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Signs of Danger/Dangerous Signs: Responding to Nuclear Threat

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Every catastrophy bursts the abscess of collective responsibility. Our systems secrets such a charge of floating responsibility that it condenses from time to time like static electricity in lightning, with accidents or catastrophes providing the spark. To all the layers which tower above us (ozone, carbon dioxide, etc.) we have to add this heap of responsibility, this radioactive dust cloud just waiting for the slightest opportunity to burst. All this guilt is, in fact, merely the concentric wave from the effect of *jouissance*, which catastrophy *naturally* arouses in us. What a liberation it would be for the human mind to recognize this *jouissance* as natural and catastrophes themselves as natural, i.e., spontaneous, without the intervention of artifice or anyone's will (and certainly not the will of God!).

Jean Baudrillard — *Cool Memories II*

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ABSTRACT

THIS doctoral thesis ("Signs of Danger / Dangerous Signs: Responding to Nuclear Threat") is a poststructural, interdisciplinary exploration of the social, political and cultural workings of nuclear threat. Drawing extensively on a nuclear waste burial initiative being undertaken by the United States Department of Energy, this work is a detailed critical analysis of the relationships between the threats posed by nuclear wastes, and the responses provoked in relation to such threats.

Working through such theorists as Jacques Lacan and Slavoj Žižek (the second death, and le Réel), François Ewald (thresholds), Ulrich Beck (risk society), and Félix Guattari (ecology of the virtual), this work demonstrates the manner in which ecological threats, such as that posed by the nuclear, are (paradoxically) "creative" forces; that is, they have a propensity to cut through traditional social divisions (e.g., class, race), assembling news lines of affinity, and new constituencies of *those at risk*. Indeed, it seems that nuclear threat constitutes a novel form of threat. A form of threat that is irreducibly material, yet admits of no objective ground upon which decisions may be made. A form of threat that threatens the very biological foundations of life, yet whose ontology is to be determined through social and cultural responses.

The principle critical figure I use to analyse and illustrate the movement of threat is the vast monument/sign which is to be constructed above the

Waste Isolation Pilot Plant (WIPP) in the desert near Carlsbad, New Mexico. If constructed, this monument will be one of the largest public works project in history. The purpose of this monument is to signify the danger which is to be buried below and thereby deter —for a legislated period of 10,000 years—inadvertent human intrusion into the site. Through analyses of the semiotic issues raised by the desert monument, the appropriation of the practice of burial and its relations to cultural conceptions of death, and the use of the desert as the mise-en-scène of waste, this dissertation shows how the larger context of waste burial demonstrates an extreme and unexamined field of cultural trauma and disavowal around issues of nuclear threat.

RÉSUMÉ

CETTE thèse doctorale "Signes du danger / des signes dangereux: La réponse à la menace nucléaire" est une exploration poststructural et interdisciplinaire des fonctionnements sociaux, politiques et culturels de la menace nucléaire. Dessinant intensivement sur une initiative d'enterrement de perte nucléaire entrepris par le ministère de l'énergie des Etats-Unis, ce travail est une analyse critique détaillée des rapports entre les menaces constituées par les pertes nucléaires, et les réponses provoquées par rapport à de telles menaces.

Travaillant par des théoriciens tels que Jacques Lacan et Slavoj Žižek (la deuxième mort, et le réel), François Ewald (seuils), Ulrich Beck (société de risque), et Félix Guattari (écologie du virtuel), ce travail démontre la façon dont les menaces écologiques, comme cela posée par le nucléaire, sont (paradoxalement) les forces "créatrice"; c'est-à-dire, elles ont une propension de couper à travers des divisions sociales traditionnelles (par exemple, classe, course), assemblant des lignes de nouvelles d'affinité, et de nouveaux collèges électoraux de *ceux en danger*. En effet, il semble que la menace nucléaire constitue une forme de roman de menace. Une forme de menace qui est irreducibly matériel, pourtant admet sans terre objective sur laquelle des décisions peuvent être prises. Une forme de

menace qui menace les bases très biologiques de la vie, pourtant dont l'ontology doit être déterminée par des réponses sociales et culturelles.

Le chiffre critique de principe que j'emploie pour analyser et illustrer le mouvement de la menace est le vaste monument/sign qui doit être construit au-dessus de Waste Isolation Pilot Plant (WIPP) dans le désert près de Carlsbad, New Mexico. Si construit, ce monument sera un des plus grands travaux publics projettent dans l'histoire. Le but de ce monument est de signifier le danger qui doit être enterré ci-dessous et décourager de ce fait - pendant une période légiférée de l'intrusion 10.000 humaine année-négligente dans l'emplacement. Par des analyses des questions sémiotiques augmentées par le monument de désert, l'appropriation de la pratique de l'enterrement et de ses relations aux conceptions culturelles de la mort, et l'utilisation du désert comme mise-en-scène de perte, cette dissertation montre comment le contexte plus grand de l'enterrement de rebut démontre une extrémité et unexamined le champ du trauma et du désaveu culturels autour des issues de menace nucléaire.

ACKNOWLEDGMENTS

The inspiration for this work dates back to 1992 and a late-night encounter with a singularly fascinating article by Alan Burdick that appeared in *Harper's* magazine. Burdick's "The Last Cold-War Monument," and the problem it describes have provided me with a rich and productive tableau upon which to pursue my various obsessions. And although we have never met, it seems that he must occupy a special place in the list of those to be "acknowledged." In addition, I would like to express my debt of gratitude to the McGill faculty with whom I have been associated over the past four years: Charles Levin, Brian Massumi, and Marike Finlay-de Monchy. A special acknowledgment and thanks is due to Will Straw of McGill's Graduate Program in Communications for his participation on my examining committee. Dr. Jonathan Bordo of the Cultural Studies program at Trent University has been, and continues to be an index to scholarly and intellectual leaps of brilliance — this work bears his marks too. Many other individuals have graciously provided assistance and support throughout the research and writing of this work. Kathleen M. Trauth of the U.S. Department of Energy at Sandia National Laboratories sent me dozens of otherwise inaccessible documents. And I would like to acknowledge the kindness, support, and assistance of Thomas Sebeok, Lawrence Hazelrigg, Will Straw, Glenn Macdonald, Stacey Johnson, Dann Downes, Tracy Marks, Anthea Browne, Douglas Cohen, Inna Vlassev, Lisa Lowe, Mary Lou Trinkwon, Robert Van Wyck, Michael

Keene (for the green slime example), Duff Gordon, the Rathaus, the idiosyncratic voice of "Fred."

But most of all, I want to acknowledge the support (and patience) of my partner, spouse and friend Angela M. Aldinucci.

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Experimentum mentis

IMAGINE if you will, a thought experiment based upon the game of Twenty Questions.[1] This, as you probably know is a game where there is a "word" chosen that must be "guessed" by the person playing the part of the *questioner* in 20 questions or less. "Is it a trombone?, Is it a lepton?," etc.

Only in this version of the game there are — rather than one — three people who will answer in turn the questions put to them. At the beginning of the game, the questioner is asked to leave the room on the pretense that the three answerers will then select the word to be guessed. However, in this case the answerers covertly alter the rules of the game. They decide that instead of selecting the word that is then to be guessed,

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1 This thought experiment is attributed to the physicist, John Archibald Wheeler. It is reported in Lawrence Hazelrigg, *Cultures of Nature: An Essay on the Production of Nature*, (Gainesville: University of Florida Press, 1995), pp. 7-8.

they will agree to select no word at all. Instead, they will put a rule in its place. The rule is simple: logical consistency. That is, each of them is free to answer "yes" or "no" as s/he pleases as long as it is possible to imagine something for which a) the answer given — whether yes or no — is true, and b) the answer given is logically consistent with all those previously given.

As the game commences, the questioner returns and begins asking questions (still thinking that there is some word that s/he must discover). As with the standard game of Twenty Questions, for each answer given to a question posed the envelope or set of possible things/words decreases (e.g., after two questions the set might be pared down to all things but those which are animal and mineral). In other words, the answers given become more and more determined, until a point is reached at which one of the *answerers* must say "*yes, it's X*" because in principle there must come a point where it simply can't be anything else. A point, in other words where no other things can be imagined which satisfy the rule of consistency.

This thought experiment is taken to be a kind of demonstration of the manner in which the "mode" of inquiry constructs its "object." The "reality" that is discovered by the inquiry of the questioner is directly produced by the conduct and history of that very inquiry.

On the one hand this little experiment appears to be an elegant if indirect critique of the very nature of scientific — and indeed, perhaps any —

inquiry, but on the other, it may work its explanatory magic a little too easily. The reasons why we might find this game provocative or illustrative are of great importance. For if we say that this is a demonstrative critique of scientific inquiry, it seems fair to say that we logically imply some position with respect to a world external to that inquiry. On one interpretation it situates Nature as an outside to inquiry. That is, Nature is viewed as a production of the inquiry; not something assessable *to* inquiry, but *produced by* it. The laws and consistency attributed to the world, to Nature, are thus the practical results of the desire to know them. To paraphrase Hazelrigg, epistemological consistency (i.e., the inquiry) is prior to, and determinative of, ontological consistency (i.e., Nature). Unless, that is, we say that the founding force of inquiry is itself "manifest as a selection effect within a fundamentally homologous process."[2] In other words, this would be to say that the epistemological and the ontological are aligned in a single though complex process; cut, as it were, from the same cloth. I am, I believe, more persuaded by this latter interpretation. It suggests to me an ethical thematic that lies at the core of all inquiry; at the intersection, that is, of the real and the symbolic.

However, the little Heisenbergian parlor game related above — and particularly in light of pan-discursive trends in various regions of postmodern thought — may seem only a confirmation of the suspicion that

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2 Hazelrigg, *Cultures of Nature*, p. 8, note 6.

there lies nothing outside of discourse. This dangerous, and I think, ethically perilous position is a significant dimension of the larger context of this present work.

What follows is a work of inquiry, of exploration. In one sense it is a work concerning the breached boundaries of the material and the semiotic. More precisely, it is about a particular kind of threat that I will argue is a feature of the modern: ecological threat. To put it as succinctly as I can, I am attempting to construct a way of thinking about this sort of threat. And although it seems to me that the interdisciplinary regions of the Humanities are the appropriate location from which to work on such problems as ecological threat, there are certain difficulties inherent to this position. Principal of which we could call a kind of malaise. And this malaise is well known. It consists quite simply in the theoretical and political difficulties one may encounter when "theory" must confront the brute and material world. The problem we could say, of realism on the one hand, and a deeply felt skepticism with respect to the epistemological supports of this realism on the other. Nonetheless, it is my conviction that the ecological problematic cannot be allowed to subsist as an unfashionable remainder while we attempt to sort out our lingering suspicions with respect to debates about realism. The stakes are too high.

The Marker

To orient the reader, I will begin in the middle, so to speak, and convey what has become an enormously complicated and productive figure in my work.

> Carlsbad, New Mexico. A very large hole has been excavated deep within the hard indifference of the desert's sedimentary salt. It is the World's first permanent, underground storage facility for nuclear waste. Stunningly expensive, and equally controversial. Several years from now the Department of Energy, under the auspices of the government of the United States, will (in all likelihood) approve the transport of low-level (and thus very persistent) nuclear waste into this hole. Then, sometime after the millennium (no one's really sure, but perhaps around 2035) the hole will be filled to capacity and sealed shut. And then the most extraordinary series of events will begin to take place. A series of events that have captivated my imagination. By decree of the Government a very large monument — in keeping with the magnitude of the burial

beneath — must be constructed to mark the site. It will be perhaps the largest public works project in modern history. But this marker, this gravestone monument must serve both more and less than a commemorative purpose. Indeed this monument must seek to *not* commemorate. For what lies beneath must never be celebrated, yet it must always be remembered. The expenditure of the monument must be equal in magnitude to the waste contained beneath it. It thus cannot be a typical monument. It cannot be allowed to content itself as a monument to the present; it is not something that we wish to remember, nor is it something for which "we" wish to be remembered. It must, and again by decree, convey a very specific message to the future — and the message it must convey is: Go Away. It must be a calling to remembrance that celebrates nothing. *Look!, here lies nothing.* It must convince the future of its utmost significance and of its terrible danger. It must participate in the double movement of the project of burial; on one hand the waste is made to disappear from sight, and on the other, the danger that lies below is to be again made manifest through the work of the monument. The material, hidden from sight, must be given back to danger by the sign. This monument to signification must perform the threat that lies beneath. It is a singular meeting of the material and the semiotic. And it is an enormous wager that hinges on making

> the waste safe — through burial — then making it dangerous again — through signification.

All of this seems of course quite fantastic. Ill-conceived. I mentioned my imagination a moment ago, and that it had been captured by this project. This is true, but there is more to the story. I began thinking about this project some years ago. It seemed to involve a number of problems related to my concerns with environmental thought. But as I began to think more about it, it seemed to me that the desert monument pointed to something else; something that engaged a more profound problematic concerning culture and nature. It struck me that the threats posed by the materials slated for burial were of a very particular sort. They are threats of a properly, or paradigmatically, ecological sort. In other words, they are threats that operate in the real. Threats, as we shall see, that cannot be contained within an arithmetic of risk. Threats, in other words that threaten the very basis of what supports organic life. Threats that threaten the very symbolic universe within which threat itself has meaning: ontological threat. They are ecological in the sense that they are deeply embedded in an assemblage that involves the very conditions of the biological; the region of the vital-, or life-assemblage. Such threats are, therefore, ethical as well. And this too is a considerable part of my motivation in all of this.

The ethical basis of this work goes beyond the moral obligation on the part of peoples currently or historically engaged in nuclear technologies (for whatever purposes) to confront the threats posed by such nuclear

practices. And as we will see, threats posed by these activities simply do not conform to traditional notions of responsibility and reparation, or location and jurisdiction, or for that matter, cause and effect. As a result the category of those who must take responsibility becomes generalized and inclusive. The ethical sense that intrigues me is that in confronting threat the ethical structure contains not only our judgments with respect to our actions, but also the judgments implied *by* our actions.[3] In other words, it's not just the manner in which ethical thought guides action, but that our actions in themselves perform judgments.

On one hand I have reported an investigation of sorts. This investigation has to do with the various bits and pieces left over from industrial and military nuclear processes, and what it is that "we" might like to do with them in order that both present and future peoples (and others) remain protected from their toxic (spatial and temporal) proximity. Accordingly, I have given an account of the development of the manner in which a certain set of problems has been approached. My interest has been less to do with the history proper — that is, with constructing a faithful account

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3 For this conception of an "ethical structure," see Jacques Lacan, *The Seminars of Jacques Lacan: Book VII: The Ethics of Psychoanalysis 1959-1960*, (New York: W.W. Norton Books, 1992), p. 311.

of a particular period of time — than with the manner in which certain ideas circulated and inscribed various problems.

In other words, I have been interested in exploring the ways in which this global problem is being thought. How, in other words, and in what sense can the challenge of this threat be met; what manner of thinking is being brought to bare on this enormously difficult problem. And finally, what I hope to have accomplished is to have reflected on what manner of thought and thinking might really be appropriate in the face of nuclear (and other varieties of ecological) threat.

The marker that I just described provides a rich figure with which one may read the responses of a particular Western culture to the problem of waste, and the manner in which its response may speak to its stated and unstated ideas about itself, its future, death, its obligations to persons living and not yet living, its understanding of the relationship between technics and meaning. For example we can see a certain set of relations between material, monument and burial: the technical, the temporal, and the ceremonial.

The marker is all of this. But it is also much more. It represents a point in time at which decisions are being made — globally — that will bind us to the future in an utterly novel way. But, and this is the rub, it presents itself as well as a vast tableau for theoretical play. It is thus a question of navigating a jouissance offered by the figure, and remaining committed to the terrible reality of the problem. These are not just stories, and no

matter how we might like to pose our Twenty Questions, where we end up does make a difference.

