DND flatly refused, leading to an initial political impasse.

performance at some northern sites, my (limited) observation of staffed NWS sites is that waste generation is still very high.²¹

This critique of the feasibility of the stated goals in the Protocol brings me to a consideration not just of the failures of protectionist mentalities, but their successes. The other unmistakable message in the quote from the 1995 summary report is that the Arctic is *ours to protect*. This is the same sentiment expressed earlier, in the 1993 ESG selection from the federal Arctic Environmental Strategy which aims to preserve and enhance “our” Arctic ecosystems, by paying attention to “local, as well as global issues” (1993, p.83). As I argued in the first section of this essay, the DEW Line cleanup may be viewed as part of a larger process of ongoing economic and environmental development of the north. Development projects like cleanups are typically undertaken by property owners. In context of the immediate history of the cleanup, I think it possible to view the project not just as part of a generic trend towards northern industrial development but also one that can specifically serve to re-naturalize military and/or Canadian ownership of the arctic radar sites. This is entirely in keeping with a general understanding of the military as aimed to defend and advance the material interests of the nation-state. Southern ownership over the North was, one might argue, established by the (American) military during the Cold War by the act of building airstrips such that as of 1958, “you may now fly completely across the North American Arctic without losing sight of the lights of a human habitation, and rarely being more than 25 miles from an airstrip” (LaFay 1958)). Interestingly, McMahon reports that the DEW-Line stations were not flying the Canadian flag in 1957 (1988, p.49); with the closure of the DEW Line, the American generals left, and now the stations fly both Canadian and American flags.²² In the meantime, there have been waves of settlement managers, missionaries, police officers, nurses, and teachers. But exactly at the end of the Cold War was a powerful rise of northern aboriginal activism, culminating in the Inuvialuit and Nunavut land-claim agreements-in-principle in the early 1990s. These agreements mean that the radar sites in Nunavut, for example, formerly on “military reserve” to DND from DIAND (the official land-owner representative of the government of Canada in the north), are now on “reserve” to DND from the Nunavut Tunngavik Incorporated. That is: the sites are Inuit land, and should the NWS become extinct as the DEW Line did, and not be replaced again, they are to be returned to northern governance. In such a domestic political context, where there might have been a perceived threat to the comfortable federalist management of the north, it does not seem much of a stretch to view the DEW Line cleanup as a continuation of a long-term sovereignty exercise.

Again, science may have some subtle contributions to this political and cultural process. In considering the role of northern science in this process, Hobson explicitly proposed a way in which arctic scientists could serve the interests of the nation-state. The following statement, found in a textbook entitled Canada’s Missing Dimension: Science and History in the Canadian Arctic Islands, falls into that historical

²¹ Environmental management systems (EMS) are currently being designed and implemented for these sites, most of which are automated. Automation means fewer personnel on-site, and therefore less domestic waste and terrestrial vehicle use. However, even at automated sites, fuel is still used to generate electricity to power the electronic components of each site, and for aircraft and on-site transportation for maintenance crews. I do not know the relative amounts of fuel required for former DEW-Line versus NWS sites. Nor do I know of any comparative projections of the impacts of human-caused fuel spills on occupied sites versus those caused by failure of automated equipment on unoccupied sites. While the ongoing EMS work may attempt to address this, the early 1990s decision to automate radar installation in the North was based, according to the document available to me, on the DND Cost-Reduction Initiative (again, following from the down-sizing of the military at the time) more so than a consideration of the relative environmental risk or impact of the DEW-Line versus the NWS systems.

²² Guay (1998) makes an interesting point, that the American exit from the north was in part precipitated by their increasing use of space surveillance rather than ground-based radar. He also claims that the Canadian military, through NORAD, is on its way to doing the same – thus suggesting that the extinction of the NWS is not a completely unforeseeable event.

nexus which was the geopolitical vacuum at the end of the Cold War, the bloom of mainstream environmentalism, and the birthplace of ESG:

We estimate that there were probably 1,000 peaceful scientists in the Canadian Arctic in 1987...It was one of John Diefenbaker's vision of the North. What better way to exhibit, gain, maintain sovereignty than to have 1,000 peaceful scientists walking around the countryside? (1990, p.14)

So: just by being in the right place at the right time, as representatives of a particular, powerful segment of Canadian society, scientists are able to project national force and influence. But in the interests of sovereignty, environmental science on the DEW Line can do better than just walking around. Ownership, in western history, may be established by active military presence, legal and economic domination, but it is also maintained by mapping and working the land. During assessment phases of the cleanup, we spend most of our time collecting soil samples (literally, turning sod) and documenting the locations of such samples. Exhaustive effort is undertaken to carefully map the sample locations, and the topography of the site as a whole; as noted, the cartographic aspects of the work have become increasingly important and sophisticated over the years of the cleanup. During construction (not demolition) phases, the land is evidently worked again. Besides developing landfills, a particularly appropriate example of this is the landfarm, where fuel-contaminated soil is spread flat, fertilized (to feed hydrocarbon-degrading soil bacteria), and tilled by a tractor to assist fuel evaporation. Landfarming is the only remedial alternative to contaminant burial used on the DEW Line cleanup – and probably the only farming that takes place north of 60. In short, at the very least symbolically, science and the DEW Line cleanup fit right into a colonial pattern.

Like so much of the work of the military (and colonialism), the macropolitical effect can result despite front-line idealism, ignorance or indifference to dominant institutional tendencies. While I do in fact think the sovereignty hypothesis has some cogency, as the institutional continuity between the DEW Line and its cleanup is quite strong, I don't believe its effects are total. For example, the recent economic and environmental co-operation agreements negotiated between DND and northern territorial governments (with the Inuvialuit Regional Corporation in 1995, and with the Nunavut Tungavik Inc. in 1998 and 2001) may have a partial effect of increasing northern dependence on southern economies and knowledge models, but they also augment northern control of the cleanup project. My sense is that this has come about at least in part because of postcolonial northern activism. I will discuss this in more detail in the final section of this essay. For the moment, however, I will conclude by suggesting that while the DEW Line cleanup originated in the matrix of an international security discourse, and responds to more localized public relations issues, I think its militarism is seen most of all in a consideration of its paternalistic nationalism – that is, its sovereign consciousness. Such consciousness is not dominant in the project discourse, but it is there. As with the bureaucratic rationalism and civilian romanticism I discussed previously, this consciousness suffers not only from hubris but also from a lack of a grounded understanding of that which it would protect. The total defense of the arctic environment is impossible, let alone through the DEW Line cleanup. The invocation of such a goal is, at best, an empty inspiration; at worst, it is an excuse to dominate. On the other hand, the more modest enterprise of the construction and maintenance of safe homes at particular locations might not only be more achievable, but (oddly enough) is an ideal towards which military values as well as existing defense policy might be bent. In my opinion, the military *could* be a credible environmental activist, but only if it chooses to redefine environmental security well both more locally, and more globally, than as the belligerent self-interests of the nation-state. The greatest danger, though, seems to lie more in the institutional habits of the military – perhaps particularly its penchant for categorical and combative separation – than its ideals. Much the same might be said, of course, for science.

Gender, Race and Feminist Science

The last discourse that I will examine at length is that of feminism. Following Di Chiro's definition cited at the beginning of the Quartetto, I will be considering both women and other major identity categories such as race.²³ Here I will rely less on a close reading of project texts, primarily because

²³ That is, I am primarily talking about feminism as a politics of inclusion, where the structures that oppress one systematically disadvantaged group can be (at least

there are none that are explicitly about gender or race. However, I will set my observations on feminist issues in context of the previous three sections while addressing two key questions: What explains the remarkable concentration of women scientists on the DEW Line cleanup? And, relatedly, what explains the remarkable absence of Inuit scientists (male or female) on the DEW Line cleanup? These questions are related in the sense that both women and Inuit have been historically absent from the privileged practice of western science. I will present the case here that southern women have gained access, and Inuit people have not, because of each group's particular interaction with the history of western science and its discourses; this has led to the distinct gendering and racing of the managerial, northern, and sovereignty environmental science on the DEW Line cleanup.

More than half of the Environmental Sciences Group are women, about 65% of our full-time staff at my last count. Almost all of these women are young (under 35) and white. We currently populate every aspect of work in our group except mapping, from scientific field and lab work to logistics, administration, medical and computer support. Many of us have life or physical sciences degrees (most Bachelor's, a few Master's and PhDs), and a small number have engineering degrees. Although the top technical positions in the group are mostly held by men, the proportion of women is still high across the board, from entry-level temporary staff through to full-time managerial positions. Translating this to the DEW Line cleanup, this means that most of the scientific staff on the project are women. However, this female-dominant characterization extends *only* to the in-house, scientific arm of the project. By contrast, I would estimate the percentage of women engineers working with the engineering design or construction firms on the project as less than 10% (I have met four total). I have also yet to hear of or meet a northern women working on the project in any capacity except cook (e.g., pilot, mechanic, machine operator, radar technician, construction worker, clerk, custodian), whether that be at a former DEW Line or an active NWS site. In the DND administration of the project, my observation has been that women also appear to be in the minority; interestingly, of the few women in upper management, some are in positions of considerable authority (the current Director General of the Environment, for example, is a woman).

Why are there so many women scientists on the DEW Line cleanup? I believe it has to do with the kind of environmental science we do. There are patterns in women's participation in the history of science – the tasks women have done, the disciplines and locations in which they practiced science – that I believe carry through to managerial, northern and sovereignty science on the DEW Line. In the four hundred-odd year history of western science, women have been almost entirely excluded from science practice until the last century, and more so until the last thirty years.²⁴ The rare woman who was able to do early modern science, frequently the (white, upper class) daughter or wife of a (white, upper class, male) scientist, was often relegated to the status of faithful assistant, being assigned routine, background and generally unpaid tasks rather than the independent, ground-breaking, or paid public work of science (e.g., see Kohlstedt (1999)). In the first section of this essay, I gave an extended discussion of the tensions between empirical and administrative rationalities, arguing that science on the DEW Line has moved away from a more original, empirical, research-based knowledge practice towards a more prescribed, instrumental, and administratively applied one. To some extent, this move entails a loss of prestige in elite science circles; the everyday technical work we now conduct for the DEW Line cleanup is not “high” science and will not lead to publications in peer-reviewed science journals, let alone prestigious theoretical ones. Although this does not necessarily reflect the quality or value of the work we do, I do think that the large proportion of women currently practicing this form of managerial science seems to follow the women-in-science pattern: we are found in greater numbers doing scientific tasks that are considered more mundane and low-status.

Relatedly, we are also in areas of science with particular content. Gradual changes (or perhaps exceptions) to the historical rule of women's exclusion from science was the Victorian passion for natural history, especially botanizing. This, while not considered “serious” science, became an elite recreational

provisionally) paralleled to structures that oppress another group. But the link between gender and race is not necessarily one of equal or equivalent categories of identity, nor is race a subset of gender analysis. As I mentioned earlier in this essay, the reason I have treated race as part of a feminist politics is primarily because of my personal intellectual history, and even so, is not an entirely satisfactory way of arranging the discussion.

²⁴ Many men have also been excluded from science practice until recently, their exclusion based on class or race rather than gender.

intellectual activity that was seen as not only suitable for upper-class women (and children) but as a feminine asset (Gates and Shtier (1997), Gates (1998)). Other fields, such as mathematics and the “harder” sciences, remained exclusively the domain of the masculine mind, thus inappropriate for women. Recent work suggests that this cultural legacy continues. Qualitative research on women studying science reflect ongoing cultural hostility experienced by women at technologically-focussed institutions such as MIT (Bix 2001), in the physical sciences (chemistry and physics; Benckert and Staberg (2001)), and in undergraduate computer sciences (Margolis et al (2001)). However, Eisenheart and Finkel document that, while the overall percentages of women receiving master’s and doctoral degrees in science and engineering remain well below men’s, this hides the facts that women’s percentages are not far from men’s in the life sciences, but not even close to equal in engineering (from a 1991 U.S. NSF study; in Lederman and Bartsch (2001)). In the workplace, these authors also note a “large proportion of female scientists in environmental and other nonprofit organizations” (2001, p.14), a finding that mirrors my own observation in this and other scientific workplaces. Although we do have engineers, chemists and geologists working on the project, along with biologists and geographers, we have all been drawn to use our various disciplinary backgrounds within an “environmental” framework. Even if this does not mean we are conducting nature studies à la Victorian feminine science, for the engineers, chemists and geologists among us, this still a disciplinary step away from “harder” versions of their academic backgrounds, and a step closer to the woman-and-nature equation. Although I have little interest in addressing the nature/nurture debate here, it is clear enough that the high population of women in environmental science on the DEW Line follow such disciplinary patterns fairly closely.

That the environment our science addresses is the arctic appears, at first glance, to be an anomaly in the patterns of women in science. For southern whites, the north has been a no man’s land, a man’s land, but almost never a woman’s land. All the heroes that Lopez celebrates in *Arctic Dreams* (1986) are men, and these men -- whalers, trappers, traders, explorers, scientists, missionaries -- usually went north either in the company of other men, or alone (Brody 1975/1991, p.219). The military sites were no exception to this rule, perhaps even an exaggeration of it. There are not many women, of course, in the military; women had to be legislated into the Canadian Forces through a human rights tribunal in 1989, and Howe puts women’s current participation at 11% (http://www.vcds.dnd.ca/dgsp/dsc/d2000news/1998/nov98/arm_e.asp). But even though the DEW Line, and now the NWS, have always been predominantly staffed by civilians, they have never been staffed by women. The maleness of the station personnel may have been related directly to a (masculine) military mentality and its projection of terrific physical hostility onto the place. Recall LaFay’s Cold War depiction of the “chaste, cruel” arctic being necessarily violated by “man’s technology” for his survival (1958); more recently, McMahon has alluded to a similar connection in the DEW Line culture, saying that, “Godforsaken as the place was, though, the men were separated from the boys just by being there” (1988, p.39).

Despite this attitude, the lack of women on the DEW Line was, by all appearances, also considered one of its greatest hardships; this is seen repeatedly in Flynn (2001), as well as in the poem “The Life of a Gay Radician” I quoted in Part II (Chorus) of this paper.²⁵ (<http://www.klystron.mybravenet.com/dewpoem.htm>). Yet while Brody reports that sexual relationships between white men and Inuit women have been relatively common since whites have been in the north (1975/1991, p.219), and although the currently staffed stations are quite close to Inuit communities with several hundred people, I was told last summer that the all-male NWS staff at one of these stations “goes a little crazy” when we come up because we are the only women they interact with in the north all year.²⁶

With such a past (and present), one might not expect that there would be so many women in arctic

²⁵ The anonymous author of the latter makes a point of noting that the poem was written “before the word “gay” took on its present meaning”.