In another sense though, I would like to see this work as an attempt to foster a productive codependence between poststructural and environmental/ecological concerns. I am interested to engage what I see as a bi-directional challenge that issues simultaneously from modern theory, and from environmental thought. The space in between is the place where I have attempted to position myself; it is the place where questions must be posed, and new mediators sought. "Mediator" is, I think, a good concept; one that I borrow from Deleuze. I take it to mean a manner of creating concepts by engaging the relations between disciplines. There is no point, Deleuze would say, in simply monitoring the movement between separate and parallel lines; one must not simply follow creative movements that exist elsewhere. Rather, one must attempt to insert a new series in between, a new series that displaces, or makes minor, the authoritative or established discourse within which it develops. The mediator bears a relation to a style; but style, less in the sense of a syntax, then as a manner of innovation, of qualitative transformations that one may set in motion.[4]

The use of the figure of the marker indicates and provokes a desire on my part to find a new mediator for thinking and working. In a larger sense, I

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4 See Gilles Deleuze, *Negotiations, 1972-1990*, (New York: Columbia University Press, 1995) pp. 125-34.

have not sought to simply follow the movements of these separate registers of thought; rather, I would like to have made a new series of thought in-between. It is not simply a question of *guessing the correct word* that was there waiting in advance, nor of the conviction that guessing is itself the fundament — an opposition specifying that a choice be made between a blind transference, and epistemological relativism. Rather, it is the tentative sense (or perhaps wish) that the opposition is simply false. But perhaps in its very falseness there is concealed something true: that the work of questioning makes something happen.

Mindful that "a problem always has the solution that it merits, according to the manner in which it is formulated, and according to the symbolic field one makes use of in order to formulate it,"[5] the outline of *my* problem is as follows.

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5 Gilles Deleuze, *How does one recognize Structuralism?*, (Peterborough, Ont.: Trent University, C.V. Boundas, unpublished translation, 1996), p. 425

The Chapters

In what follows we shall begin to explore what appears as the two movements that together constitute the imperative of threat: one that draws us toward the very large (the transnational, the transpolitical, the transtemporal), and one that draws us toward the very small, the invisible (molecular, biological, atomic). The purpose of this discussion will be twofold. First, since the language of physics and chemistry is the principle language used to adjudicate decisions and practice with respect to the materials in question, it is useful (practically and theoretically) to rehearse them, to utter them in such a way as to discover both their strangeness and precision, where they work, and where they falter. In another sense it is to say that to speak critically about the practices of nuclear waste one might usefully have some notion of the language game that is operationally wedded to those practices. And secondly, it is to show that threat cuts a difficult, tricky, path. It's not exactly about scale, or location, or magnitude. In fact threat, I will contend, is quite indifferent to almost any coordinates we might like to assign it. Even the familiar coordinate of the "accident" becomes an enormously vague concept in the case of ecological and nuclear threats.

In the second chapter the problem of the desert marker is introduced as a secret that must be kept and disclosed simultaneously. The Waste Isolation Pilot Plant has been designed to house the secret, and everything about the physical context of the project is said to support its ability to do so. The deep and geologically stable salt beds that lie below the desert's surface will contain specially designed barrels of transuranic waste. And even though the WIPP is designed to accommodate wastes that are yet to be produced, the concept for burial in salt has been a feature of scientific and legislative concern for over twenty years. Yet the security of salt formations and the remoteness of the desert has been deemed insufficient for the security of permanent underground disposal of nuclear waste. Such sites as the WIPP must be submitted to further levels of security in the form of "permanent markers." This is the case for two reasons. First, because of the longevity of the materials to be buried, the question of inadvertent human intrusion in the site becomes increasingly prominent. That is, hiding it is not enough; instructions about what is hidden there, and an explanation that it is highly dangerous must also be a feature of the design. And second, because the United States Government wishes to see this project as a prototype. Ideally the design concept will be used globally by other nuclear nations for permanent waste disposal. Accordingly, a standardized (global) system of markers might increase the likelihood that knowledge of the burial sites could persist over the legislated period of 10,000 years.

From my point of view the question thus becomes one with the marker. What is it that we ask of a monument to waste? And how must the project be thought in order that the monument marker be seen as a sensible solution. Everything about the project itself operates at the limit. At the limit of civilization; its place is the desert, the other American wilderness. At the limit of history; its time is the deep future. At the limit of meaning; its witness is unknown, abstract, and indeterminate. At the limit of language; auguring the *ebonics* of the future is a forced confrontation with the unknown. In the third chapter I attempt to disclose some of these limits. I look to a reading of Jacques Lacan for an outline of the problematic of meaning and its projection, and the operation of quilting as a plausible way of reconceptualizing, or at least realigning the issue of the stability of meaning. The problem with threats of a nuclear sort is that they issue from the real; they are insufficiently contained within an arithmetic of risk; they are threats that threaten the very basis of what supports organic life, and that threaten the very symbolic universe within which threat itself has meaning (death of a second order, the second death, as Lacan would say); and they are constituted by an essentially traumatic relation. All of which makes it rather difficult to talk about such things as nuclear threat.

In light of these ideas about threat and the real, chapter four returns to the site of the problem in the desert, and outlines the search for a solution that has been carried out by the United States Government. More or less following the sequence of events starting with a task force that was struck

in the early 1980s, we see how the problem of design was initially defined, subsequently approached, and eventually solved. The solution that is being advocated at this point is, in relation to the various design ideas that have been put forward, exceedingly uninspired. Pragmatic concerns of cost and engineering complexity have derailed the more fanciful — if misguided — visions of signs to danger and dangerous signs. The millennial marker has become via a sweeping technical and semiotic reduction a very large berm with technical features. In this sense a dangerously unmanageable situation has become worse. But because the risks have been accounted for, and future scenarios specified, the solution comes to resemble the problem. And it is to the problem of risks that the next chapter turns. Through François Ewald, and Ulrich Beck the claim is explored that the kinds of risks that issue from nuclear materials have a considerably less than objective status. Indeed, to paraphrase Ewald, the greater the potential of an ecological "risk," the more its reality is dependent upon a system of values. And furthermore, that resistance to acknowledgment of threat grows in direct proportion to the threat's size and proximity. In other words, disavowal varies in direct proportion to threat. So, it's not just that threats of magnitude are dependent on "values," it's also that the greater the magnitude, the greater the resistance there is to constituting them symbolically. And, to make a reckless paraphrase of Deleuze, the novel characteristic of such threats is that they are virtual *and* real. Discourses of risk are incapable of conceptualizing anything but the possible.

The characteristics of threat (its indifference to symbolization, its status as virtual and real, and its essentially social ontology) bring the discussion to a consideration of trauma. The parallel between the Lacanian real — as that which resists symbolization absolutely, and that which can only be discovered through the disturbances it causes in the symbolic — with that of threat is, I think, more than analogical. I will argue that the movement of threat has to be understood as a kind of missed experience. Like LaCapra's description of trauma, it is an experience not fully owned. But it is also a kind of experience that exceeds one's capacity to integrate it qua experience. Instead, the effect of threat is that it is always displaced from the scene of experience. It is never quite there. Yet rather than concluding that therefore there can be no response to nuclear threats, I think that understanding its chronic traumatic nature might allow us to become aware of when our responses become pathological.

ONE

THE BIG AND THE SMALL

THE task here is to start to bring the issues of threat and waste into focus. To see, in other words, what different sorts of discursive lenses will do. We needn't worry here about challenging the status of the lenses themselves. My intention is not to valorize one position over another, not to use one to explain that rest. Rather, my interest is in the ways that the "behavior" of waste and the movement of threat, are inadequately contained in whatever frame we may choose to deploy.

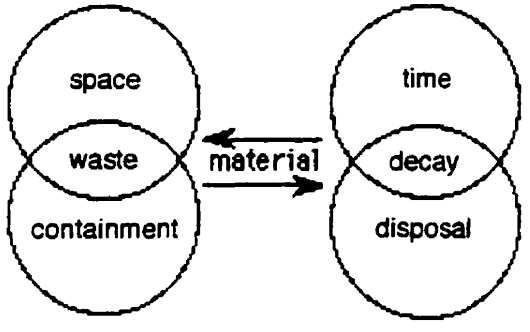

Figure 1. Waste / Space / Containment, Decay / Time / Disposal. Adapted from "Modeling Industrial Thresholds: Waste at the Confluence of Social and Ecological Turbulence."

In "Modeling Industrial Thresholds: Waste at the Confluence of Social and Ecological Turbulence," Jody Baker thus conceptualizes the contemporary situation of waste. He writes,

> Waste is a spatial category; it is produced in place; it is realized only in its materiality. Decay is a temporal category, it is produced over time, as duration, it is the process of desubstantiation. Waste which successfully enters the process of decay is transformed into energy and is dissipated, lost, expended. Decay can only become waste if its processes come to a halt, and it stabilizes long enough to take form.[6]

In Baker's analysis, there is either disposal *or* containment; one or the other, but not both simultaneously. Leakage occurs when material moves across or between the two series; i.e., when that which was contained becomes dispersed (e.g., Chernobyl), or when that which was disposed of becomes somehow contained or accumulated (e.g., low pH stack emissions). In the case of Chernobyl the containment was breached, resulting in local and downwind dispersal. In the second case, stack emissions (the so-called Super Stack in Sudbury, Ontario is a good example), what was assumed to have been dispersed (SO_2, NO_x,

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6 Jody Baker. "Modeling Industrial Thresholds: Waste at the Confluence of Social and Ecological Turbulence." *Cultronix* 1.1 (1994). Online. Available: http://english-www.hss.cmu.edu/cultronix/Baker/.

particulates and derivatives) in fact begins to accumulate, "unexpectedly," elsewhere in the form of acidified soils and water.

It would seem quite clear that this model of Baker's adequately describes the relations between disposal and containment. But it only does so only on the condition that we are speaking about materials that operate according to the specification containment = spatial, and disposal = temporal. But it is essential that we understand that nuclear materials fail to conform to the assumptions of this model.

Nuclear waste. There is, by now, a great deal of this Cold War detritus. There could be a great deal less than there in fact is. However, in 1977, Jimmy Carter, in one of those critical historical decisions that was probably both fortuitous and disastrous, disallowed all plutonium reprocessing and recycling on the grounds that a domestic plutonium fuel cycle economy would present a massive security risk. Accordingly, material that would qualify as fuel in, for example, France, has the status of waste in the United States.[7]

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7 The situation was far more complex than this, but the point I wish to make is that the actual isotope of Uranium that is necessary to sustain a nuclear reaction (U-235) is in fact a very small percentage of "natural" Uranium—i.e., U-238—(less than one percent). During the 1970s it was thought that global supplies of *in situ* Uranium were quite low. However, a byproduct of the non-fissile U-238 is plutonium—itself a suitable reactor fuel. Thus the non-fuel in natural uranium, produces a fuel source: this is the basis of the concept of a breeder reactor. And its promise, is near unlimited fuel from a limited resource. The downside, of course is that Plutonium is also the ideal source for the manufacture of weapons.

But in any case, there is a great deal of it. Some of it piled up, some partially buried, some leaking through its temporary containment apparatus. One of the most startlingly unbelievable examples would be the Hanford site in Washington. The intrigue, the covers-ups, the covert experiments on workers, all of this pales in comparison to the simple fact of the accumulated nuclear waste that is stored on this site. Materials once contained in ponds and other confinement areas have now permeated the area to such a degree that the entire area must now be considered a waste repository. Writes Linda Rothstein:

> The tank farms at the Hanford Site hold 61 million gallons of liquids and sludges. The contents include radioactive waste and spent fuel from nine weapons production reactors mixed with assorted hazardous chemicals, including nitrates and nitrites, chromium, mercury, and cyanide. By the early 1990s, 24 of the tanks were considered in some danger of exploding, according to William Alumkal, who is the executive vice president of Westinghouse Hanford's tank waste remediation division.[8]

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8 Linda Rothstein. "How did we get in this mess?" *Bulletin of the Atomic Scientists* 51.3 (1995). Online. Available: http://www.ratical.com/radiation/NGP/. For further frightening material concerning Hanford, see Linda Rothstein. "How did we get in this mess?" *Bulletin of the Atomic Scientists* 51.3 (1995). Online. Available: http://www.ratical.com/radiation/NGP/, The Economist, "Hanford's nuclear dirt: cottage industry," *The Economist* 316.Sept. 15 (1990), The Economist, "Nuclear clean-ups: repent at leisure," *The Economist* 324, Aug. 15 (1992): 74, The Economist, "Witch's brew at Hanford," *The Economist* 315, June 2

However, it is also important to point out that although the cold war may be over, the nuclear problem is not simply one of waste, power generation, and maintenance of the diminishing supplies of warheads. The following was reported in *Covert Action*:

> On January 14, 1991, days before the beginning of the Gulf War, the Pentagon leaked to *Newsweek* a major study on the use of nuclear weapons against Iraq. It publicized the Pentagon's varied contingency plans to use nuclear weapons and pointedly mentioned General Norman Schwarzkopf's request for permission to use them in the Gulf. The plan called for neutron bombs to destroy enemy troops, nuclear "earth penetrators" to vaporize underground bunker positions, and hydrogen bombs detonated over Baghdad to wipe out its communications systems. During the war itself, there were approximately 300 U.S. hydrogen bombs in the Gulf aboard U.S. ships.[9]

The waste problem is thus not as simple as dealing with the clean up; there is always the question of whether someone might put the military's nuclear interests to use. In any case, such waste — whether in a leaking

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(1990): 25-26, Rosalie Bertell, *No Immediate Danger: Prognosis for a Radioactive Earth*, (Toronto: The Women's Educational Press, 1985), Carole Woods, "Why Hanford?," *Dissent* 34, Spring (1987): 250-251.

9 Michio Kaku. "Nuclear Threats and the New World Order." *Covert Action Information Bulletin* (1992). Available: http://www.ratical.com/radiation/.

drum, or spread out over greater metropolitan Baghdad — is no longer thinkable as pollution, as matter out of place.[10] Rather, it must be seen as a novel feature of this point in history; it is matter *without* a place. Novel, because is represents a *new form* of waste. It is a kind of waste that resists its own containment. Landfill waste, in distinction, the remainder of domestic consumption, can be *disposed of*, it can be contained in a space where, in a temporal sequence of events of decomposition (aerobic or anaerobic), that waste will decompose. Or at least most of it will. And if there is a loss of containment, if there are leaks in the containment system, those leaks are more or less problems of a technical nature. Solvable, that is, by technical (engineering) means. Or, on the other hand, it can be dispersed (ocean dumping), where similar processes of decomposition, together with homogenizing, entropic forces of dilution will ensue.

Nuclear waste differs in that its "nature" operates in a radically different temporality; it is material whose toxicity requires a different conception of history and time. The degrees of freedom (that is, the number of relevant variables that must be taken into account) within which assumptions of containment probability operate in the case of a landfill, are of a radically different order from that of nuclear materials. Consider: Nickel-59, with a half-life of 80,000 years, will remain radioactive and dangerous for upwards of 750,000 years (a conservative estimate, given that the rule of thumb for radioactive abatement is 10 half-lives). Within

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10 See Mary Douglas, *Purity and Danger: An Analysis of the Concepts of Pollution and Taboo*, (London: Arc, 1966)

such temporal limits, probability models of containment failure converge on certainty in an asymptotic manner.

The sort of time and history that must be grappled with in the case of nuclear materials is precisely the challenge that the marker addresses. The time that must be thought is a discontinuous time, too remote to conceive of as connected to us through relationships of filiation. It is a time that approximates pure future, too distant to seem connected to a present. And equally, it is a time that challenges one's sense of history. And it does so in two ways. In the first sense, it challenges history as a record of permanence by casting that very permanence into radical doubt. In the second sense, the distance that must be conceived of, the utter magnitude of the "future" that must fall under administrative control exceeds the cumulative historical record from which support may be drawn.

Nuclear Culture

Cesium 137 in the fallout, by affecting reproductive cells, will produce some mutations and abnormalities in future generations. This raises a question: are abnormalities harmful? Because abnormalities deviate from the norm, they may be offensive at first sight. But without such abnormal births and such mutations, the human race would not have evolved and we would not be here. Deploring the mutations that may be caused by fallout is somewhat like adopting the policies of the Daughters of the American Revolution, who approve of a past revolution but condemn future reforms.