²⁶ My impression is that the station personnel appear – for the most part - to lead quite segregated social lives from the local communities, consistent with the pattern of whites as an uneasy northern “sub-community” that Brody first noted in 1971. Like McMahon (1988), some of what Brody reported rings true with my more recent experience. While the following may not be representative, when I asked two white men last summer why they did not mitigate their loneliness for female companions by trying to meet women in town, I was greeted by nervous hilarity and incredulous disgust.

science on the DEW Line. But the north we travel to now is not the same north it once was; if man's technology deflowered the arctic in approximately 1958, she has since seen a long process of domestication. As I discussed in the second section of this essay, the arctic we address on the cleanup is now not so much hostile or awe-inspiring as damaged; protectionist romanticism and paternalistic nationalism not only render it an object of care rather than aggression, but also proclaim the once wild frontier safe. Perhaps it is no surprise, then, that white women began appearing in the arctic in the 1960s and 1970s as part of the colonial settlement and development programs of the Canadian government. Brody, for example, notes that, in 1972 in the Baffin administrative region, 62% of the school teachers were women, 60% of them married, with an average age of 30.5 years old; the nurses in the same area were all women, all single, with an average age of 32.7 years, although 63% of them were under 30. Both teachers' and nurses' duration of employment in the north averaged between two and two and a half years (1975/1991, p.55 and p.59).

The familiarity of these statistics brings me to a consideration of why so many of us are involved not only in managerial, but northern and sovereignty science. The romantic quest of (masculine) science, or as I noted before, its "colonial imagination", is explained by Haraway as being "all about excitement and exploring" *as well as* "doing good things in the wide world" (2000, p.9). Recent qualitative research into the disciplinary patterns of women in science have found that women students of science express socially embedded reasons and interests in the work; that is, women students are characterized as having "a desire to help others", thus tending to "satisfy their science interests in socially-applied sciences especially medicine and health" (Miller et al (2001)). The Environmental Sciences Group is a non-profit scientific organization that offers women scientists not only the allure of the historically unavailable, culturally prestigious, now safe, northern adventure, but is also an organization heavily implicated in social issues, including the desire to do good. Much as many idealistic southern Canadian women have gone north on the social front line to be missionaries, teachers, nurses and doctors, I think that the contemporary north has a particular attraction to the women in this group (myself included) as an arena in which to express their desire to help others who have been disadvantaged through interactions with Euro-American culture. The name "DEW Line *cleanup*" might be even more specific to this gendered pattern, in that women are often cast in the role of domestic caretaker in our culture, a role which includes cleaning up. If heroic science in the hostile north was done by individual male explorers, protectionist DEW Line cleanup science on arctic contaminated sites is implemented by a female-dominated science *group*.²⁷

None of this is to say that the current predominance of women in the scientific aspect of the project means that it is poor, dull, misguided women's work, and/or that we who do such work are being deliberately victimized by hegemonic institutions(s). Rather, I offer this discussion in order to try to explain and reflect upon what appears to be a rather remarkable concentration of women in science. I also don't believe (as I hope is apparent by now) that there is anything inherently wrong with domestic work and/or idealistic motivations, regardless if they are considered low-status or have consequences well beyond individual aspirations. Moreover, I would point out (much as Woodward (2000) does for women soldiers in the British Army), that the women who do get into such work, for whatever reasons, obtain substantial benefit from succeeding in a historically male-dominated occupation and location. We are able to obtain training, experience, material and social rewards by doing well in our remote science practice. Additionally, because there is in fact a critical mass of women in our group, we have at least a potential means of building our own confidence as women in science; certainly some of us come from academic and work backgrounds in which this critical mass was absent, and the female community can be both a pleasure and relief.²⁸

²⁷ Indeed, irrespective of individual employees' gender or sex, the entire group is sometimes feminized (i.e. marginalized). I once overheard a coworker, half in jest, actually say that "ESG was like the woman" when it came to inter-organizational politics between science and engineering groups.

²⁸ I would note that this feeling is not universal nor unambiguous. Some of us, myself included, have also experienced twinges of discomfort by finding ourselves amongst so many of our categorical peers. My own self-reflections on the source of this discomfort have come up with three possible (non-exclusive) explanations: (1) it is a new and strange experience to work among so many young women scientists, and requires slightly

The immediate consequences of this critical mass for the project, and its governing institutions, have been interesting. There have been some problems. These are a combination of the usual problems of women in male-dominated science/society, additional problems incurred by the remote locations and cross-cultural working groups, and perhaps also by the sheer novelty of the presence of so many women in Department of National Defence workplaces. The worst of these problems, in my assessment of the situation, has been the undermining of women in authority positions by older, male, southern co-workers. Least common is the outright rejection of a women leader's authority; this has happened, and in remote and often high-pressure field situations, can be disastrous not only for the woman but for the crew and work in general. Somewhat slightly less awful but present is the subtle questioning of women leaders' decisions; the difficulty in negotiating this is sometimes exacerbated by the culture gap between science and engineering in combination with the frequent age gap (women younger, man older) between technical leadership on field sites.

By culture gap, I am referring primarily to the more economic and instrumental rationality of engineering, versus the more empirical rationalism (and perhaps intellectual romanticism) of science. This difference can be further exaggerated by disciplinary ideologies; the worldviews of environmental biologists and geographers *tend* to be a little more overtly "green" than those of environmental chemists or geologists, and thus can rest a little further from those of (for example) petroleum engineers. As well, the administrative rationalism in which the DEW Line science partakes is also relevant; while the private-sector engineering culture appears to also be strongly governed by legal obligation, problem-solving and cost-benefit rationales, it is not highly enamoured with bureaucratic hierarchy and the inefficiency that accompanies it. Unlike DEW Line science, it appears that DEW Line engineering distances itself as much as possible from administrative politics; the engineering firms working on the cleanup are based in western or maritime Canada, have a variety of other private clients, and sometimes include pointed (and probably standard) disclaimers in reports noting their exemption from liability due to regulatory change, etc. (e.g., ESG 1995, p.II-34). Finally, engineering is one of those technical disciplines that is least populated by women; while this does not mean that individual male engineers are necessarily more sexist than other men, it does mean they are among those who are least accustomed to working with women.

The problems incurred by the age gap, on the other hand, can be more directly related to romanticism. Perhaps the most trivial, subtle and common example of the undermining of women's authority here is through outdated chivalry: men persistently and sometimes aggressively offering to do physical tasks for women such as digging test-pits, driving, or lifting heavy objects. Most women on the project neither need nor want help with such tasks, and/or will ask for it if they do. For many of us, it can be mildly annoying to extremely frustrating to constantly have to negotiate such apparent assumptions of physical incompetence in our jobs; some of the common consequences are insulting one's co-workers to getting a chip on one's shoulder about men's sexism/ women's defensiveness, to over-developing an ethic of toughness. Like engineers, men who have spent a long time working in the north are among those least accustomed to working with women. Yet the problem may also be explained as much by both groups expressing their own physical capabilities, as by both (unconsciously?) competing to live up to the fundamentals of arctic mythology. Romanticism is founded on a gendered dualism: the object of fear/adoration/pursuit/protection is typically female (or feminized), whether it be the land, truth, beauty, or an actual woman; the active subject who fears/adores/pursues/protects, on the other hand, is typically the heroic male. That is, the expression of romanticism requires a subordinate "other". In a culture (science, military, society as a whole) that requires that one be either feminine or masculine, and accepts female masculinity better than male femininity, we have a lot to win by trying to live up to a hero model – and a lot to lose by taking on a more passive role. So this can make the trivial decision of who gets to dig a test-pit a rather culturally loaded situation. While men may be trying to uphold their heroic status, women may be trying to earn it, but the legend says you can't both be the hero. Again, this conundrum pushes us to consider at least alternative romanticisms, and perhaps entire alternatives to romanticism.