Causes much less involved than radiation have the effect of increasing the number of mutations. One such simple cause is an increase in the temperature of the human reproductive organs. Our custom of dressing men in trousers causes at least a hundred times as many mutations as present fallout levels, but alarmists who say that continued nuclear testing will affect unborn generations have not allowed their concern to urge men into kilts.
Edward Teller — *The Legacy of Hiroshima*

Garret Hardin began his now famous essay entitled "The Tragedy of the Commons" with the claim that the problem of pollution in general was a member of a set of problems with no formal solution. The conclusion he

drew from this was that as a result, nature would be the arbiter of any attempt to deal with the dynamics of pollution and culture. *Nature will commensurate the incommensurable*, he said. A shifty rhetorical move, but one that lifted the burden of ethical thought in a manner reminiscent of a Hobbesian *nature bats last.* But Hardin was right, at least in so far as he pointed to a category of problems that share a characteristic of having no formal solution. No solution, that is, in the sense of a linear, logical fix.

Each level of the nuclear waste problem as such is mediated at another level by other problems and other systems. For example, the drift of nuclear waste from a storage facility is in one sense conceivable as a purely technical problem of containment design. But this realm is mediated at other levels by legislative design, by risk models, by social perceptions of need, by various ideas of liability and its limits, etc. Since the formal characteristics of each of these systems are different — presupposing different ideas, different criteria of what would count as evidence — there would seem to be no way to optimize for a solution without having either an enormously elaborate model of the relevant systems and their interaction(s), or — and perhaps in any case — endeavoring to make a viable and working reduction of the complexity involved in order to consider only those interactions felt to be relevant. This would seem to present itself as a problem of optimization; e.g., optimizing for social good, economic viability, and maximum containment. However, not all of these systems are equivalent. Containment must be optimized in and of itself. Yet to do so, the other variables under consideration cannot likewise be optimized.

It becomes clear that the field of nuclear threat is as much a discursive and epistemological issue as it is a material one. No big surprise, to be sure, but important to point out nonetheless. It is my contention that the whole realm of environmental threat must be thought out in the discursive and epistemological terms that are typically foreign to environmental thought. Yet this must take place without shifting into a pan-discursive zone; there are more than signs at stake. What I am attempting to do is discern a point from which both the intimate levels of the material and semiotic can be viewed.

What does all this mean? Radioactive materials are simply understood to be seriously dangerous materials. But to be simply understood can too easily mean *understood simply*. We cannot dispense with a very overt realism when speaking of such things as radioactivity. We take on faith the horror of radioactive poisoning, of radioactive death resulting from violent subatomic fracturing of materials, of bodies. We can recall, for example, the terrifying routine-ness of the mortification of bodies in *Black Rain*. We can say neither that our symbolic, discursive constructions simply *miss* their object, nor that the object itself can be entirely hit.

Culturally, to the extent that we pay attention any more, we are stuck between the radioactive hysteria of the 1950s and 1970s, and the soothing words of the nuclear industries. We perhaps remember that plutonium has a half-life of 24,000 years; though we may not be sure what that exactly means. And we all remember Chernobyl, and may indeed have some vague images of reindeers and stock footage of Lapps in Scandinavia as having figured into the story. Indeed, reindeers, in the days and weeks

following the events at Chernobyl, functioned as a provocative Christian/Disney plot device that allowed a complete story to be pulled together from the scarce and contradictory reports being released at the time from the Soviet Union.

The ground zero, as it were, oscillates for most of us between Three Mile Island — *what happened there anyway ... nearly a meltdown?* — and the bombing of Hiroshima and Nagasaki.[11]

These events, these mishaps, tend to disappear, to become incorporated into other aspects of cultural memory. For instance, the explosion and coolant release at Chalk River, Ontario (1951) when control rods were inadvertently lifted from the core resulting in a hydrogen explosion, and the flooding of the reactor building with on the order of a million gallons of highly radioactive water.[12] Or the reactor fire at Windscale, UK (1957):

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11 It is, in a way, odd that these are the *meaningful* reference points. The veiled history of the military testing of nuclear weapons in the United States is itself a terrifying piece of history. Two extraordinary books that document the history of military secrecy and denial around domestic nuclear and conventional weapons testing are Richard Misrach, and Myriam Weisang Misrach, *Bravo 20: The Bombing of the American West*, (Baltimore: Johns Hopkins University Press, 1990), and Carole Gallagher, *American Ground Zero: The Secret Nuclear War*, (New York: Random House, 1993). The former documents the US Navy's control of over 70% of Nevada's airspace and its 40-year history of bombing the landscape. And the latter is a collection of photographs and personal narratives of persons involved (many, by simply living downwind) in nuclear testing that took place in Nevada, Utah, and Arizona.

12 Bertell, *No Immediate Danger*, pp. 170-72.

this reactor, designed to produce weapon-grade plutonium, was a particular sort of design that requires periodic discharge of stored energy. During one particular discharge in 1957, the fuel ignited. The resultant blaze lasted several days and involved the significant discharge of airborne radioactive material.[13] In 1961, during a maintenance routine, a reactor explosion occurred in Idaho Falls that resulted in the immediate death of three workers (one was impaled, and left pinned to the ceiling). The accident is presumed to have been the result of control rods having been removed from the reactor core.[14]

Or in some cases, the events disappear without ever having been known. The best (least known) is the still unreported (major) accident in Chelyabinsk, USSR that occurred in 1958. Until very recently there have been few reliable reports as to the precise nature of the Chelyabinsk "accident."[15] It is now known that during the late 1940s, the Soviets constructed a very large, and highly secret complex of reactors — the Mayak Chemical Combine, in the province of Chelyabinsk — bordered by Siberia on the north, and the Urals to the West (and rumored to have

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13 James Megaw, *How Safe?: Three Mile Island, Chernobyl and Beyond*, (Toronto: Stoddart, 1987), pp. 156-67.

14 Bertell, *No Immediate Danger*, p. 206.

15 Incidentally, in my copy of the *International Nuclear Fuel Cycle Fact Book*, (Washington, DC: US Department of Energy, 1992)—essentially a global telephone book for nuclear installations and waste management facilities—the Mayak facility is, out of hundreds of listings, covering 23 countries, the only facility that has neither phone nor fax numbers.

been the actual surveillance target of Gary Powers' U2 in the 1960s). This region is now believed to have undergone not one, but a series of nuclear accidents. The first, over a period of a decade, in which high level waste from the reactors was discharged directly into the Techa River — the principle water source for several thousand people. The second, in 1957, when the cooling system for a high-level waste containment system malfunctioned, overheated, and exploded exposing over a quarter of a million local inhabitants to a reportedly massive amount of atmospheric radiation. And the third accident, in 1967, when Lake Karachay — used since the early 1950s for dumping liquid nuclear wastes — was so severely depleted by a regional drought that sludge dried out, became airborne, and contaminated an area thought to be over twenty-five thousand square kilometers.[16]

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16 This area has been the subject of a recent documentary— *Chelyabinsk: The Most Contaminated Spot on the Planet*, 1995, by the American-Polish director, Slawomir Grunberg. Other sources I have located include the following that are related to the documentary: Slawomir Grunberg. *Chelyabinsk: The Most Contaminated Spot on the Planet—Script*. 1994. Online. Available: http://ww1.logtv.com/webpages/grunberg/nofrm/chelya/narrat.html., Slawomir Grunberg. *Chelyabinsk: The Most Contaminated Spot on the Planet—Project Description*. 1994. Online. Available: http://ww1.logtv.com/webpages/grunberg/nofrm/chelya/narrat.html, Tan Cheng Li. *Chelyabinsk Nuke Horrors Revealed*. 1995. Online. Available: http://ww1.logtv.com/webpages/grunberg/nofrm/chelya/chelya.html, and Pang Hin Yue. *The Tragedy of Chelyabinsk*. 1994. Online. Available: http://ww1.logtv.com/webpages/grunberg/nofrm/chelya/chelya2.html. And two other sources concerning the situation in Chelyabinsk: Nils Bøhmer, and Thomas Nilsen. *Reprocessing Plants in Siberia*. 1995. Online. Bellona Working Paper no. 495. Available: http://www.grida.no/ngo/bellona/ehome/russia/sibir/index.htm; and Michael Schwellen.

Chernobyl it seems has largely disappeared with the Soviet Union. Just as the containment structure of Chernobyl the reactor facility was made transparent by an overheated core, so were the faulty, dysfunctional institutional controls that supported the facility itself. And indeed, the latter has surmounted the former in terms of popular memory. Chernobyl happened, it seems, not because of an event concerning an insupportable risk, but because of a corrupt and inept political/social configuration that supported it. (The Western media was nearly unanimous on this point, adding for good measure an apocalyptic spin: Chernobyl as "all that is given to us to know the end of the world."[17]) This *post hoc ergo propter hoc* has slipped into Western thought both as alibi and explanation. If we really believed that the reactor was run by "peasants" — and officially sanctioned as such — then the "accident" would seem inevitable for entirely institutional reasons. In a way we are thus empowered to forget *what* happened in favor of remembering only *why*.

Another way to look at this would be to say that even without the Cold War prejudice that allows us to make of the Soviets a culture of corruption, we really have no idea what happened, because we really don't have the enough understanding of what such processes as nuclear power generation, or fuel production, or weapons production involve — or for that matter, what an "accident" is all about. We know it is risky

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Russia's Environmental Mess. 1994. Online. Available: http://infomanage.com/environment/russia.html.

17 Quoted in Spencer Weart, *Nuclear Fear: A History of Images*, (Cambridge: Harvard University Press, 1988) p 371.

business. We know that accidents can be disastrous. And we know that it is controversial on at least a couple of levels. But beyond this, I think it tends to be a bit of a fog. And rightly so.

Consider Three Mile Island. The "accident" that occurred there in March of 1979 is one of the important reference points in North American nuclear history. It is also an extraordinary testament to the "improbable."[18]

Dozens of accounts of this event have been written, and I will not attempt to do any more with this example than to show its complexity. The first few minutes of the "incident," as it became known were something like this[19]: first, the secondary cooling system (the isolated system that transfers heat from the primary cooling system in the reactor core) failed. A system responsible for removing particulates from the secondary cooling water leaked into a non-related pneumatic system that controlled

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18 For a detailed account of the health related fallout of Three Mile Island, as well as a strongly worded warning that should something similar happen, absolutely nothing will have been learned from these events, see Harvey Wasserman, and Norman Solomon. *Killing Our Own: The Disaster of Americas Experience with Atomic Radiation*. 1982. Online. Available: http://www.ratical.com/radiation/KillingOurOwn/.

19 These events are now part of the public record. I have relied on a number of sources for this gloss. Particularly good are: Mike Gray, and Ira Rosen, *The Warning: Accident at Three Mile Island*, (Chicago: Contemporary Books Inc., 1983), James Megaw *How Safe?*, Charles Perrow, *Normal Accidents: Living with High-Risk Technologies*, (New York: Basic Books, 1984), Richard Wolfson, *Nuclear Choices: A Citizen's Guide to Nuclear Technology*, (New York: McGraw-Hill, 1991).

instruments. The now damp instruments reported a non-existent error, and fed back into a pump-shutdown sequence. Without the pumps, the secondary cooling system was no longer circulating water, resulting in a buildup of heat in both it and the primary system. When the pumps shut down, the turbine that accomplishes heat transfer between systems also shut itself down; and without the turbine, there was no way for heat to be released from the core. In such unlikely scenarios, a redundant system exists in order to circulate water through the secondary system, and thus prevent heat build-up in the core. However, the valves that allow water to flow from the emergency reservoir into the secondary system had — for reasons unknown — been left shut. The control panel indicator gauges that would have clearly shown the operators that these valves were in the wrong position were unfortunately obscured by a repair tag hanging on the console. With no heat reduction in the core, the reactor was scrammed (meaning that graphite control rods are dropped into the core to slow the reaction). But even with a slowed reaction, the decay products continued to react, and with no cooling systems operating, the core was still getting hotter. In such instances, a safety valve exists which allows the operators to directly bleed pressure from the reactor vessel. However, when the operators opened this valve and released much of the built-up pressure from the reactor core, the valve failed to reset into the closed position. As a result, about forty percent of the water from the core was expelled, creating a context for the situation popularly know as the China Syndrome; that is, a melt-down. In fact, what was happening was a loss of containment event; that is, the reactor core was becoming exposed. The operators however knew none of this. Nor could they, because on the one

hand, the instrumentation reported conflicting and non-related errors, and on the other the failure-mode assumptions that they had been trained to make, did not include the failure mode they were in fact currently experiencing.[20]

Thus the incident commenced with a series of events that both *could not* happen, and, therefore *were not* happening. This is more than saying that the events were unexpected and incomprehensible. The system performed in a way that was outside of the universe of belief of the operators. The instrumentation, assumed to be a reliable index of the reactor's operating envelope began to communicate either the wrong information, or none at all.[21]

Of course the fact that various warning alarms, and a thousand or so warning lights were simultaneously flashing and buzzing only made the situation more chaotic. Similarly, the fact that when Three Mile Island

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20 As an example of the systems theory category of "wishful feedback," John Gall writes: "the alarm signal that indicated a valve stuck in the "open" position [at Three Mile Island] was connected to the control panel in such a way that merely pressing the "close" button was enough to silence the alarm signal, even when the valve actually remained in the "open" position. That is to say, the control panel was designed to register what the operator *wished* the state of the system might be, rather than what it actually was." John Gall, *Systemantics: The Underground Text of Systems Lore: How systems Really Work, and how they Fail*, (Ann Arbor: The General Systemantics Press, 1986) p. 140.

21 In a personal communication, Charles Levin suggests that it may be the inevitable result of such hardware "accidents" that instrumentation gets "cut loose" and reduced to a panel of floating signifiers.

management concluded that an "incident" was in progress they were unable to contact the Nuclear Regulatory Commission (a message had to be left with the answering service), slowed response time significantly. Add to this other circumstantial developments — such as the simultaneous failure of independent systems effectively coupling isolated systems, and that the site computers had become so overwhelmed generating diagnostic reports and unable to prioritize the massive queue of data that the output of important information was delayed by hours in some cases — and it is easy to see how the possibility for a decisive response became increasingly remote.

Incomprehensible events persisted for the next day and a half, culminating in a situation that was about as close as you can get to a "worst case" scenario. It was not until ten years later when it became possible to inspect the reactor that it was discovered that some 20 tons of uranium had melted onto the bottom of the reactor vessel.

What precisely can be said to constitute the "accident" here is not at all clear. To consider the sequence of events as they took place one would conclude that the "accident" was really a kind of utterly improbable series of non-related failures that involved electrical, hydraulic, servo-mechanical, computer, administrative, institutional, organizational, interpersonal, and other structural and epistemological factors. It was an assemblage level failure; that is, the "system" that failed was far larger and

more complex than those involved had realized.[22] In one sense this points to the fact that when a complex system such as a reactor moves rapidly away from its "normal" operating envelope it can and will behave in ways that are "incomprehensible." In another sense, it means that the only way to adequately speak of the risks involved would be to fully take into account the social, material, semiotic, and political factors — a daunting, if not impossible feat.

We could ask how different is this type of accident compared to, for example, an earthquake, or flood, or hurricane. What in other words is the distinction between an accident of a natural sort, and one that is anthropogenic or technological. In a way this is an extremely important question. It assumes, on the one hand, that there is in fact a meaningful distinction between the natural and technological. There might seem to be an obvious fault line when one thinks of the distinction between, say,

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22 Charles Perrow describes an extraordinary accident that occurred on Lake Peigneur, Louisiana in 1980. The unlikely coupling of "independent systems" involved an oil rig, a salt mine and the Lake itself. A Texaco drill rig had started work in the middle of the Lake. When the drill had reached a depth of approximately 350 meters, it got stuck, and when pulled loose, the entire rig began to sink. The drillers abandoned the rig, and watched from a safe distance as it disappeared into the Lake. Of course, unbeknownst to the drillers, there was a salt mine below which extended under the Lake. The drill had punctured a section of the mine, effectively pulling the plug on the entire Lake. The whirlpool which formed on the surface sucked in various boats and barges and a tug, and a sizable chunk of a local tourist attraction. Meanwhile, as the salt mine filled with water, the displaced air forced the emergency elevators to the tops of their shafts, and when the mine filled, the water pressure blew a 400 foot geyser. See Perrow, *Normal Accidents*, pp. 251-3.

flooding and Three Mile Island. In the former there is a kind of punctuated event, a rapid deviation from a water level mean that begins, eventually crests, then abates. An act of God, or Nature, according to taste. Three Mile Island doesn't exactly follow this sequence. Certainly it had a beginning. And certainly it reached its maximum proportions in the weeks following, but it is entirely unclear about how one would place the point at which it ended. Erikson, for example, sees that part of the difference between a toxic event, and that of "classical" forms of disaster is in the way that toxic events fail to conform to the rules of plot; that is, the figure of tragedy is itself left incomplete. Beginnings are retroactively constituted. Love Canal is a good example of how toxic disaster begins precisely *because* it really began sometime earlier. And its ending is equally indeterminate. For residents of Love Canal, the events may significantly never end, and for the rest of us, they ended when we forgot to remember them.

But this distinction between the technological and natural is only apparently easy to draw. The obviousness of the difference between a flood and an oil spill is only supported by the superficial opposition that the two terms impose. However, considered at the assemblage level, the flood is as much technological as the spill is natural. And in any case, both could be considered "normal," at least in the sense it has come to be used by Charles Perrow.[23] The normal accident is a term used to describe such

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23 See Perrow, *Normal Accidents*, pp. 15-31.

accidents as Three Mile Island. It is a kind of accident that is inscribed into the design of technological endeavors. When, for example, the safety of a design is given in a proposition such as, "The reactor is expected to operate within design expectations x times out of 100 for y hours or years of operation," the subcontrary of the proposition (some S is not P) is also the case. In other words, to speak of a safety probability, is to have already inscribed the probability for failure. In this sense the accident at Three Mile Island was normal. Yet the same could be said of "natural" events; but for two reasons. The first is quite straightforwardly seen in the periodicity of punctuated events: the Hundred Year Storm, Mount St. Helen's, etc. Such events are both knowable and unknowable simultaneously in much the same way as a reactor failure or an oil spill. The second reason is to be found in the general fuzziness of the distinction between the technological/cultural and the natural. In the case of flooding, one would most certainly have to include in the causal picture many elements that are not at all "natural": patterns of development, deforestation, soil modification, weather patterns, and all the other elements that would constitute the local, regional, and possibly global hydraulic, terrestrial and atmospheric assemblage. As Kai Erikson put it, albeit more poetically, the collapse of a mine shaft in the Appalachia is but the collaboration of a restless mountain and a careless people.[24]

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24 Kai T. Erikson, *A New Species of Trouble: The Human Experience of Modern Disasters*, (New York: Norton, 1994), p. 194. It is an important dimension for Erikson's work on modern disaster that there is no clear ending in the disastrous events. "The feeling of

Yet, unlike Chernobyl, the accident at Three Mile Island is typically understood as having resulted from operator error. Which, as we can see, has an element of truth, but at the same time fails to capture the complexity of the situation. What it does do though, is cut a political and discursive fault line between the improbable *accident that happened* — in the case of the United States — and *catastrophes of the inevitable* — in the case of the former Soviet Union.

To be fair, I suppose, to the category of *catastrophes of the inevitable* we should probably add another species of inevitability — *accidents of the intentional.* For example, from a 1992 report on nuclear accidents:

> The Soviets revealed that they have been dumping radioactivity into the Kara Sea, which connects to the Arctic Ocean, for three decades. Besides four nuclear-powered submarines lost at sea, the Soviets said they dumped four decommissioned naval nuclear reactors in 1965 and 1966, three reactors from the icebreaker Lenin in 1967, a barge carrying a submarine reactor sunk in 1972, and a nuclear-powered submarine jettisoned its reactor core in 1982. Dr. Charles Hollister of the Woods Hole Oceanographic Institution calculates that the soviets dumped about 600

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uncertainty—the lack of a sense of ending—can begin the very moment that the event ought, in logic, to be over." p. 148. And I think this is true, but I also think that of equal importance is the indeterminacy of beginnings. Indeed, for what we will come to around the idea of trauma, the question of beginnings will be of paramount importance.

> million Curies of radioactivity into the ocean, or roughly seven times as much radioactivity as was in the Chernobyl reactor that melted down April 26, 1986.[25]

And as for the other pole of the nuclear imaginary — Hiroshima and Nagasaki — the fact of what happened there remains a kind of impossible idea for Americans. But perhaps more than any other cultural feature of the nuclear age, these unspeakable events made nuclear threat into a set of images seared into the American consciousness like the shadows of humans scorched onto streets and sidewalks of these Japanese cities. The result was, I think, the onset of both a moral malaise, and a nuclear anxiety — an action-goading fear.[26] Somehow the events became personalized in the sense that the world had changed, a certain innocence was lost, and no one — especially given that those who were killed were simply citizens — no one was safe. But the discourse of a malevolent

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25 Peter Montague. "The Year in Review: Nuclear." *Rachel's Hazardous Waste News* 317 (1992). Online. Available: ftp://ftp.std.com/periodicals/rachel. However, this is not to suggest that the (then) Soviet Union has (or had) a proprietary relationship with carelessness. In the same year as this report was released, I note that the US Army admitted having inadvertently shipped a kilogram of plutonium via Federal Express. *Facts On File World News Digest*, Dec. 22, 1994, cited in Peter Montague. "The Fourth Horseman: Nuclear." *Rachel's Environment & Health Weekly* 473 (1995). Online. Available: ftp://ftp.std.com/periodicals/rachel.

26 Spencer Weart, *Nuclear Fear: A History of Images*, (Cambridge: Harvard University Press, 1988).

natural force (so popular at that time), and the harsh reality of threat that it fostered bore witness only to the abstraction of nuclear threat.

In *Nuclear Fear: A History of Images*, Weart gives a remarkable analysis of the manner in which the media and political figures spoke of the bombings. He describes how the bombings were framed as the unleashing of nature, that "something unimaginable had come into the World," and according to Churchill, the bombs were "a revelation of the secrets of nature, long mercifully withheld from man." To his credit, Weart identifies some compelling social and political aspects to the focus on the "Maximum Credible Accident" scenario (the principle scenario used in regulatory controls). The foremost result of this focus is that it resulted in little attention being paid to the accidents that had already happened — accidents that were less than the maximum, but entirely credible. The coupling and complexity type accident exemplified by Three Mile Island was studied far less than the hypothetical "massive incident." This amounts to attempting to define the "Maximum Credible Accident" as part of the predictable operating envelope, but ignores how chaotic, non-linear interactions are in fact the "norm."[27]

Ultimately though I disagree with Weart's position that the anxiety provoked in relation to nuclear practice is an imaginary response — a nuclear fear, as he calls it. His position is that the actual record of, for example, the chemical of mining industries, or damming projects, provide

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27 cf. Weart, *Nuclear Fear*, pp. 305-6.

a much more "reasonable" grounds for anxiety concerning big science and technology. It is because he wants to consider the threats objectively, as element of actual risk, that he reaches the wrong conclusion. On the one hand, he has constructed an extraordinary account of the extent to which nuclear threat is located in the imaginary. His research is vast, and he has touched on the manner in which images of disaster have propagated since the first atomic tests. Yet on the other hand he has failed to see that the reason for the shared imaginary around nuclear threat — out of proportion to its objective body count as it may be — is the result of the nuclear itself. By the same token, my use of nuclear example should not be seen as marking a complete privileging of the nuclear in relation to ecological threat. Without a doubt, the contingency and potential consequences of events such as Bhopal India, Buffalo Creek West Virginia, Mississauga Ontario, and a litany of other mining and dam related accidents, contributes to a social climate in which these threats and incidents are internalized; that is, various representations of them are, even though they may not be objectively arranged.

Now, one could observe that as the bubonic plague rolled through Europe in the seventeenth century no one had a particularly well formed idea of its precise mode of contagion, where it came from, or what initial conditions were required for it to take the form of an epidemic. Nor, for that matter is the contemporary threat of HIV/AIDS understood in a manner "sufficient" to avert its threat. And such observations are certainly appropriate interventions when the line of argument seems to

imply that somehow a technical understanding is necessary to properly understand threat.

I agree that it would seem to be intuitively true that threat need not be understood in order to be perceived *as* threat. But the point here is that the fact of threat perception says nothing of the adequacy of the perception, nor of the social and political transformations brought on by such forms of knowledge.[28] The issue thus becomes a question of what we mean when we say something is *understood*; what, in other words, gets to count (socially, politically) *as* understanding.

To follow this example, when the plague entered Europe, a standard response to the threat of contagion was to lock all doors and windows of those not contaminated, to seal the environment, and to purify the area with ignited perfumes.[29] On the face of it, this is not all that far from lining one's garage with aluminum foil to avert radiation poisoning — a *Popular Mechanics* tip circa 1952.

In the early years of AIDS awareness in North America, transmission, infection, were poorly understood, but there was no ambiguity about the

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28 Clearly what is perceived as "risk" is as highly malleable as it is utterly political. Risk is spoken of socially as though it designates an objective threat. Yet to use a relatively banal example—seat belt law—one sees nothing objective at all apart from a particular schema of understanding, an ordering of reality that constructs risks as such.

29 See Michel Foucault, *Discipline and Punish: The Birth of the Prison*, (New York: Vintage Books, 1979)

threat posed to the breakdown of bodily immunity; this was made clear in a number of ways.

The threats posed by such events as AIDS — the epidemic of signification, as Treichler put it[30] — and the plague draw a host of responses in the name of safeguarding order, and in the name of the functioning of power. In Foucault's analysis (of which I will not say much here) he concerns himself with the functioning of power in response to leprosy, the plague, and their victims. He sees power operating in two registers — distinct though not incompatible — in relation to these two threats. On one hand, the logic of power around the leper constitutes a figure of exclusion. The abnormal individual — the infected body — is swept up into a binary division of dangerous/harmless. On the other hand, the plague elicits a response of disciplining, and of segmentation. In this case, a simple binary distinction of exclusion was an inadequate response to the movement of the plague; it called for multiple distinctions and segmentations, and the parallel development of power apparatuses capable of carrying out such forms of discipline.

In the case of nuclear threat we can see certain analogous movements. The Cold War years are a veritable theme park for the analysis of regimes of disciplining and segmentations. In the cold heat of the *duck and cover* years, the responsible citizen was required to submit to a series of civilian

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30 Paula Treichler, "AIDS, Homophobia, and Biomedical Discourse: An Epidemic of Signification," *October* 43 (1987): 31-70

defense strategies in the name of the threat of a nuclear war.[31] As Diefenbaker put it in 1961,

> Notwithstanding what has been and is being done, nuclear war is possible either by the intended actions of evil madmen or by miscalculation ... your personal survival can depend upon you following the advice that is given and the

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31 The following, a kind of Cold War rumba, was a popular education mantra of the late 1950s. The response to threat was discipline, responsibility, and always, and above all, alertness.

Deetle dum dum, deetle dum dum,
There was a turtle by the name of Bert,
and Bert the Turtle was very alert.
When danger threatened him he never got hurt,
he knew just what to do.
Chorus
Duck, and Cover.
Duck, and Cover.
He did what we all must learn to do,
you and you and you and you:
Duck, and Cover.

Voice-over: Now you and I don't have shells to crawl into like Burt the Turtle, so, we have to cover up in our own way. Paul and Patty know this, no matter where they go, or what they do, they always try to remember what to do if the atom bomb explodes right then. "It's a Bomb! Duck! and Cover!" Now here's Tony going to his Cub Scout meeting. Tony knows that the bomb can explode any time of the year, day of night. "Duck! and Cover! Ataboy, Tony, that flash means act fast!"

Federal Civil Defense Administration, Duck and Cover, Film, (Washington: Archer Production Incorporated, 1955).

> survival of many others may depend on how well you have heeded the advice ...[32]

This is disingenuous, really. He leaves out the other possibility, the possibility that betrays the omnipresence of threat: Us.

Therefore, and retroactively, the formula becomes: nuclear war is possible by either "us," by "them," or by mistake. That pretty well covers all the bases. Hence, the home fallout shelter. Provisions. Education: *duck and cover*. And most of all, there was the instilling into social consciousness of the need, the responsibility, to be always alert. More than the need to be prepared, there was the need to be on guard against the unseen threat of nuclear terror. The omnipresent doomsday clock of the *Bulletin of the Atomic Scientists* ticking ever nearer to the midnight of civilization; the metronome of threat.

But my intention here is not simply to find a parallel to Foucault's analysis of power's response to threat. My point is that in all cases threat makes things happen. And my interest is to consider the case of nuclear threat, and to look at what this particular threat is making happen. But before I can get to this, I want to consider the manner of material that engages in what amounts to a nuclear-economic pleasure principle. Through the reduction of excitation, and the concomitant production of energy, it is matter that, to paraphrase Laplanche and Pontalis, seeks a

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32 Emergency Measures Organization, *11 Steps for Survival: Blueprint for Survival No 4*, (Ottawa: Queens Printer, 1961).

return to the absolute repose of the inorganic. How, in other words, are we to understand that the spontaneous material transformation undergone by radioactive elements results in the emission of radiation?

Matter

A look at the periodic table — essentially the DSM of matter — is useful. Though I must be clear that this table is a shifting map. The ontological shoreline that it figures is subject to constant — though, for the last century, predictable — tectonic shifts. Throughout its history it has been in a state of flux; revisions, refinements, additions. The International Union of Pure and Applied Chemistry — the contemporary body charged with the responsibility of legislating matter in and out of existence — oversees the table. A decade ago when I was an undergraduate there were only 105 approved elements. When I began working on this project in 1996, there are "officially" 109 elements in the world, and as of early 1997, there are 112. There are a number of minor variations on the table's presentation. I have adopted the most common. Most everyone has at one time or another come across this table. What concerns us most here will be the final row, the actinides. But before I get to that, a few words about this elemental map.

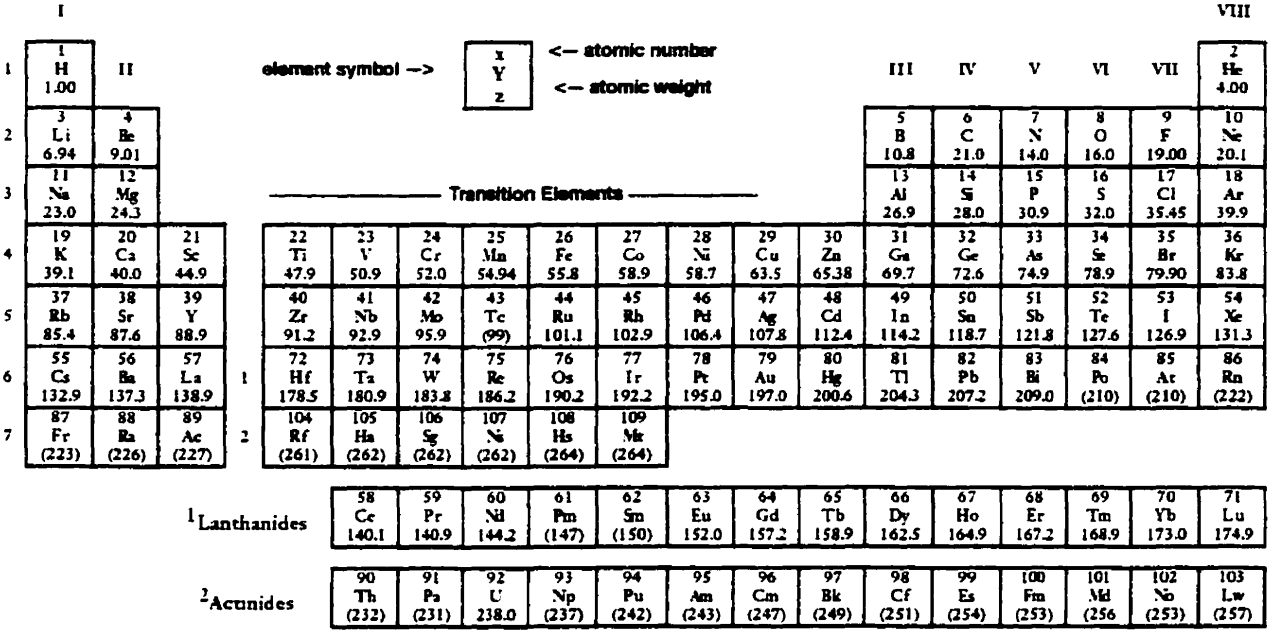

Figure 2. Periodic Table of Elements. Adapted and revised from William H. Brown and Elizabeth P. Rogers. *General, Organic and Biochemistry.*

The Periodic Table — so called since 1869, more or less — is the standard representational tool to present the elements. In a sweeping and less than precise reduction of an enormously complex and fascinating history, its story is as follows.