The second major set of problems women have faced on the project has been sexual harassment, from both southern and northern men. This too can be extremely difficult to negotiate in the enclosed,

different social skills; (2) in some ways, it diminishes the special status we may have formerly had as a successful minority in male-dominated workplaces; and (3) we have vague internalized doubts about the quality of science conducted exclusively by young women, having been educated in a culture dominated by older men.

remote-location field team. I also sense, from various informal conversations, that it has been difficult to get on the agenda of a workplace dominated by empirical as well as administrative rationalism; how does one objectively “prove”, after all, that one is being harassed (particularly if the harassment has not been outright assaultive), let alone convince a supervisor thousands of kilometres away of a problem that is not easily resolvable by legal or economic mechanisms? The difficulty is, in this case, sometimes compounded by cross-cultural difference. One of the more common forms of harassment my co-workers discussed at the workshops was how to negotiate sexual advances and/or comments from Inuit men, who are (I have been told and read about) more sexually open than southerners.²⁹ Many of my co-workers have wrestled with the dilemma of whether or not, and how, to enforce southern behavioural expectations on Inuit men, not just because the continued safe and legal operation of the project often depends on them in their capacity as bear monitors, and not just because we don’t always speak the same language, but also because it seems somehow culturally inappropriate. Aren’t we supposed to be helping “these people”, rather than disciplining them for being “themselves”? Suddenly the social disadvantage of being a woman in science is in tension with the social power of being white in the north, and the history that goes along with that. Moreover, aren’t the Inuit “right” in being less sexually repressed than us politically correct, uptight southerners? This may or may not be a romantic legacy too (i.e., the eroticization of the native Other, as opposed to the intellectualization of the over-civilized Euro-American); but still, it is a real perception among us, and brings up our cross-cultural ignorance, inexperience, guilt, and (as Brody describes it) our “urgent desire to please” due to our anxiety about being a race/class representative (1975/1991, p.90). The typical brevity of our relationships with Inuit people on site may actually intensify such anxiety; there simply isn’t enough time to share our individualities instead of representing our category.

The efforts to address such difficulties have been notable, and somewhat contrary to the stereotypical expectation of science, let alone the military. We have had two sessions of management presenting new “zero-tolerance” anti-harassment policies. In a somewhat familiar vein, they offer a punitive, hierarchically governed, policy solution to the problem, which does not really address the thorny issues of long-distance, cross-cultural implementation that I have raised above. Still, the policies represent a strong response from within available mainstream administrative practice to the consequential realities the project faces with both men and women working on the project. More unusually, the project administration in Ottawa has supported two gender-issue workshops; within the first six months on the job, I attended two separate workshops facilitated by consultants hired by the project. One workshop was internal and for women only, and the second attended by southern defense administration and civilian engineering groups contracted on the project. Both were aimed at identifying, discussing and ameliorating some of the difficulties that women on the project have run into. What I find particularly remarkable is that the problems have not, in my observation of the current internal situation, blamed on the presence of “too many women”, or on the women themselves. (This would be difficult given the obvious competence of many of the women on the project; however, dismissing the problem and/or blaming the victim are not uncommon responses to difficulties women experience in male-dominated institutions). Rather, there has been an organizational effort to address the attitudes and behaviours of (some of) the men on the project.

The presence as well as the administrative response to the women in DEW Line cleanup science have given me some hope that there is an opening onto a more radical kind of feminism within the project,

²⁹ Workplace conversations and one cultural awareness seminar I attended (led by a white, southern, male professor) reflected the perception that the Inuit, as a group, are more open about sexual jokes and behaviour than southern whites. I personally know little about sexual politics among the Inuit, and have not had any interactions with Inuit men that were more sexually explicit than those I have with white and/or southern men in similar (i.e. field work) situations. In fact, because of language and workplace barriers, I had relatively few interactions with Inuit people with sexual overtones, while sex (and gender) was a fairly common topic of conversation among white coworkers. Although I would not discredit the experiences of people with longer and more intimate knowledge of Inuit people, my sense is that the generalization about Inuit sexual openness might be a reflection of white anxiety about sex confounded with white anxiety about working and living with Inuit, as much as a reliable statement about Inuit cultural and/or sexual norms.

which attempts to alter the institutional arrangements rather than simply expecting the “outsider” to operate (often marginally and uncomfortably) within existing systems. Returning briefly to the history of women in science, one of the most pressing concerns for feminists has long been to just get women equal access to education and employment, based on the argument that women, as a group, could be “just as good” (i.e., the same) as men in science. Of course this is generally true, but when implemented, it maintains a masculine measuring stick that was developed under particular historical and material conditions. One of the more obvious difficulties of this has come about with the double career that many women now undertake; while women have evidently become “just as good” in science and other public work, they are still often expected to do most of the private domestic work, to which men have not been counter-assimilated. In this sense, the full expression of liberal feminism (equal representation of women in existing positions of political, economic, and social leadership) may have the effect of being only workable for middle and upper class women; that is, the system that maintained male privilege over women can only be extended by the continued (or increased) subordination of other groups to support privileged women. So, should women become scientists in the same way as men have been scientists in the past, then we will require as a society another group of people to take care of necessary, low-status domestic responsibilities like child-care, food work, cleaning, etc.³⁰ This problem necessitates a consideration of the wider problem of science as not merely a male dominated practice, but a practice that intersects with wider power dynamics.

At this point, I would like to turn my focus from the presence of women in the science on the DEW Line cleanup to the absence of Inuit in the same. In terms of linking the politics of gender, class and race, this is a simplified discussion; it does not include an analysis of the differences between Inuit and Inuvialuit participation in the project or gender relations among the Inuit (about which I know little), nor of the complexities of race and class relations among southerners (white and non-white). Despite their relevance to a discussion of the internal dynamics of the project, I am not able to do all of these topics justice in this essay because of a lack of available literature as well as space. I have chosen to focus below on Inuit-white relationships primarily as there is substantial written work on these (mostly by white southerners); however I have in places throughout this paper tried to indicate the intersections of other power relationships.

To my knowledge, there have never been and there are no Inuit scientists on the DEW Line cleanup. This is not unusual in a general sense. As it is masculine, so the history of western science is white – but perhaps even more so. Harding’s overview of European colonial science relationships with the indigenous peoples of the world suggests that the only “appropriate role” for people of colour in western science was as native guide, providing local information and technologies which were then appropriated as universal western scientific knowledge (Harding 2000); DeLoria has given an even more critical appraisal of western science’s interactions with indigenous knowledge in a book called *Red Earth, White Lies* (ch.2, 1995). I have myself encountered very few people of colour in biology and/or environmental science (even fewer than in other disciplines of science); and although I have not read as widely in this field as the history of women in science, I have also found little information on people of colour in science, especially indigenous peoples. Contemporary data reflect a level of non-white participation in western science that is below women’s overall participation; Silverman notes that of the science PhDs in the American labour force in 1993, “11% were Asians, 2% were blacks, 2% were Hispanics, and less than 1% were native

³⁰ Applying this particular example to the DEW-Line cleanup, I would note that I know of exactly one woman currently employed in a field capacity who has children, including women at ESG as well as those few at other engineering firms. Additionally, most women on the project do not have long-term partners. This may reflect the young age of many of us who do such extended field work for the group, as well as constraints placed by the work itself. However, most of the men working in technical capacities for collaborating companies are both older and have wives and children. The specific difficulty of balancing remote site field work with domestic relationships for women scientists is documented by Burns (2001) in her ethnographic study of women in Antarctic science. Grant et al. (2001) also offer a good discussion of the career/marriage/parenthood puzzle for women scientists in general.

Americans” (in contrast to 20% women) (in Lederman and Bartsch (2001), p.39). Thus it is not difficult to believe the explanation within the project that the lack of Inuit technical staff on the project is due to a lack of people with sufficient and suitable educational background to do the work.

This explanation usually signifies the end of the discussion. Here, though, I would like to pursue the obvious once again, asking why exactly is it that there are so few people with this background? If many Inuit have been educated in (mostly English) Canadian systems for several generations now; if the DEW Line cleanup takes place in a large area of Canada that is populated with over 80% Inuit; and if the DEW Line sites are quite literally in the backyards of most Inuit communities, then the lack of Inuit people in scientific capacities on the DEW Line cleanup seems a little more glaring than the “usual” predominance of white people populating science projects in other parts of the world. Moreover, at least according to some observers, the Inuit are quite interested in doing northern science. Hobson, following a conference panel on arctic science in Alaska, concluded:

They want to take part in our research design. They want to set the agenda. These are the words that have been used. They want to be involved from start to the end. They should be consulted even in data-interpretation and surveys... That’s what they want, and that is it what you and I [as arctic scientists] must be prepared to face. But behind that, they want to encourage their young people to get into science, they want to develop managers, to become involved (1990, p.18).

Anecdotal accounts of curious village kids wanting to help in some of our field labs support a portrayal of local interest in our scientific work. I would also like to note here that, in my opinion, much of the (low-status) scientific field work such as soil sampling does not require graduate-level, or even undergraduate level education in science, but only a willingness and ability to learn a specific sampling technique. From a purely economic point of view, the cost of hiring and training scientifically inexperienced local labour, with their own housing and food, to do such jobs could well be less than the cost of transporting, feeding and housing more scientifically experienced southern labour.

Still: we have no Inuit scientists, technicians, or even students on the DEW Line cleanup. Does the absence of Inuit have anything to do with the specific type of managerial, northern and sovereignty science that I have argued exists on the cleanup? Here I will draw on my analysis above – specifically, the patterns of women’s participation in various tasks, disciplines and locations of science – to make some parallel arguments for the Inuit absence.

I will begin by looking at where Inuit *are* found in the cleanup. The project has made some effort to incorporate local Inuit public opinion on the cleanup process (such as in the public consultations I discussed in the first section of this essay; these are ongoing). In the economic agreements on the cleanup between the territorial governments and the DND, there is a minimum Inuit content employment clause. Inuit have thus been employed as labourers: the men as bear monitors, construction workers, and machine operators, and, in much smaller numbers, the women as cooks. In the environmental agreements, there has been slightly more inroads of Inuit into knowledge work, including site visits by Inuit elders accompanied by territorial government representatives (often, but not always, consulting southern engineers). The information gathered in these visits is incorporated, as I understand the process, into the generic evaluation matrices I discussed earlier, which are then reviewed by the joint north-south technical group known as the Environmental Working Group. While the decisions reached by this technical group are reviewed one more time by an upper management group which includes northern politicians, there are, to my knowledge, no Inuit people who actually sit on the technical review group. Thus, Inuit appear to have achieved some economic benefit and political oversight of the DEW Line cleanup but little control of knowledge production at its source, and thus little control of the *terms* in which decisions are made.

Drawing the parallel to women in science, then, the Inuit have entered the DEW Line cleanup in what could be called “appropriate roles”: the actual jobs they are assigned are indeed routine and generally low-status, and what knowledge the Inuit contribute enters through the ministrations of a hierarchical managerial science controlled mainly by southerners. This knowledge is deemed “traditional” or “local concerns” (not original, empirical truths). Such labelling does not, incidentally, automatically denigrate such knowledge – the idea of traditional knowledge is quite respected in a general sense on the project – but it does render it quite marginal to the everyday work.

This pattern of marginalization, considering my previous analysis of the gendering of scientific *disciplines*, may appear somewhat surprising. One might think that environmental science, more so than many other areas of western science, would be relatively accessible to the Inuit. Like women, the Inuit have

been long characterized in western thought as having a special connection with nature. The following is an excerpt from the 2001 ESG Field Manual called “Communications With Northerners”:

The Inuit are a fascinating people with a rich culture who have survived in the Arctic for thousands of years....The Inuit live in very close contact with the earth and regard nature much more highly than Westerners so it is important to be respectful of nature on site...If we act with understanding while we are in these people’s backyards, we can work well and learn together as friends (2001, p.6).

Such a depiction partakes of evidently romantic themes: despite our soil sampling, the Inuit live in closer contact with the earth than us westerners, and it is important to respect nature not because it is worthy of respect in and of itself, but because the Inuit do. (This is not a bad reason, but it locates nature “up there” and respect for nature in “these people”, a belief that we should politely acknowledge, but not one available in our own culture.) Still, the Inuit are evidently portrayed here as people with a source of unique environmental knowledge.

Why, though, have the environmental sciences become accessible to white southern women, and not the Inuit, if both groups are affiliated with nature? I would suspect it is not only because Inuit people don’t yet qualify by southern educational standards, but precisely because their very close, intimate, *personal* affiliation with and regard for nature (note: not environment) further disqualifies their existing environmental knowledge from being considered “serious” science. Women have had a little longer to prove their objective capabilities. More pragmatically, this special regard for nature might necessitate change in the way the science is done. The ESG document does not say this explicitly, but there have been disagreement between southern scientists and Inuit people over sampling strategies; Lopez (1986) notes persistent Inuit unease with the validity of Western biologists’ short-term wildlife observations, and several Inuit in a 1997 study of Hudson Bay bioregional knowledge express objections to the way southern scientists handle animals as well with the inapplicability of government land management regulations.³¹ If based in quite a different ethic than southern animal rights activism (i.e., an ethic of regard for nature that readily accommodates killing parts of it), such objections could still be quite problematic for western environmental-science-as-usual. And of course, even if stone-cold objective, Inuit relationships not just with nature but with their backyards might pose some special challenges. For example, people who live and often hunt in the vicinity of radar stations, with their personal vulnerability to environmental impacts of its land-use, may be a little more interested in food and health studies than we have been so far, with all the logistical and political difficulties that go along with those.

This brings me to the locations of practice. Recall that I explained the presence of women in DEW

³¹ “Scientists and wildlife managers don’t realize the damage they do to the animals or birds they try to study. They don’t realize that they are mistreating the environment when their study or policy interferes with the life of a bird or animal” (Jimmy Rupert, Chisasibi). “They have different excuses for why they study the animals, but it comes down to only one reason – money. With our knowledge, we can identify whether an animal is sick or not but they want to make money from learning about our animals...As Inuit, we are totally different from the white man and don’t see the animals as money. We see them as food. We kill an animal to eat it, and have good reasons for why we don’t like to eat what has been put to sleep. This is our way of life. We grow up with the animals here in the north, so we would appreciate it if they wouldn’t do that.” (Peter Alogut, Coral Harbour). “The government took over our animals, and started making laws according to the knowledge of scientists and wildlife officers. They make laws without listening to us even though we have our own traditional knowledge of the environment and wildlife. It’s not surprising we’re never satisfied with the laws they make because we already have our own knowledge of the animals. There are so many pages that we have to follow according to the government laws.” (Lucassie Arragutainaq, Sanikiluaq) (all cited in McDonald et al. (1997) p. 58-9)