The desire to account for the fundamental chemical constitution of matter has been alive since at least the time of Lucretius and his *De Rerum*

Natura (~50 B.C.).[33] However, an essential logic of the constituent bits of matter was for a long time elusive; the *res extensa* presented an orderly universe, one that was gradually being resolved through the efforts of science, but the elements themselves seemed difficult to resolve. Following Linnaeus (17 C.), there were attempts to determine a binomial taxonomy of physical/chemical relationships (amongst many other accomplishments, Linnaeus developed the system of classification based on kingdom, phylum, class, order, family, genus and species.) Missing though, according to historians of chemistry, was a concept of element that did not implicitly or otherwise include the compound, and an analogic means for relating these elements. The first problem was resolved by experimentation (heating, dissolving in acid, combining). The second was resolved by arranging the elements according to their mass; this was accomplished through the use of an index element such as carbon or hydrogen.

As the list of known elements grew, it was seen that there were certain repeating patterns, or a periodicity evident.[34] Principle of these would be the discovery in 1817 (owing apparently, though I'm not quite sure how,

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33 Titus Lucretius Carus, *De Rerum Natura. Translated as The Nature of the Universe*, (New York: Penguin Books, 1951).

34 J.W. van Spronsen, *The Periodic System of Chemical Elements: A History of the First Hundred Years*, (Amsterdam: Elsevier, 1969), J.S.F. Pode, *The Periodic Table: Experiment and Theory*, (New York: John Willey & Sons, 1971), J.R. Partington, *A History of Chemistry*, (New York: Macmillan & Co Ltd., 1964), W.H. Brock, ed., *The Norton History of Chemistry*, (New York: W.W. Norton & Company, 1993)

to Goethe's rock collection) by Döbereiner of the calcium triad (calcium, strontium, barium), the subsequent addition of triads by Gmelin, Pettenkofer, Gladestone and Cooke, the set of atomic weights deduced by Cannizzaro, and the so-called 'law of octaves' proposed by Newlands. Indeed, Newlands musical figure of octaves was a Pythagorean insight into this periodicity.[35] The horizontal relations of increasing mass had served to confirm only the distinctness of the individual elements. The periodicity (the repetition of certain properties) melting point, solubility, conductivity, etc. — became evident with a) the idea of series based on distinctness, and increasing mass, and b) when properties were sufficiently known to generate relations of analogy. The octave was an analogical means for describing the relations both within series and analogy. It became possible to see that elements typically differed in series in a predictable manner, and that repetition of properties differed as well in a likewise predictable manner.

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35 I note—so to speak—with perverse interest that it is now generally conceded amongst physicists that the universe does in fact generate a particular *music*. Hydrogen, the dominate material in the universe, emits a sound frequency of 1420 megahertz—the precession of the spin of its electrons. Doppler permutations, together with the natural harmonics of this frequency make up a good deal of the noise generated in space. see Lawrence Krauss, *The Physics of Star Trek*, (New York: Basic Books, 1995), p. 129.

The ghost of Ockham loomed large over the entire field for quite some time before Mendeléev, a Russian chemist working in Germany, came upon a working version of the periodic law.[36]

Essentially the "law" states that the properties of elements are a periodic function of atomic weight. Following Mendeléev's table, there was a complex growth of work and a resultant Kuhnian accumulation of exceptions and anomalies.

Twentieth Century electron theory was the razor that made it possible to look at the table as having depth, a dimensionality. And it also resolved many of the anomalies that challenged the octave configuration of the table.

The basic relationship of periodicity was conserved, but the sequence of linear periodicity became 2, 8, 8, 18, 18, 32, 32, and the table was rearranged accordingly. This conception of period was founded by a more elaborate idea of the atom; specifically, one that conceives of the atom as being composed of a positively charged nucleus, and negatively charged electrons. And further, that electrons of given elements were organized into discrete orbital energy patterns. The patterns correspond to energy levels, and can be visualized as discrete, concentric shells encircling a nucleus. Each shell may accommodate a fixed number of electrons. The

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36 Mendeléev published his work in a paper to the Russian Chemical Society in March, 1869. "The Relations of the Properties to the Atomic Weights of the Elements." Collected in *Selected Reading in Natural Science*, (Chicago: University of Chicago Press, 1947).

filling of electrons about the nucleus was shown to follow a specific pattern, one that followed the progression of atomic weight, and most importantly, one that provided a new theoretical foundation with which to conceptualize horizontal and vertical relationships within the table.[37] The shell configuration of atoms became the principle explanatory feature of elemental properties.[38]

For example, column VIII of the table, the monatomic gasses, are placed at the end of periods 1 to 6. What had historically united these elements vertically is that each had similar characteristics of a discrete elemental gas. What electron theory showed was that this similarity was an

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37 These relationships include the following: atomic radius decreases as you move right; metallic properties decrease as you move right; atomic radius decreases as you move down; metallic properties decrease as you move down; atomic number increases as you move right; ionization energy increases as you move right; atomic number increases as you move down; and, ionization energy decreases as you move down.

38 There are seven energy, or quantum levels, each representing a particular energy state. Each level can accommodate a fixed number of electrons. The relationship between energy level and number of possible electrons is expressed as $2n^2$, where n is equal to the number of the level. Thus, energy level one can accommodate 2 electrons, level two can accommodate 8, and so on. Within each energy level (above one), electrons occupy specific, and again, discrete orbitals. Orbitals are named *s*, *p*, *d*, and *f*. Each orbital can accommodate a fixed number of electrons to a maximum characteristic for a specific energy level: s=2, p=6, d=10, f=14. So, energy level one, which we know (via $2n^2$) has a maximum of 2 electrons, has only an *s* orbital. *P* electrons are only added after the *s* orbital is filled, and *d* electrons only after *p*. (There are exceptions to this, but it needn't concern us here; the basic rule is that as each electron is added, it assumes the next available orbital of the lowest energy. (The actual filling order is: 1s, 2s, 2p, 3s, 3p, 4s, 3d, 4p, 5s, 4d, 5p, 6s, 4f, 5d, 6p, 7s, 5f, 6d, 7p.).

expression of having identical outer shell electron configurations. Specifically, the monatomic gasses have their outer shell comprised of filled *s* and *p* orbitals (*s* only, in the case of Helium). The relation of analogy was thus transformed into one of homology. The horizontal series relationship can be restated as *each element differs from its immediate neighbors by the presence or absence of a single electron*.

One could think of all of this as a kind of electron constructor kit. We begin with Hydrogen, the element with the simplest atomic structure. Because of what we realize about the orbital configuration of atomic structure, the next horizontal relation is helium, and it is located at the far end of the table. Their significant difference amounts to a single electron, and collectively amount to the filling of the innermost energy level with the two electrons it can accommodate. Add a single electron to Helium, and the result is Lithium (*2s, 1p*).

The elements that are of interest to us (as to the nuclear industries) are those that appear in the series called the actinides. Together with the lanthanides, they comprise what is called the inner transition elements. The actinides are the unstable elements — the radioactive group. Only the first three (Th, Pa, U) are known to occur naturally (i.e., unassisted). The rest are produced through experimental procedures. One notes that this, the seventh period, is incomplete. It is anticipated that the rest of the 32 elements that would be required to fill the period are simply yet to be synthesized.

The strange alchemy of decay

It comes from outer space, the ground, and even from within our own bodies. Radiation is all around us and has been present since the birth of this planet.
Environmental Protection Agency — *Radiation: Risks and Realities*

The vast majority of elemental matter on earth is of a stable configuration.[39] Spontaneous changes and transformations are the exception. Matter in a stable configuration can be understood as a mingling of (nuclear and electric) forces in equilibrium. The principle atomic constituents subject to these forces are the nucleons of atoms (the most basic of which are positively charged protons, and neutrons) which collectively constitute the always positively charged atomic nuclei. And surrounding this are the negatively charged electrons. The ratio of charges tends to be at unity.

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39 The following discussion relies mostly upon my memory of physics and chemistry classes. There are numerous basic sources for this sort of information. Two reasonably good ones are: Richard Wolfson, *Nuclear Choices: A Citizen's Guide to Nuclear Technology*, (New York: McGraw-Hill, 1991), and League of Women Voters, *The Nuclear Waste Primer: A Handbook for Citizens*, (New York: Lyons and Burford, 1993).

The forces that are most active within the atomic nuclei are of two sorts: *nuclear* force is a strong force that binds together atomic nucleons, and operates only over very small distances, and *electrical* forces which, though weaker, operate over greater distance. If one thinks of a chemical reaction, say, burning coal, the kind of rearrangement of matter that takes place — oxygen + carbon → heat energy + carbon dioxide — involve changes at a molecular, but not atomic level. In other words, a new *chemical arrangement* has been made but the constituent bits of matter are unaltered. The principle forces at play are of a weak electrical nature, and the resultant energy potential is relatively small. However, when reactions take place such that the nuclei of atoms are altered, when the number of protons and neutrons are changed, the resultant release of energy can be staggering, and the matter itself, so to speak, speciates.

The products of such a process of atomic reorganization are of two sorts. The "new" matter is called an isotope, and the leftover bits are called the decay products. Isotopes can be either stable or unstable. If stable, they are subject to chemical interactions, but not to spontaneous nuclear ones. All elements greater than atomic number 83 (Bismuth) are unstable and thus all of their isotopes are unstable as well. The heaviest naturally occurring element — that is, with the largest nucleus — is uranium (atomic number 92). All elements heavier than this must be produced by technical means. The rule seems to be that the larger the atomic nucleus, the less stable is the atomic structure. Thus for element 109, Unnilennium, the length of time for which it remains intact is on the order of .005 seconds.

The question of stability of a radioactive element or isotope is a relative one. On the one hand there are elements such as Unnilennium that can *exist* for a fraction of a second. While on the other, there are elements such as uranium-238 that take on the order of 4.5 billion years to only partially decay. The manner in which this is conceptualized is the "half life." Simply put, the half life is the length of time it takes for *half* of a sample of unstable atoms to decay. Much like the LD50 concept in biological science, it is a statistical concept applicable to aggregates only. The products of decay, the bits that are ejected from the nuclei of unstable atoms, are the remainder of this process in which matter attains stability. What makes the remainder of this process dangerous, what in other words constitutes the threat of this matter, is its potential to ionize; which is to say, strip electrons from atoms or molecules that it encounters. It is precisely this ability to ionize that describes the manner in which the remainders of decay can cause carcinogenic, mutagenic, and teratogenic changes to living tissue.

The Alpha (α) *particle.*

The most massive and densely ionizing of decay products. It is a manner of decay that allows an unstable atom to rid itself of excess protons. A single α particle is comprised of two protons, two neutrons, various subatomic denizens, and a single pathological drive: to lose its double positive charge through the appropriation of otherwise engaged electrons. Helium envy; the alpha particle is simply a helium nucleus minus the electrons.

Traveling at some 10,000 miles per second, the α particle — even though it can travel only a fraction of a millimeter within organic material — crashes into one hundred thousand or so atoms before arriving *home*, as it were, in a stable helium configuration. Damage done as a result of the forced ionization is dependent upon the particular tissue(s) involved.

The Beta (β) *particle.*

Another product of nuclear decay, it is composed of a single electron jettisoned at 150,000 miles per second from the nucleus of nuclear material in the process of decay. As electron, it carries a negative charge. The beta particle is as close to nuclear alchemy as I can imagine. It poses the question, How does a nucleus expel an electron? (since electrons are found outside of the nucleus). The explanation is apparently that a neutron *just* spontaneously transforms into a proton and an electron, keeps the proton, and jettisons the electron. In any case, β particles, like their alpha kin, ionize whatever atomic material they encounter. Since both the mass and charge of the β particle are less than that of the alpha particle, its behavior is different. On the one hand, the extent of the ionizing of which it is capable is less. However, because of its lower mass, the distance it travels before it regains a stable configuration with a positive ion is at least an order of magnitude greater (i.e., up to half an inch of tissue). In other words, it can penetrate further, but will lead to less ionizing damage.

Gamma radiation.

The third principle mode of decay, gamma radiation is non-particulate. It is purely high-energy photons that are produced in the process of nuclear decay. As photon, gamma radiation has no mass, and no charge and thus has much greater penetration potential than either α or β particles. The damage wrought by gamma radiation is as a result of its action *on* particles. The high energy of gamma radiation can displace cellular electrons, effectively creating β particles (and other masses such as positrons) which in turn can do their ionizing damage to tissue and cells.

A simplified typical decay sequence (showing only the primary decay products) is as follows:

$$^{238}_{92}U\ \alpha \rightarrow {}^{234}_{90}Th\ \beta \rightarrow {}^{234}_{91}Pa\ \beta \rightarrow {}^{234}_{92}U\ \alpha \rightarrow {}^{230}_{90}Th\ \alpha \rightarrow {}^{226}_{88}Ra\ \alpha \rightarrow {}^{222}_{86}Rn \rightarrow [\ldots]\ {}^{206}_{82}Pb$$

Beginning with U-238, a naturally occurring uranium, the process of decay results in alpha emission. The product of reducing a uranium atom by two protons and two neutrons is thorium (half-life, 24.1 days). Thorium typically undergoes beta decay, which from the point of view of the decay products, creates an element with one additional proton — protactinium (half-life, 1.2 minutes). Also a beta emitter, protactinium decays to another uranium isotope (i.e., same atomic number, same number of protons, but different overall mass). This process continues through another twelve decays until a stable configuration of lead-206 is

reached. One could think of these intermediate elements as (strange) attractors, regions of organization with varying degrees of stability.[40]

The manner in which the energy of decay products and their remainders is quantified oscillates around a kind of subject/object split. On the one hand, there are scales that are concerned solely with the number of disintegrations a particular sample of material will undergo in a given period of time. The curie, or in more contemporary parlance, the becquerel, are such scales. The concern is the radioactive object and not the body. The potential is only its activity, the rate at which a radioactive material decays.

In order to speak about the effect that radioactive decay has on a body, one must know more than the disintegration rate. In addition, one must know the *kind* of disintegration, and its energy level. The units typically used to describe the rate at which tissue absorbs radiation are rads (radiation absorbed dose) — that refer *only* to the extent of tissue absorption (per gram) of energy deposited by various high-speed particles and gamma rays. In this sense, rad and greys (100 rads) are significantly less assumption-bound than units such as the rem. The rad and the roentgen

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40 One could wonder if there will be elements, yet to be synthesized (i.e., with an atomic number greater than 109) that will demonstrate a stability. In other words, whether the periodicity of matter will demonstrate similar regions of stability in a manner analogous to that shown by the logistic equation (i.e., the difference equation used historically in population ecology: $x = r\,x(1-x)$). See James Gleick, *Chaos: Making a New Science*, (New York: Penguin Books, 1987), for a history of this equation and its relationship to non-equilibrium systems.

are similar in this respect. Rems (roentgen equivalent man), relate the absorbed dose to the effective biological damage in living tissue. But in order to do so, one must have some conviction with respect to the probabilistic basis for various sorts of tissue sustaining damage from certain levels of energy absorbtion. In other words, units such as rems or sieverts (100 rems), or effective dose equivalent are, in addition to an expression of a quantity of energy absorbed, an expression of what we believe to be their effect on tissue.[41]

All of this atomic activity, even as I attempt the routineness of its language, is just too small, too strange to be much more than an article of faith. In the absence of a direct experience, the science fiction of decay inhabits a region below a threshold. Its existence must be granted, and agreed upon by purely symbolic means.