Line cleanup science as the development of a progressively accessible (and domesticated) arctic. The north, of course, has always been “accessible” to the Inuit, or at least, for a lot longer than to white women. Certainly there have been more Inuit than women on the DEW Line sites³²; Inuit men have been employed throughout their 50 year history in mostly “outside” jobs (McMahon 1988, p.40), similar to the labourer positions currently available to them on the cleanup. But, despite the fact that the north is populated mostly by Inuit people, western cultural history does not usually portray it as Inuit land: as I noted earlier from the early DEW Line literature, the arctic was empty, and fully open to construction of the DEW Line without consultation with local people, despite the fact that USAF had just constructed tactical targets in their backyards at regular 80 km. intervals. Although this attitude has not meant the total exclusion of Inuit from DEW Line sites, it has carried through in the domination of the Inuit use of site property through southern landuse rules.³³ The southern perception of the north as empty has evidently changed over time, but I wonder, for example, (without really knowing) if contemporary Inuit scientists would buy into either the “malevolent/sublime” or particularly the “sensitive” metaphors that western science now rely on in describing the north; it is possible that the latter, at least, is a construction of northern nature produced by and peculiar to recent, localized, seasonal, southern, romantic, military and male interactions with the arctic.³⁴ Although I have no specific suggestions as to how Inuit scientists would construct the contaminated military sites differently, several southern commentators have summarized a key difference between northern and southern land ethics as one of respect for nature (as implied by the ESG Field Manual quote), rather than responsibility for the environment (McMahon (1988), p.40).

Moreover, McMahon (1988) reports that Inuit attitudes about north-south politics are quite clear: while white-Inuit relations *are* problematic, sovereignty is hardly an issue. The Inuit, McMahon asserts, are perfectly happy to be Canadians, and are also quite clear that the north is their land. There is no contradiction.³⁵ If this is a reliable generalization, it raises the question: does environmental science and a cleanup look different when you have a long-term, local, unquestionable and possibly guilt-free cultural relationship with the area in which you conduct this work? Even lacking that, I know that my scientific interests would shift if I were doing research or remediation in Kingston or Toronto. And while naturally I can’t speak for Inuit scientists I haven’t even met yet, I have suggested above some ways in which local questions might be different, and I can also imagine that northerner’s desire “to do good” would be less romantically colonial than mine. If there might be other romantic attractions, I think it might be a little more difficult to recruit them based on underlying desires for the glamour one might gain from working selflessly in such a remote, novel destination.

Inuit presence in the cleanup science, though, might interfere with our romantic (and sovereigntist) protectionism more than just at the level of metaphors, ethics, and secret desires: how comfortable would it be to have Inuit and white scientists and engineers haggling over remedial recommendations in our internal technical reviews? Although time and interpersonal experience might heal most wounds, I can imagine that

³² McMahon notes, however, that Inuit women and children were excluded from the DEW Line site mess, at least in the early years of operation (1988, p.34).

³³ The fall of 2001 has seen the beginning of the first joint venture between a southern and northern contractor in the operation of the NWS sites (see www.pail.com). The joint venture goes by the name “Nasittuq”, or “to see from a high place”.

³⁴ While I have read relatively little polar scientific literature outside of DEW Line work, Hobson and Christie both noted in 1990 that much arctic science (historical and contemporary) has been conducted directly or indirectly through the military; the 1993 ESG report, with its claim to generating the largest database on contaminants in arctic soils, plants and the marine food chain, testifies to this generalization. More recently (summer 2002), the Environment Canada weather station at Eureka on Ellesmere Island was closed down due to lack of funds, although DND environmental science projects like the DEW Line cleanup are not under-funded.

³⁵ I suspect, upon self-reflection, that the reason this initially seems contradictory to a (white) southerner is that we tend to unconsciously assume, perhaps especially in a northern context, that Canadian = white.

at least the initial level of anxiety would escalate significantly if there was cross-cultural representation of both the “colonizer” and the “victim” at the conference room table. We (as white, southern scientists and engineers) are not accustomed to working in a shared technical capacity with Inuit people. Would we be outright hostile, inadvertently dismissive, or (perhaps more likely in this context) fall silent in discomfort, hoping that the Inuit representative might, by some process of cultural osmosis, have all the right answers to our environmental and cultural dilemmas?³⁶

However, the most crucial issue here may not be unknown differences in specific white-Inuit scientific interactions, but known differences in general white-Inuit political agendas. Although the DEW Line cleanup protocol has been accepted by the territorial governments through extensive negotiations, it is evidently a north-south compromise. One of the more revealing internal documents that illustrates this is a DND press release on the 1998 Environmental Co-operation Agreement between Nunavut and DND (www.dnd.ca/eng/archive/1998/aug98/nanavut_n_e.htm). The following is an excerpt:

“The agreement between the people of Nunavut and DND is an important step forward in restoring conditions in and around these former radar sites,” said Defence Minister Eggleton. “We acknowledge our responsibility to correct this environmental condition across the North, and look forward to working with Inuit across the territory of Nunavut to complete this cleanup for the benefit of present and future generations.”

“Inuit across Nunavut are pleased that the DND has today declared its intention to clean up this problem on our land,” said Mr. James Eetoolook [premier of Nunavut]. “This agreement is a big step towards solving a problem that has lingered across the North, and it has taken a long time to get this far, and there is still a long way to go. We appreciate DND’s move to make appropriate financial and other commitments to clean up these old radar sites. We hope that the agreement signed here today will be carried out in a spirit of partnership, and that it will be a productive experience for Inuit across Nunavut.”

The Defense Minister is, with suitable importance, stepping *forward* to work with the Inuit (an apparently novel situation) and correct a condition for which we have *responsibility*, while (once again) singing the refrain of sustainable development (“for the benefit of present and future generations”). The Nunavut leader, in much more cautious tones, mentions the problematic past and the uncertain future, carefully notes the agreement marks the *intention* of DND to clean up on *our* land (the Nunavut political refrain), and expresses *hope* for a productive experience. Both of these are positive statements endorsing the process, but they are made in totally different terms. The powerful, progressive language of administrative rationalism is contrasted with a more tentative, historically grounded language of partnership and experience. I think it particularly significant, though, that while Eggleton speaks of *completing* the cleanup, Eetoolook notes there is *a long way to go*. Where, the press release doesn’t tell us. But it is such political difference, perhaps as much as other reasons, that I think have thus far prevented Inuit from gaining increased internal, everyday, epistemic control over the DEW Line cleanup. It is somehow hard to imagine the DND administration undertaking aggressive recruitment of in-house technical expertise among a group of people whose most powerful political representative has implied some form of dissatisfaction with the proffered status quo.

Given this, Christie’s comment about northern science is unsurprising: “The alternatives of integration with existing communities, or of training northerners, with their different work ethics and social values, are continually being considered. So far, little has been achieved.” (1990, p.30). Is it a desirable goal to continue aiming for increased “integration”, or does such a desire also reflect a colonial mentality? Perhaps both. I have little doubt that some Inuit know things about the radar sites and their environmental impacts that we will never discover using the existing investigative process. I say this despite good, early empirical research on selected sites, and despite the project’s attempts to incorporate traditional knowledge. Since those first studies, locally specific ecological (and political) conditions have necessitated serious changes to the cleanup; as well, some of the necessary knowledge might not just be traditional but also

³⁶ I am much indebted here to anti-racism and environmental justice discussions with several FES students, including those on the FES Anti-Racism Committee, Pablo Bose, and Andil Gosine.

daily, and untranslatable into English, let alone numbers and generic evaluation matrices. I also believe that it simply makes sense that – objective or not – those who are impacted by pollution should have control over the process by which that impact is measured and mitigated. Undoubtedly, Inuit will continue to advocate for themselves as they see fit. My opinion, however, is that getting a minimum Inuit content in science-as-usual does not seem desirable as a goal in itself. Changing our science to more deeply incorporate and accommodate local, traditional, and contemporary Inuit environmental knowledge, and Inuit people, up to and including doing science in Inuktitut, does.³⁷

To conclude, I would like to briefly consider a few of the issues generated from my discussion of the experiences of women in environmental science on the DEW Line cleanup. First of all, should we and/or the Inuit pursue increased participation of Inuit people in the project's science, this will likely bring material and social advantages to Inuit practitioners through affiliation with a socially powerful occupation and knowledge system. There would also likely be problems for Inuit scientists with racism, as there have been problems for women scientists with sexism. I would anticipate that this would eventually entail institutional responses such as anti-racist policies, but it would also necessitate internal cultural change. Finally, if there is truth to generalizations about Inuit occupational preferences (for example their commitment to family above work (ESG 2001, p.6)), then it would necessitate structural change in the way the work is done. The male, middle/upper class, white measuring stick that tends to dominate science practice would work just as poorly for the Inuit (and perhaps more so, and in different ways) as it does for some women scientists.

The case of women in science on the DEW Line cleanup illustrates that demographic change is possible in historically male-dominated institutions. To the extent that this case can illustrate something about Inuit participation on the DEW Line cleanup so far, it suggests that Inuit have achieved participation in the project by adapting themselves to and compromising with southern systems of knowledge production and social power. But because white southern women are culturally much closer to managerial, northern, sovereignty, and feminist science at this juncture, Inuit remain far more marginal as a group than we do in the cleanup science. Still, the comparison suggests that there are avenues for change: there is the fact that western, military-sponsored, arctic environmental science now not only welcomes women but sometimes tries to change itself to accommodate them. If the historical and political context is evidently quite different for the Inuit, there are also some small hints within the project discourse of a willingness to change. Returning to the ESG 2001 Field Manual discussion of "communication with northerners", the section concludes with the following instructions:

If you are approached with questions from northerners, be honest about what you are doing and why, but be careful about how you explain things. Questions should be directed to team leaders. Encourage people to express their concerns about the areas that you are working in and, *if possible, include these concerns in your sampling strategy*. Record the details of all encounters with the public and inform home base accordingly [emphasis added] (2001, p.6).

Between the paternalistic instructions and their overt attempt at social control, there is that hint of flexibility: "if possible, include these concerns in your sampling strategy". That is, an alternative approach could be generated through contact with the people who live where we are practicing science. Vague and tentative as it is, this is a postcolonial sensibility. With the many paradoxes of a feminist politics of inclusion for science on the DEW Line, that is, the obvious difficulties of integrating "others" into a strongly white, masculine rationalist, romantic and militaristic science, these tiny openings begin to seem very important. The question that the above discussion raises is whether or not the actual science we do and how we do it will also change, rather than just its demographics. For both empirical and ethical reasons I have argued that it should, but I don't yet know if it will.

³⁷ More specifically, Inuktitut in the eastern and parts of the central arctic, Inuinaktun in the central western arctic, and Inuvialuktun in the western arctic.

V

FINALE

*in which
our investigator recapitulates
the purpose & extemporizes
on future research directions*

aug 04 2001

Science on the DEW Line cleanup is, as I have presented it above, managerial as much as empirical, romantic as much as rational, nationalist, feminist and perhaps even postcolonial. These discourses are not always logically (or emotionally) compatible, but they do exist together. Before returning to the broad theoretical issues of the politics of representation that frame this case study, I would like to reflect fairly briefly on where science on DEW Line cleanup might go.

diesel

the seal surfaces, sniffs, coughs
came when called in a sing-song voice
the only black head in pewter new blue

this colour, texture, mercurial but clear
clear as bones to the gravelly sand
cold salty clarity true to the touch

after seconds of wet my fingers half-know reality
not just the surface
of pale arctic dreams

In view of my discussion of administrative rationalism and managerial science, I would suggest that continued loyalty to empiricism is perhaps one of the most immediately available means of improving the project. Empirical rationality, relative to economic and/or administrative, is uniquely positioned to prioritise environmental (and ecological) realities. Since these realities are those over which we have least control, they should be the ones we accommodate the most. However, empirical rationalism has been, and will likely continue to be, pitted against anthropocentric legal systems and short-term economic considerations. With respect to the latter, though, I think it key that we are clear that there is a difference between prioritising cost-savings or profit for their own sake, to finding ways of spending available funds in the most eco-logical (i.e., practical) way. I think we also might do well to remember our funding context. Because I have never worked in anything close to such a rich project, I personally have been easily impressed by the deep, generous pockets of DND. Nonetheless, the DEW Line cleanup represents a very small part of available departmental funds; furthermore, considering the amount of money the DND spends in creating environmental destruction in Canada and around the world through training and other military activities, it is a pittance.

dust

the seal breaks the surface, black, looks at me, swings towards,
submerges ripples

the seal breaks the surface, wet, looks at me, swims away, submerges
ripples

the seal breaks the surface, black wet head, looks back at me, swings
away, submerges, ripples

i stand between cold-shattered sun-generous sea-wet stones
listening to the chorus of ordinary magic

One of the recommendations that I think it possible to make, from our position as “environmental advisory” to the DND, is a reconstruction of the notion of security to prioritise social (human plus environmental, or ecological) security rather than economic, legal, or strategic security. The means of implementing an ecological militarism would be through capitalizing on existing elements of military idealism, especially the values of honesty, freedom, justice, and the maintenance of the beauty, integrity

and continuing existence of one's home(s). At the least, I believe this project would necessitate ongoing implementation of technoliberal military environmentalism (as in the sustainable development strategy) to the letter, and the development and inculcation of a more egalitarian, ecocentric and less punitive spirit of environmental awareness than seen in the existing Environmental Responsibility document. This new environmentalism could easily partake of some kind of romanticism, albeit one relying on respect as much as responsibility. At the most, ecological militarism would require divorcing the Canadian military from multinational agreements with belligerent nation-states such as the U.S.; separating public and/or environmental defense from the military-industrial complex; and perhaps finally, relegating a foundational attachment to the ideal of "security" (what about trust?). The senselessness of strategic nationalist postures in a world with nuclear weaponry, globalized economies, and massive international migration must surely contribute to the need for some reassessment of conventional military priorities; as I have argued, there is evidence (including the DEW Line cleanup) that such a reassessment is happening.

blood

up now across tundra towards grave, and turn away from mosquito, from faint breeze fluttering
forehead, from making involuntary gestures of death

to a moon flattened full flesh pink in white purple, blotted purple, deep soft cloud purple, rising fast,
thinning, rounding, paling, a pink rippling stain bleeding across black

i remember draining knowledge with the moon today
about life measured short but still fluttering to the point

but i get there and feel nothing still
magnetic misalignment, silver tanks spilling my spiritual stratigraphy

Despite, however, my valuation of empiricism as a useful tool within the current discursive terrain of the cleanup (including its militarism), I do not view empirical rationality – in a traditional, objectivist, value-neutral sense – as either the only or the best way to produce reliable knowledge. The empiricism that I would recommend for the project would include tactile knowledge gained from working the land in a variety of capacities, knowledge that gets beyond hostile, romantic as well as colonial concepts of the arctic, and a methodology that remains open to internal sensation and non-rational experience. (A better word for such empiricism may be phenomenology, or an open approach to the thing-in-itself which respects the inaccessibility of total knowledge – another paper, perhaps.) Knowledge gained by such an approach may be untranslatable to numbers or words, let alone the English-language technical discourse that dominates our current representations on the project. Evidently, such an approach will need to continue to find ways of learning from non-western and/or non-elite environmental knowledges. I would expect that the success of this ongoing process will require not just respect of a generalized Inuit difference, nor even the incorporation of more indigenous peoples into science practice, but an active process of changing our science practices from within.