Now it is time to visit the desert. For it is here that we find a figure that gives a form to some of the concerns that have been raised thus far: waste, the nuclear, the accident, and ecological threat. Or perhaps better put, a figure that allows us to convey the complexities and dynamic relations of the encounter between the content of ecological threat (understood

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41 In the health sciences, these units have been replaced by the SI (i.e., metric) units, gray and sievert. See John W. Gofman, and Egan O'Connor. *Answers to Frequently-Asked-Questions about "Radiation"*. 1996. Online. Available: http://www.ratical.com/radiation/CNR/radFAQ.html#A14.

minimally in its (im)material materiality), and the various modes of its expression (political, juridical, social, scientific). A slow-motion catastrophy, as Baudrillard might put it.

TWO

THE DESERT

Desert: luminous, fossilized network of inhuman intelligence, of a radical indifference — the indifference not merely of the sky, but of the geological undulations, where the metaphysical passions of space and time alone crystallize. Here the terms of desire are turned upside down each day, and night annihilates them. But wait for the dawn to rise, with the awakening of the fossil sounds, the animal silence.
Jean Baudrillard — *America*

The Secret

THUS far I have been talking about waste and containment, problems and solutions, accidents (normal, natural, and technological), and about the perception of threat and the particularity of the nuclear. And I have attempted to outline the terrain of what we might call the ontological map of nuclear matter, and the *abécédaire* of its products. Now I would like to begin to introduce a place and a project that amounts to a (perhaps) unlikely, though thoroughly real coincidence of these concerns.

This desert of Baudrillard's, reading, as it does, like Rimbaud on holiday (*from the bituminous desert ... with sheets of fog spread in frightful bands across the sky*), is a very serious place. It is a place filled with signs; it captures the future of the social — its catastrophy — in the indifference of geology. Yet the desert I am concerned with should probably not be confused with *le désert* of Baudrillard. Such a place is for Baudrillard merely a form; the desert organizes features of surface, and superficiality.

> Why ... are the deserts so fascinating? It is because you are delivered from all depth there — a brilliant, mobile, superficial neutrality, a challenge to meaning and profundity, a challenge to nature and culture, an outer hyperspace, with no origin, no reference points.[42]

Perhaps to Baudrillard's Euro-dandyism the desert can work this way. It is a tempting leap from the sand and the dunes of the desert to the Sands, and the Dunes, of Las Vegas. But the desert is more than a metaphor. To see its shifting, flat and mobile brilliance one must get out of one's vehicle; a move I suspect Baudrillard never attempted. Baudrillard *the Desert Rat*, as Genosko calls him, was, after all, only a tourist.[43]

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42 Jean Baudrillard, *America*, (London: Verso, 1988), pp. 123-4

43 See Gary Genosko, *Baudrillard and Signs: Signification Ablaze*, (New York: Routledge, 1994), pp. 117-29.

The desert I am interested in is a desert filled with spatial and temporal depth. It is an ecological and ontological space. A tricky place, brimming full of emptiness. This is a desert that belies Baudrillard's claim of "no monuments, no depth."[44] For in this desert there will be a monument, and there will be unfathomable depth. This desert that I am interested in will be a place that will house an enormous secret; a secret that must be kept, and always disclosed — simultaneously.

In a way this is a sure bet. That is, there is a sense in which this requirement for secrecy and disclosure will most certainly be met — for at least two reasons. The first, cynical. And the second, to do with the necessarily social aspect of secrecy. Cynically speaking, there is no particularly good reason to assume — operating as it will at the limit of technology, the limits of history, and the limit of time — that the secret could possibly remain intact. And perhaps this isn't cynical at all, perhaps it simply involves the sense that as a limit project, failure and certainty are asymptotically related.

But in another sense, secrets are just like that; that is, they tend to secrete. Theorists of the secret Deleuze and Guattari have put it this way:

> The secret has a privileged, but quite variable relation to perception and the imperceptible. The secret relates first of all to certain contents. The content is *too* big for its form ...

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44 Baudrillard, *America*, p. 123

> or else the contents themselves have a form, but that form is covered, doubled, or replaced by a simple container, envelope, or box whose role is to suppress formal relations.[45]

And furthermore, "these are contents it has been judged fitting to isolate or disguise for various reasons."[46] So far so good. The secreted materials, the contents in this case, have a very slippery relationship to their form. In a sense the materials themselves are not dangerous; it's what is expelled that is. On the one hand, without the particularity of the contents, the material could not have the actual form that it has, but on the other, the form is only probabilistic, related back to the state of the contents at a given moment. Thus the form and the contents operate in a kind of mutual arrangement; an arrangement that can only be known through some kind of disclosure or leak.

> [T]he secret has a way of spreading that is in turn shrouded in secrecy. The secret as secretion. The secret must sneak, insert, or introduce itself into the arena of public forms: it must pressure them and prod known subjects into action.[47]

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45 Deleuze and Guattari, *A Thousand Plateaus*, p. 288.

46 Ibid.

47 Ibid. p. 287.

Thus secrets can never be perfectly secretive. Consider the example of stealth aircraft offered by Baudrillard. A stealth fighter or bomber is paradigmatically a contents that presents *no* form — this is what allows them to remain unseen, the precise opposite of a decoy. Indeed, as Baudrillard points out, early versions of these aircraft were so transparent, so invisible that they were unable to locate even themselves (resulting in several rather expensive crashes). These prototypes were too secretive. There has to be some relationship to perception — "something must ooze from the box," say Deleuze and Guattari. Or, from Baudrillard's perspective, "as is well known, when playing hide-and-seek, you should never make yourself too invisible, or the others will forget about you."[48] And this, he surmises, is the reason why the stealth — even though it was a "high level" secret — was presented to the public to begin with.

We could see a similar pattern in the need to secret nuclear waste. Indeed, there was a point in the initial planning phases of the project in the early 1980s, when a null hypothesis — the option of not marking the waste at all — was given some fairly serious consideration. The idea being that if it were really well hidden, and hidden in a place that no one would

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48 Jean Baudrillard, *Cool Memories II*, (Durham, NC: Duke University Press, 1996), pp. 14-15. This is not, however, to align Baudrillard with Deleuze and Guattari with respect to their conception of the secret. Elsewhere, particularly Jean Baudrillard, *Seduction*, (Montréal: New World Perspectives, 1990), he pretty well makes it clear that the secret is a kind of pact in which the contents of the secret is secondary, or even incidental to the keeping of it, to its remaining unspoken. See pp. 79-81.

ever think of looking for anything else, then the safety of the present and the future would be secured. Yet by 1985, the possibility that a disposal site could be designed without a permanent marker system was specifically excluded by the Environmental Protection Agency ("*Disposal sites shall be designated by the most permanent markers*"). If, in other words, the wastes were hidden too well, we might forget that it was there, and discover either it, or its secretions by "accident."

This is the figure, then, of the secret in the desert: a material with contents too big for its form. It is a container of secrets that exceed itself. It is in this sense that the "significant" part of nuclear material is its own remainder. And we can see that the secret has a third term. It is not a question of an opposition between the secret and its perception. The secret is not simply opposed to its disclosure. To paraphrase Deleuze and Guattari, the secret must move through society as a fish through water, but on the condition that society behave toward the secret as water to fish. The secret thus is a social function, a social assemblage.

One could say that rather than one, we in fact have two secrets. On the one hand the burial, and on the other, the sign. The burial of the waste operating as the justification for the design and placement of the marker. And the marker operating as the (ethical) alibi for the interment of the waste. Both concealing a secret operation, and each operating as the standard-bearer for the other. The marker, as we will see, will operate through the deployment of "enduring signs of danger" to signify the danger below. Yet the precise nature of the danger is incidental to the

intention of the sign. The signification of this sign, its contents, must exceed in every imaginable way, its form as monument. In a sense then, the sign's real function is to efface the burial — this is the secret of the sign. The sign's double mission: efface the waste, and remain "dangerous." And the burial, ostensibly the thing that supports the sign, is allowed to remain in secrecy.[49]

Deleuze and Guattari note that as a social function, every secret operates between two discreets/discretes (*discrets*): influence and doubling, secretion and concretion. They describe the operation of secret societies as always involving a more secret hindsociety (which perceives the secret — Manhattan Project?), and as always having its own (secret) mode of action (secret languages, etc.) which facilitates its movement through society.[50] A bit paranoid, perhaps, but I think we will see that the political, scientific, technical, and juridical dimensions of this project in the desert will resonate with this dual aspect of the secret.[51]

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49 One only has to start inverting some of the presupposition behind these operations to see how, at this level at least, the whole thing might fail.

50 Deleuze and Guattari, *A Thousand Plateaus*, p. 288.

51 See particularly my description of the *atomic priesthood* (below, Chapter Four) in relation to the dual aspect of the secret.

The Desert

It is said that the desert is perhaps a good place to hide things. A lot of people are counting on this. Somehow it is thought that the desert is a good place — a particularly good place — to keep a secret. There will be a burial there, and there will be a grave stone, *lest we forget*. The cadaver in this case will take a great deal of time to decompose. Millennia; too long to comprehend, really. At least too long in the sense that once a duration becomes of a certain magnitude it becomes more or less analogous with forever.

The gravestone must signify with an intimate fascination its eternal bond with what will lie bellow. But it must signify its own indifference, for it must not exalt. It must monumentalize and demote. Mark, and dismiss. It must say *look, over here, lies nothing*, or, *this is significant, it must be ignored.* It is a very complicated sign and even if it never gets built, it is a rich figure to help us imagine the contours of threat. The place is Carlsbad, New Mexico (Figure 3).

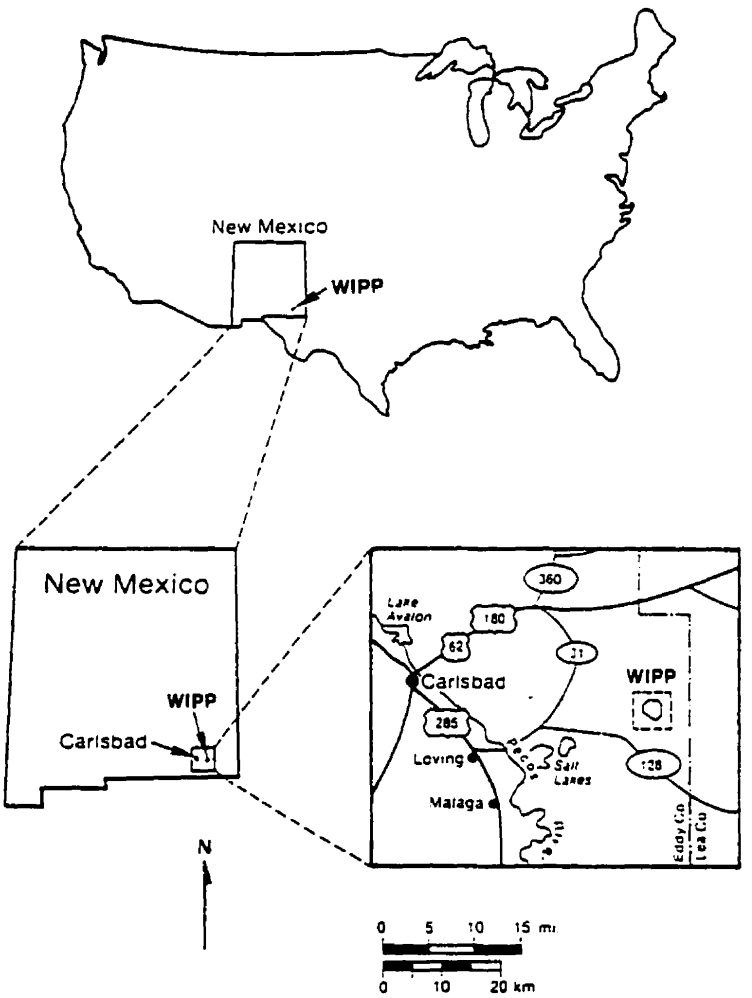

Figure 3. Map showing location of the Waste Isolation Pilot Project. Reproduced from Trauth, et al. *Expert Judgment on Markers to Deter Inadvertent Human Intrusion into the Waste Isolation Pilot Plant.* p. 1-2.

Never having visited the site, I am forced to rely on other sources for descriptive purposes. Alan Burdick's piece from *Harper's* has been particularly evocative. He describes his visit thus:

> One morning last January I stood in a wire-cage elevator and watched the sky dwindle to a pinpoint. On my head was a hard-hat, a headlamp, and goggles; on my belt, an emergency oxygen kit; in my fist, an amulet of sorts, a numbered brass tag given to me for "identification" — required in the event my corpse were to be burned beyond recognition in a flash fire.
>
> The descent lasted several minutes. When the cage finally shuddered to a halt, it opened onto a bright corridor 30 feet wide and 13 feet high. The vast hall had been machine-carved from the salt beds lying 2,000 feet beneath southwest nowhere, New Mexico, about a forty-five-minute drive east from the struggling tourist town of Carlsbad. Engineers wearing blue coveralls zipped past in industrial golfcarts. My swaggering young tour guide, Craig, commandeered one of the small vehicles and speed us beyond the bustle, deep into miles of empty tunnels and alcoves. The place might have been an unending underground parking garage or a most

cavernous mausoleum, but, in fact, it was nothing so benign.[52]

The facility is close to Alamogordo, New Mexico, the site of the first nuclear detonation of July 16, 1945. Trinity, it was called.[53] Carlsbad itself is not the site of a detonation. It is the site of a vast, underground storage facility. And if it ever opens — and it now seems it will — it will permanently store somewhere in the neighborhood of 900,000 specially

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52 Alan Burdick, "The Last Cold-War Monument: Designing the keep out sign for a nuclear-waste site," *Harper's* 289.08 (1992): pp. 62-67, p.61.

53 Project Trinity was the name given to the war-time effort to produce the first nuclear detonation. Three weeks following the Trinity detonation, on August 6, the first uranium-fueled nuclear bomb, a gun-type weapon code-named LITTLE BOY, was detonated over the Japanese city of Hiroshima. On 9 August, the FAT MAN nuclear bomb, a plutonium-fueled implosion weapon identical to the TRINITY device, was detonated over another Japanese city, Nagasaki. Two days later, the Japanese Government informed the United States of its decision to end the war. On September 2, 1945, the Japanese Empire officially surrendered to the Allied Governments, bringing World War II to an end. See Carl Maag, Steve Rohrer, and U.S. Defense Nuclear Agency. *Project Trinity: 1945-1946*. 1982. Online. Available: ftp://uiarchive.cso.uiuc.edu/pub/etext/gutenberg/etext96/prjtr10.txt. Rarely were the names of detonations so loaded, as it were, as Trinity. Indeed, these names themselves would make an interesting study. In my list of detonations between 1945 and 1994 (which, although it runs some 43 single-spaced pages, is no doubt rather conservative) there is a decided preference (in US detonations) toward naming after Westernized Indian tribal names, the names of foreign cities, and scientists. See Oklahoma Geological Survey Observatory. *Catalog of 1900+ known nuclear explosions*. 1994. Online. Available: gopher://wealaka.okgeosurvey1.gov:70/00/nuke.cat/nuke.cat.under.construction.

designed drums of plutonium-based, military nuclear waste. Transuranic waste, TRU, as it is known.[54] Waste in the transuranic category may be liquid or solid, but generally consists of contaminated protective clothing, tools, glassware, and equipment; in a word, dross.

TRU is taken to be distinct from High Level Waste (HLW), and Low Level Waste (LLW). HLW, exceedingly dangerous material, is principally spent radioactive fuel rods from commercial and military reactors. TRU is any waste that is heavier than Uranium. And LLW is any waste that does not fall into either of the preceding categories. Specifically, TRU is made up of all radioactive isotopes that have an atomic number greater than that of Uranium, and a decay rate of greater than 100 nanocuries per gram (100 nCi/g); that is, if one billionth of a curie is 37 disintegrations per second, 100 nCi is equivalent to 3700 disintegrations per second. In an article written for *Smithsonian*, Jeff

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54 see *Transuranic Waste Transportation Handbook*, Southern States Energy Board, 1994.

The principle Transuranic Elements and their most stable isotope:

Neptunium	Np-237
Plutonium	Pu-244
Americium	Am-243
Curium	Cm-247
Berkelium	Bk-247
Californium	Cf-251
Einsteinium	Es-254
Fermium	Fm-257
Mendelevium	Md-258
Nobelium	No-259

Wheelwright puts the distinction between types of nuclear waste quite clearly:

> If all radioactive waste emitted the same kind of radiation at the same rate and for the same length of time, there would be less confusion and antagonism over disposal. People tend to mix up the three important characteristics, which are activity, volume and longevity. The single best measure of a waste's hazard is its (radio)activity, not its volume or half-life. Thus low-level waste has a high volume but a low activity and for the most part a short half-life. High-level waste packs high activity and long life into a relatively small volume. And though TRU is mostly low-volume, low-activity, its extremely long life magnifies the threat in another dimension.[55]

The Waste Isolation Pilot Plant (WIPP) is the name given to this underground facility in New Mexico. This site has been prepared for disposal of certain kinds of defense nuclear wastes, beginning as early as the end of 1997. The wastes in questions are of two sorts. Some are simply left over from nearly five decades of nuclear weapons research and

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55 Jeff Wheelwright, "For our nuclear wastes, there's gridlock on the road to the dump," *Smithsonian* 26.2 (1995)

production at sites across the country. But the bulk of the waste destined for the WIPP has yet to be produced.[56]

When and if approval is given, wastes will be shipped in specialized containers by truck to the WIPP. The WIPP, it is said, will be authorized to receive only materials in the specific category of transuranic wastes. As it stands, no wastes from commercial nuclear operations are to go there, nor any manner of waste defined as "high-level," or "low-level" wastes.[57]

The WIPP site sits on a 16-square-mile tract of federal land in the arid rangelands of southeastern New Mexico. Fewer than 30 people live

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56 Contrary to popular belief, military nuclear materials are proliferating, not decreasing. From the Bulletin of the Atomic Scientists: "While it is generally believed that the future U.S. nuclear stockpile will number 3,500 warheads under the Strategic Arms Reduction (START) Treaty, the truth is that the Clinton administration is planning for a stockpile more than twice as big--closer to 7,500 warheads. These figures were part of the Defense Department's Nuclear Posture Review (NPR), released on September 22, 1994, establishing the missions and levels for U.S. nuclear forces through the year 2003. The discrepancy results from non-strategic warheads (which do not fall under START II), spares, and a "shadow stockpile" or "hedge" of 2,500 warheads. The hedge is an under-emphasized but important subtext of the NPR. The Pentagon has kept its plans about this shadow stockpile very secret, but because its size and composition have a large bearing on many key questions, it demands greater public examination." William M. Arkin, and Robert S. Norris. "U.S. nuclear weapons stockpile, July 1995." 51.4 (1995). Online. Available: http://www.ratical.com/radiation.

57 See, for example, U.S Department of Energy. *Backgrounder #1 What is the Waste Isolation Pilot Plant?* 1996. Online. Available: http://www.nsc.org/ehc/wipp/whatwipp.htm.

within 10 miles of it. Approximately 50,000 people live in Eddy County (Figure 3), about half of them in the town of Carlsbad, 26 miles west of the WIPP.

The above-ground complex of buildings at the WIPP site is organized around by a high-tech Waste Handling Building, where the 10-ton waste containers will be unloaded, inventoried, inspected, and prepared for underground disposal. The complex includes a health physics laboratory, an exhaust filter building, and emergency electric generators, and various office buildings. The site has its own fire department, ambulance service, and mine rescue capability. Four vertical shafts allow access and ventilation to the underground portion of the WIPP.

The transuranic waste disposal process that ends in this underground repository is regulated and overseen by many government agencies under many laws. The facility must meet all of EPA's standards, not just for radiation safety, but for all other kinds of environmental protection. Transportation safety is regulated by the Department of Transportation and the NRC, and mine safety by the Mine Safety and Health Administration. The State of New Mexico regulates the hazardous chemicals in the WIPP waste, and oversees technical aspects of the WIPP through an independent, legally mandated Environmental Evaluation

Group. Transuranic waste shipments are also subject to certain requirements in the state and local jurisdictions they pass through.[58]

One may be curious why the desert was chosen for the placement of this waste. After all, we usually hear of storage proposals relating to deep, old and stable rock formations. Yucca Mountain, for example, or the Canadian proposal for deep burial in Precambrian geological formations.[59] The feature of the particular area of desert that has been chosen that makes it attractive is salt. The vast sodium chloride formations near Carlsbad were deposited through the evaporation of the Permian sea (late Paleozoic, some 255 million years ago). The salt formation at the disposal site begins about 250 meters below the surface, and extends down some 600 meters (Figure 4).

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58 U.S Department of Energy. *Backgrounder #1 What is the Waste Isolation Pilot Plant?* 1996. Online. Available: http://www.nsc.org/ehc/wipp/whatwipp.htm.

59 See, for example, AECLs Impact Statement for the Canadian disposal scenario. Atomic Energy Canada Limited, and Ontario Hydro, *Environmental Impact Statement on the Concept for Disposal of Canada's Nuclear Fuel Waste*, (Ottawa: Atomic Energy Canada Ltd., 1994).

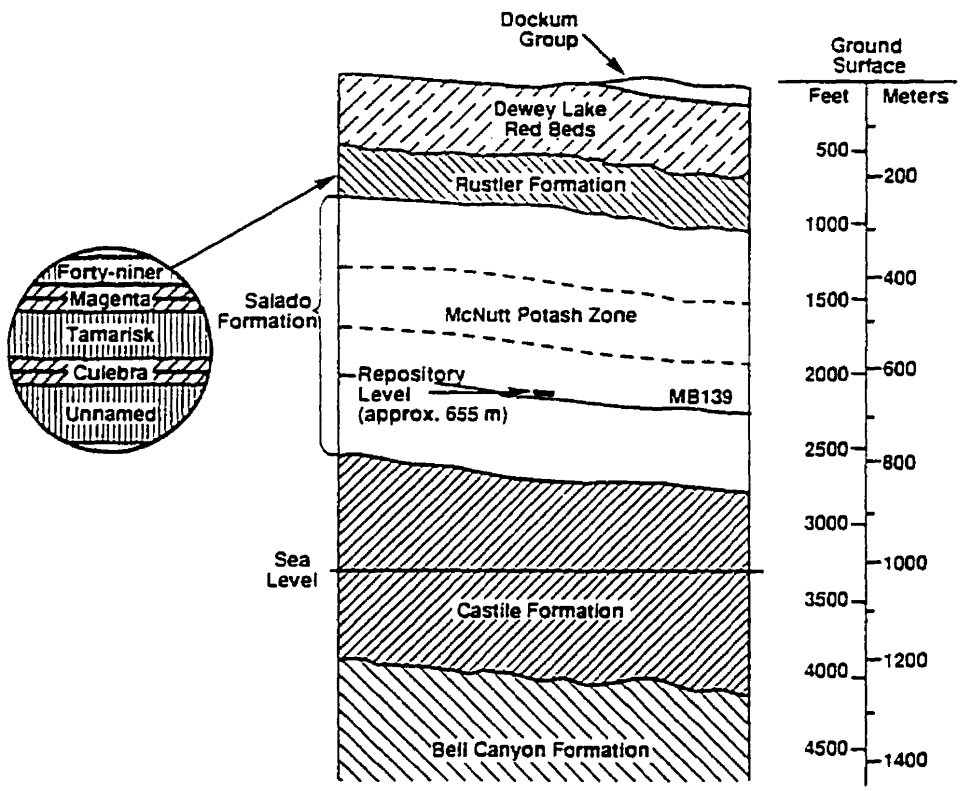

Figure 4. Generalized stratigraphy of the Waste Isolation Pilot Project. Reproduced from Trauth, et al. *Expert Judgment on Markers to Deter Inadvertent Human Intrusion into the Waste Isolation Pilot Plant.* p. 1-2.

And the answer to the somewhat vexing question of why salt is being used for defense-related, transuranic waste, when deep plutonic formations are apparently the preferable formation for high-level wastes is that most deposits of salt are found in highly stable geological areas with very little earthquake activity, hence assuring the stability of a waste repository. (This of course assumes geologic and volcanic science might have a role as predictive, as opposed to explanatory sciences, but nonetheless.)

An important feature of salt deposits is that they demonstrate the absence of flowing fresh water that could facilitate the movement of waste to the surface. The very presence of salt in formation demonstrates the absence of flowing water. Salt also has a high plasticity making it both relatively easy to mine, and making it prone to "heal" its own fractures.

This plastic quality of salt is conceptually knitted into the design of the site; that is, unlike chambers excavated within rock, the salt formations will, over time, encase the mined areas (and containment rooms), and, ideally, seal radioactive waste from the environment. The persistence of this formation is given to be strong evidence that geological and hydrological activity (earthquakes, subsurface water flow) are a minimal risk to the integrity of the site over the period of time being considered. The Department of Energy sums it up as follows:

The proven stability over such a long time span offers the predictability that the salt will remain stable for a comparatively short quarter million years. That's about how long the WIPP-bound waste will take to lose most of its harmful radioactivity and no longer be a threat to the environment. At the depth of the WIPP repository, the salt will slowly encapsulate the buried waste in the stable rock. Relatively small amounts of brine, salt-saturated water, were trapped in the formations millions of years ago. Moisture and salt molecules in the brine will help the recrystallization process to naturally encapsulate the waste in the salt. Meanwhile, salt rock also provides shielding from radioactivity similar to that of concrete. The mission of the Carlsbad Area Office is to protect human health and the environment by opening and operating the WIPP for safe disposal of transuranic waste and by establishing an effective system for management of transuranic waste. Stable salt formations offer an excellent repository medium.[60]

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60 See U.S. Department of Energy. *Fact Sheet—Why Salt?* 1995. Online. Available: http://www.wipp.carlsbad.nm.us/.

Transuranic Disposal

Transuranic waste is difficult material. In a certain sense it is no more radioactive than low-level waste. However, as mentioned above, it is profoundly persistent, remaining radioactive for many thousands of years. It is for this reason that such a great deal of energy and money has been invested in working out a scheme to isolate this stuff in the name of future generations.

The U.S. Department of Energy (DOE) operates the WIPP, aided by the Westinghouse Electric Corporation, the principal contractor. Wastes are to be shipped to the WIPP from 10 major Energy Department sites from South Carolina to Washington State, in something on the order of 40,000 shipments over 35 years.

The waste to be interred at WIPP will come from the Rocky Flats Environmental Technology Site, Colorado; Idaho National Engineering Laboratory; Los Alamos National Laboratory, New Mexico; Hanford Site, Washington; Lawrence Livermore National Laboratory, California; Nevada Test Site; Oak Ridge National Laboratory, Tennessee; Savannah River Site, South Carolina; Argonne National Laboratory East, Illinois; and the Mound Site, Ohio. En route from these sites, the waste will be transported through Alabama, Arizona, Arkansas, Georgia, Indiana, Louisiana, Mississippi, Missouri, Oregon, Utah, Texas, and Wyoming.

As it now stands, the waste will travel to the WIPP in special "TRUPACT-II" shipping containers. These 10-foot-high double-walled stainless steel containers, certified by the Nuclear Regulatory Commission (NRC), are designed to withstand a drop of 30 feet, a 30-minute fire of 1,475 F°, or immersion in 50 feet of water for eight hours. How well they will withstand burial in salt for 300 generations is an open question.

The waste shipments are to be monitored by DOE's TRANSCOM system, which uses satellite technology to track and communicate with the trucks, making this information available via computer to state and local officials. This level of assurance, however, may not be good enough. Simply at the level of transportation, the conveyance of the waste is a stunningly complex problem. Each and every jurisdiction through which the waste will pass on its way to its final resting place must be persuaded to enact appropriate legislation; another frenzy of nuclear pork barreling looms on the horizon of this project.

In 1992, Congress passed a law specifying that the WIPP first must meet certain regulations and standards before it is authorized to open. The U.S. Environmental Protection Agency has been mandated to first certify that the facility will comply with standards for protection of the environment and public health. This process is ongoing.

The National Academy of Sciences recommended salt formations in a 1956 study as a suitable medium for permanent disposal of radioactive

wastes. After elimination of one potential salt-mine site in Lyons, Kansas, the U.S. Geological Survey, in 1974, chose the site near Carlsbad, New Mexico, for exploration. Congress then authorized the WIPP as a demonstration project in a 1979 law, and actual excavation began in 1982.

The 1992, the WIPP Land Withdrawal Act (PL 102-579) withdrew the land from general public use and transferred jurisdiction over it from the Interior Department to DOE. It also required DOE to conduct certain "test phase" activities at the WIPP to demonstrate compliance with applicable disposal requirements. Subsequently, as a result of pressure from anti-dumping lobby forces, the on-site testing phase of WIPP was redefined requiring that all testing be done in a laboratory setting (see Appendix A, 1993). If the WIPP can not demonstrate compliance with the U.S. Environmental Protection Agency (EPA), the law requires that the WIPP to be shut down, and the use of the land for that purpose deauthorized.

At this point the WIPP is only authorized to receive defense related transuranic wastes. The total waste to be disposed of from all the generating and storage sites amounts to about 6 million cubic feet (170,000 cubic meters), including both existing inventories and wastes expected to be generated over the next 35 years. The history of this site, the site selection process, land disposition, and legislative compliance is long and complicated. A brief timeline and selected bibliography are given in Appendix A.

The Site must be Marked

The disposal of radioactive waste is an international problem, and although present political boundaries shape many aspects of how the problem is being defined and handled today, it is clear that these boundaries have no relevance to the generations of future millennia. *It is therefore essential that any WIPP markers be designed as part of a global system of marked sites.*
Trauth, Kathleen M., Stephen C. Hora, and Robert V. Guzowski — *Expert Judgment on Markers to Deter Inadvertent Human Intrusion into the Waste Isolation Pilot Plant.*

One should keep in mind that the United States houses only about one quarter of the accumulated store of global nuclear wastes. And of course many other Nations are watching the United States to see what manner of success they meet. Since the United States is presently the only nation with an advanced storage plan for transuranic waste, comparisons are difficult. A more or less accurate picture of current global initiatives for

the storage of high level waste is as follows.[61]

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61 Adapted from "Nuclear Waste: The Problem that won't go Away." *Worldwatch Institute*, December 1991, pp. 24-25, and U.S. Department of Energy, and Office of Civilian Radioactive Management, *International Fuel Cycle Fact Book*, (Oak Ridge, TN: U.S. Department of Energy, DOE/RW-0371P, 1992).

Table 1. An outline of the status of Global Initiatives for the storage of high-level nuclear waste.

Country	Earliest Date	Program Status
Belgium	2020	Underground laboratory in clay at Mol.
Canada	2025	Independent Commission conducting 4-year study of government plan to bury irradiated fuel in granite.
China	no date	Irradiated fuel to be reprocessed; Gobi desert sites under investigation.
Finland	2020	Field studies being conducted; site selection by 2000.
France	2010	Two sites to be selected for study; final selection by 2006.
Germany	2008	Gorleben salt dome sole site to be studied.
India	2040	Irradiated fuel to be reprocessed, waste stored for 20 years in yet to be identified granite site.
Italy	2040	Irradiated fuel to be reprocessed and stored for 50-60 years then buried in clay or granite.
Japan	2020	Limited site studies. Cooperative program with China to build underground facility.
Netherlands	2040	Interim storage of reprocessed waste for 50-100 year before burial. Possibly seabed or another country.
Russia	no date	Program uncertain.
Spain	2020	Burial in unidentified clay, granite, or salt formation.
Sweden	2020	Granite site to be selected in 1997; evaluation studies under way at Aspo site near Oskarshamn nuclear complex.
USA	2010	Yucca Mountain, Nevada, site under study, and if approved, will receive 70,000 tons of waste.
UK	2030	50-year storage approved in 1982; long term options include seabed burial.