diesel

abruptly at the leeseid (which is as far as i've ever got)
i think a flash of movement and am quickly afraid
but touch the grey portal and then i'm going in

the entrance a white cloth, rusty stains
cautious across wreckage rot everywhere moss
and a rock too heavy to have blown or drifted in

later, slow, realize where it would have been
under that wide circular moon hole right over my head

This brings me to my last point of reference for my kind of environmental science. The kind of empiricism that I would recommend would need to get over the human/nature dualism. (Tall order, I know). This would mean that we (as inheritors and transmitters of western science and culture) need to get over the displacement of nature to elsewhere, and respect for nature as something they have there but we can't have here. Again, it seems empirically evident to me that "we too are nature", as are the places in which we make a living, both north and south. I have occasionally wondered, in a raw calculus of human numbers, how much environmental good \$500 million would do if invested in addressing soil and water contamination in Toronto (one of my homes). I have also wondered, in a more serious way, how much long-term good \$500 million would do for a variety of organisms if invested in *preventative*, rather than remedial, environmental work: awareness raising, but also careful, slow study of potential impacts of, and alternatives to, continued development of land, industrial chemicals, and military technologies of surveillance and mass destruction. If there is a moral in the DEW Line fable, it is that mitigating the environmental echo of the arms race is an incredibly long, slow, complicated and expensive process – a process that, with institutional and cultural change, is preventable.

dust

so there i stand, listen, close my eyes three times

feel, stand, close, listen, and breath

fear

breathe, feel stand, close, listen and
fear

stand, feel, listen close
fear breathes open

Discourses shift over time, in conversation with historical and material circumstances. There are some indications that a shift towards more militaristic public rhetoric is occurring again, if listening to national radio since September 11, 2001 is any indication. In such a discursive environment, the cleanup might be clever (in the short term) to unearth the strategic and patriotic value of its work in Canada's north, in contrast to its cost-efficiency and managerial compliance. But alternative shifts are possible. If the current North American militaristic climate de-escalates, or if the American empire takes a fall, or lastly, if the military and/or federal environmentalism takes a peaceful, long-term, and ecocentric *institutional* view, then the DEW Line cleanup might benefit far more by further opening and deepening of its existing commitments to environmentalist and feminist projects.

diesel

outside fear stops, leaving thought salty clear
the place should be burned, to the ground and below
sharp, hard thoughts

why? is it my fear, fear of me, this blind experiment?

How? I would suggest that the Environmental Sciences Group is an interesting place to start. Shuttlng almost weekly this winter between ESG on the Royal Military Campus and the Faculty of Environmental Studies at York University, it has often occurred to me that RMC has almost everything that a certain kind of environmental activist (an educator for social change, for example) could want, but usually doesn't have: beautiful and extensive land-access; national and international connections; excellent public funding, a history of broad, non-elite public support; a systematic and thorough approach to education (complete with intellectual, physical, technical, linguistic and interpersonal training); foundational ethics of public and/or community service; and provision of material and social support during and after schooling. In short, it has occurred to me that civilian, liberal environmentalist, liberal feminist ESG is uniquely positioned at the margins of a powerful institution.

dust

saw imagined? not a real seeing, but an unexplained thought

a person stowing away in the corner, shipwrecked briefly, needing shelter, in that corner, a little one,
desperate, wizened, survivor smart, dark eyes peering sharply
out above wraps

I would like to return to the more general question I raised at the beginning of this paper: is it science? Again, I can't answer this question with any finality. But this paper does relate experiential evidence to theory through a coherent, communally generated methodology; it does attempt to represent this process of knowledge production in a way consistent with that methodology. However, I don't actually think this was all that Haraway had in mind when she was defining science as "better accounts of the world". Haraway has also called these "situated knowledges". These are not universal knowledges. Nor are they scientist's knowledge, women's knowledge, indigenous people's knowledge... they are not knowledges granted by simply being a part of a particular identity group. Rather, situated knowledges are, in one of Haraway's articulations:

highly specific visual possibilities, each with a wonderfully detailed, active, partial way of organizing worlds. All these pictures of the world should not be allegories of infinite mobility and interchangeability, but of elaborate specificity and difference and the loving care people might take to learn how to see faithfully from another's point of view... Understanding how these visual systems work, technically, socially, and psychically, ought to be a way of embodying feminist objectivity. (1991, p.190)

Haraway continues,

So, with many other feminists, I want to argue for a doctrine and practice of objectivity that privileges contestation, deconstructions, passionate construction, webbed connections, and hope for transformation of systems of knowledge and ways of seeing.... [T]his close touch of the fantastic element of hope for transformative knowledge and the severe check and stimulus of sustained critical enquiry are jointly the ground of any believable claim to objectivity or rationalism not riddled with breath-taking denials and repressions. It is even possible to read the record of scientific revolution in terms of this feminist doctrine of rationality and objectivity. Science has been utopian and visionary from the start; that is one reason we 'need' it. (1991, p.191-2)

Science, then, is not just about being more empirically accurate: it also is about being loving, faithful, passionate, hopeful, and utopian.

blood

the maps show a coastline of small points, this one called gladman
the only change is one window that lets in the song of the ocean
and the gull does not attack me on the way home

I confess that I have visions of ESG as a seed-bed for a radical feminist environmentalist change. What would it take? In my mind, this would (among other things) require building on the elements of rigorous material practice and visionary idealism that already exist among us, but in the context of a discursive overhaul. This idea sometimes seems quite outlandish – even deluded. After all, we work at the behest of an institution that is very hierarchical, very new to environmentalism, very male-dominated, very white, and very determined in its interests, goals, and representations. But once again, I would refer to the model of the Shuttered Box. Knowledge can move through this box without the conscious intention or control of its producers; nothing terribly sneaky is required for information to be strategically absorbed. Even a chain of command has links. As Haraway points out in her reclamation of vision, we simply can't

see everything, even with our admittedly wonderful binocular view. At the moment, I have no idea how we, as civilian environmental scientists, mostly white and middle-class, mostly young, mostly women, working at the fringe of a military campus in Kingston and getting contracted to dig dirt in the arctic for a few weeks a year, might instigate such radical change.

diesel dust blood

However, I do know that we exist. I also know that, at long last, I have managed to write a paper that is both inside and outside of science on the DEW Line cleanup, as well as both inside and outside of feminist environmental theory at the Faculty of Environmental Studies. So, scientifically, truthfully, successfully, or not, my position can be represented. Does it help us? Does it contribute to our field? I won't answer these questions alone. But

calling the arctic trinity, we may yet dream black out of quicksilver

VI

CURTAIN CALL

*in which
the graduate student bows
to the support staff*

Voices, in order of first appearance

Heather Ducharme

Howard LaFay

Environmental Sciences Group

Mark Solovey

Lynden T. (Bucky) Harris

Kevin McMahon

Heather Myers and Don Munton

Barry Lopez

The Canadian Government, quoted by Hugh Brody

Anonymous

Charles C. Flynn

Carl Mydans, for *Life Magazine*

Federation of American Scientists

Major Dominique Guay

Miriam Lowi and Brian Shaw

Department of National Defence - Director General of the Environment

Rachel Woodward

Western Hudson Bay Cree, quoted by Miriam McDonald, Lucassie Arragutainaq & Zack Novalinga

B. Vitale

David K. van Keuren

G. Hobson

Iram Khan

Gro Harlem Brundtland, quoted by Arturo Escobar

heather ducharme

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