It is, I think, important to recall that as late as 1992 there were 31 countries operating nuclear reactors for energy purposes. This, together

with an unspecified number of countries operating reactors for the purpose of weapons production, is sobering. To date, there are no permanent disposal sites in operation.

The particular story of the marker begins in 1979 when by act of Public Law 96-164, the Waste Isolation Pilot Plant (WIPP) was authorized as a research and development facility to

> demonstrate the safe disposal of radioactive wastes resulting from the defense activities and programs of the United States exempted from regulation by the Nuclear Regulatory Commission [i.e., non-energy related nuclear wastes].[62]

The problems posed by the challenge of disposal quickly diverged into two streams. The first had to do with the material context of the entire site, and the materials that would be used for construction. How, in other words, the material could be placed into a site such that the likelihood of leakage and migration was *as low as reasonably achievable*.[63] Site stability was thus a principle concern. In addition to its geological stability (saltbeds aged on the order of $2.25 * 10^6$ years) the area was selected for its remoteness from concentrations of known (valuable) resources, and its

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62 Kathleen M. Trauth, Stephen C. Hora, and Robert V. Guzowski, *Expert Judgment on Markers to Deter Inadvertent Human Intrusion into the Waste Isolation Pilot Plant*, (New Mexico: Sandia National Laboratories, 1993), 1-1.

63 A phrase know in risk-speak as ALARA.

general barrenness from the point of view of anticipated land use (e.g., less than 12 inches of annual rainfall).

The other stream, and the area that will interest us here, has to do with the requirements that

> Disposal sites shall be designated by the most permanent markers, records, and other passive institutional controls practicable to indicate the dangers of the wastes and their location.[64]
>
> The performance assessment for the disposal facility must be probabilistically-based. That is, not only must the consequences of a given scenario be calculated, the likelihood of the scenario must be estimated.
>
> Active institutional controls are considered effective for no more than 100 years.[65]

The passive institutional controls referred to here are such things as markers, public records and archives, ownership and regulation of disposal lands, and "other methods of preserving knowledge about the location, design and contents of a disposal system." The "probabilistically-based" performance assessment criteria revolve around

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64 Trauth, et al., *Expert Judgment*, p. 1-6.

65 Ibid., p. F-19.

the use of techniques for working with the subjective analysis of experts.[66]

In order to cope with the temporal security of the site, a task force was established in 1980 by the Office of Nuclear Waste Isolation. The role of the "Human Interference Task Force" was to determine approaches to reduce the likelihood of inadvertent human intrusion into waste repository sites. The Environmental Protection Agency, the government body responsible for determining standards for waste disposal, has set the time frame for which the site is to remain secure at 10,000 years (i.e., the period of regulatory concern).

The problem is thus how to convey the intended message (i.e., go away, danger below) to whoever might visit the site for a period of 10,000 years, or 300 generations. Assuming we started counting from this year, that would mean that the site must remain secure from inadvertent intrusion until the year 11997.

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66 The methodological process of "expert-judgment analysis" was used extensively throughout the development of the project. It is a method of extracting probability estimates with respect to questions that have significant and unresolvable uncertainties. Essentially this means assembling a group of experts, dividing that group into teams, assigning a set of rules around the assignment of probability estimates, defining a clear statement of the issue to be judged, and then proceeding to reduce the issue to dimensions which can be conceptually assigned to a finite probability scale. See. E.J. Bonano, S.C. Hora, R.L. Keeney, and D. Winterfeldt., *Elicitation and the use of Expert Judgment in Performance Assessment for High Level Radioactive Waste Repositories.*, (Albuquerque NM: Sandia National Laboratories, 1990).

This is big science. It will use big materials, and of course cost big dollars. Tucked away in the desert, WIPP will house a very big secret. Forever.

THREE

THE OTHER DEATH

BEFORE we come to look at how this problem of the marker has been "solved," I want to give some thought to what is being asked; what it is that we ask of ourselves when considering a project of this sort. We ask of course a great deal. We have, significantly, very little to go on. If we consider the problem as one of simply making a monument endure, in addition to having missed the point, we have produced only a technical problem; a problem solvable (one would suppose) with better, more enduring materials. If we consider the problem to be one of making a monument not only endure, but "mean," for the prescribed period, we have an utterly different sort of problem. In fact we have not one but two problems side by side. Let us say that if the first concerns meaning and its projection into the future, then the second must concern the vehicle of transmission: the monument itself. And once put this way, we might begin to ask certain questions concerning monuments. For instance, is the monument being demanded for the nuclear waste burial even the sort of task that monuments are called on to perform? Clearly, this monument is

being called upon to force us to remember. Not unlike other monuments, war memorials, etc., this monument is responsible to history as a reminder for us. Yet what monuments are typically charged to call into remembrance is something for which *we* wish to be remembered. "A work intended to celebrate and preserve the memory of a person, an event, or an idea ..."[67] The Great Battles, the Great Figures in history, moments in time, points in space. Borglum's Rushmore. The monument *to something* is an anchor of presence dropped into time by a people unsure that they will be remembered. Monuments are left to posterity to things that are worth remembering, to things that *we* value, and for which we would wish to be remembered. In this sense the monument is not about the future. It is about the ontological anxiety of the present precisely with respect to the very uncertainty of the future (*le dur désire de durer*). The desire of the monument is to make permanent that which is not. The very idea of a monument to something that we wish would never have come to presence to begin with is a rather odd thing. Certainly there are monuments to wars and other atrocities in history, to things in other words, that we may well wish had never taken place. But such monuments are no different; they are witness to the passing, and the overcoming of the events to which they refer. A monument to waste is an inversion of the work of a monument. It has a task of perpetuating a

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67 Harold Osborne, ed., *The Oxford Companion to Art*, (London: Oxford University Press, 1970), p. 737.

memory, but it exalts nothing. Indeed, it must assert its real danger, but it must do so in an idiom foreign to such messages.

As for the first problem, that of meaning and its coherence and its projection, it strikes me that this an even more difficult problem than whether a monument can be a vehicle to convey a message to the future. Clearly the marker is a limit event in which there is a singular meeting of the material and the semiotic. It is a place of many intersections. Science and culture, meaning and non-meaning, life and death, the present and the future. In what follows I would like to consider, abstractly, what sorts of concerns might be relevant to considering this problem. I am curious to work through the question of whether this is a problem of semio-engineering, or whether this is really a problem that points elsewhere. Whether, in other words, the anxiety in the face of the profound temporal limits of this waste may tell us something about ecological and nuclear threat.

What do we Ask?

If we are going to talk about the semiotic operations of the marker, we should give some consideration to what Lacanian theory might have to say. For I think that contemporary psychoanalysis is, *par excellence*, a way of thinking about limit events.

We recall that the Lacanian (re)configuration of the Saussurian sign is as follows:

$$\frac{S}{s}$$

To what extent, we may ask, does this configuration of signifier and signified plus bar map onto the problem at hand:

$$\frac{\text{Monument}}{\text{Waste}}$$

Either this sign-unit is operational, and functions dependably, or the signified is elsewhere (beside the point, or under the point). If the former, then the security of the waste depends on the stability of the sign as a whole. In other words, the line drawn from S to *s*, the bar, must be uninterrupted; there must be no leakage, no contamination.

To increase the dependability of the sign-unit through the use of secondary elaborations — codicils, archives, user's guides, and the like — is (in addition to a hopeful admission that the sign might not work) subject to the same problems. That is, one increases the signifying network by increasing the sign-elements that, nonetheless, are still directed at the security of the principle signification: the monument.

Consider:

$$\frac{\text{Monument}}{\text{Waste}} \rightarrow \frac{S}{s} \rightarrow S_m$$

where the entire sign unit(y) of the monument is S_m. If there are, in addition to the monument, supporting signs,

$$\frac{S_x}{s_x} \quad \frac{S_y}{s_y} \quad \frac{S_z}{s_z}$$

the assumption is that the signified in each case has two particular and dependable properties:

a) that it coheres qua sign, and;

b) that its proper function is another particular S.

So,

$$\frac{S_{x \ldots z}}{S_M}$$

would be the sense in which all of the redundancy of the additional supporting materials would refer back to the principle sign, the

monument. All of this of course requiring that it be recognized as the *same* sign in spite of the repetitions and variations.

What are the conditions upon which this might be the case? How can a cluster of significations operate such that there is a stability or dependability to their operations — particularly over such a vast period of time. From a Lacanian perspective one would almost have to point to the operation of "quilting." As I will attempt to show, this may offer a tentative, though ultimately (and operationally) not satisfactory model of how we might conceive of sign stability; the gain we may receive in favor of the sign will tend to exact a rather high price.

The quilting point, the *point de capiton*, is a spatializing device, and an effect of language that refers to the function and operation of the signifier in discourse. It is, says Lacan, the point around which "all concrete analysis of discourse must operate."[68]

In the always retroactive construction of meaning — that constitutes the operation of discourse for Lacan — the quilting point is the *place* in discourse that fixes meaning; that is, that fixes a signifier to a signified.

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68 Jacques Lacan, *The Seminars of Jacques Lacan: Book III: The Psychoses 1955-1956*, (New York: W.W. Norton Books, 1993), p. 276. "Whether it be a sacred text, a novel, a play, a monologue, or any conversation whatsoever, allow me to represent the function of the signifier by a spatializing device, which we have no reason to deprive ourselves of ... a quilting point."

Since Lacan states quite plainly that the following graph is to be accorded broad applicability, consider the following[69]:

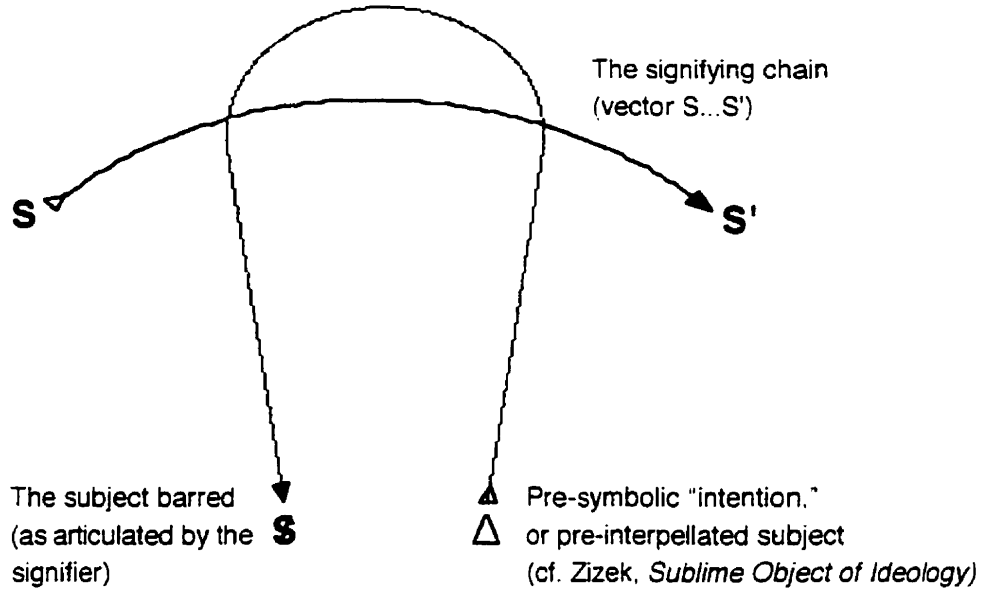

Figure 5. Lacan's "Graph I. "Adapted from Écrits, "Agency of the Letter in the Unconscious," p. 153

The horizontal line, the vector S...S', is what he will call the "signifying chain": "rings of a necklace that is a ring in another necklace made of rings."[70] It is these rings that constitute an uninterrupted flow of

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69 Jacques Lacan, "Subversion of the Subject and the Dialectic of Desire in the Freudian Unconscious," *Écrits: A Selection*. trans. Alan Sheridan, (New York: W.W. Norton Books, 1977), p. 303. The graph, he writes, "having been constructed and completed quite openly in order to map in its arrangement the most broadly practical structure of the data of our experience."

70 Écrits, "Agency of the Letter in the Unconscious," p. 153

metaphorical connection. If we note the retrograde movement of the vertical line, we can see how it is that, for Lacan, meaning is always based on an illusion, on a trick in which the otherwise endless movement of the signifying chain is arrested and fixed.

Žižek will draw attention to the fact that the second intersection — the one that happens second, but locates itself prior — is the transferential point. It is the point at which meaning takes on the appearance of always having been there. (This, in the analytic context, is what would position the analyst as the *one presumed to know*.) This line proceeds from a pre-symbolic intention (Δ) through the double intersection with the signifying chain, to its terminus at the barred subject. The observation I would draw from this particular Lacanian knot is that for the subject meaning is fundamentally based on the illusion of stability. The double intersection indicates that the subject is always and necessarily constituted in a retroactive fashion. That meaning seems concrete and immanent to discourse speaks to the success of the operation of quilting. What the graph isolates is a figure of the process whereby the sliding (*glissement*) of signification is stalled, fixing a temporary reference point. Writes Žižek:

> If we maintain that the *point de capiton* is a 'nodal point,' a kind of knot of meaning, this does not imply that it is simply the 'richest' word, the word in which is condensed all the richest of meaning of the field it 'quilts': the *point de capiton* is rather the word which *as a word*, on the level of the signifier

itself, unifies a given field, constitutes its identity: it is, so to speak, the word to which 'things' themselves refer to recognize themselves in their identity.[71]

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71 Slavoj Žižek, *The Sublime Object of Ideology*, (London: Verso, 1989), pp. 95-6.

Quilting the Real

We could thus see the monument as a redundantly supported exercise in quilting. The monument itself is, *par excellence*, the quilting point. As a signifier, its task is to fix a stable meaning; that is, within a given ideological space its purpose is to function as a 'master' signifier that will retroactively determine the operational and discursive meanings of the entire project. From the point of view of the project's proponents, the monument will do just that. And in case it doesn't, there will be a set of auxiliary signs as a backup. And each of these would be subject to the retroactive coherence conveyed upon them by the position of the monument. Although it is important here to distinguish between its synchronic and diachronic functions. In the former sense, the so-called floating signifiers — for example, responsibility, justice, and safety — are recast by the monument project such that each of these terms is fixed into a general scheme: responsibility must be upon the condition that the future is secured from the activities of the present; justice must proceed not from the rights and privileges traditionally accorded the individual, but from the distributive sense in which the future has a moral and legal standing; and safety, which has traditionally taken the form of *become as dangerous as possible in the name of remaining safe*, is retroactively determined as *become as safe as possible in order to preserve the very possibility of being*

dangerous. The quilting demanded in a diachronic sense contains all of these determinations, but includes as well the figure of the burial and its adequacy, and the monument itself, figured as a remembrance to something we wish to be forgotten (or certainly that for which we do not wish to be remembered). But once within the purview of the project itself, it *appears* that the monument *proceeds* from the field of meaning that it, in fact, organized. As though the project of the monument followed logically and smoothly from what was already agreed. Such is the retroactive operation of quilting.

To the extent that quilting describes the operation and structural configurations of discourse, and whether or not my examples of the operation are accurate, we can see how its conditions are tenuous, and temporary (or at least contingent).

But from my point of view, the monument as quilting point is as though the upholsterer's needle has attempted to gather together the wrong materials. As we will see in the next chapter, the project has moved in the direction of making a natural signifier point to the waste itself. But what actually must happen amounts to the paradoxical operation of quilting the signifier to the real.

This is the question we must ask: is such an operation, its paradoxical dimension notwithstanding, possible: a sign of and for the real? That the real itself would be the guarantor of the sign's reality. For this must be the direction in which stability is sought. By quilting the signifier to the real,

the desire is to finally deliver the sign from its anxiety. And, one could say, the real *would* do precisely this; after all, it's not going anywhere, the real is always in its place. As Lacan puts it,

> It is the realist's imbecility, which does not pause to observe that nothing, however deep in the bowels of the earth a hand may ensconce it, will ever be hidden there, since another hand can always retrieve it, and that what is hidden is never but what is *missing from its place*, as the call slip puts it when speaking of a volume lost in a library. And even if the book be on an adjacent shelf or in the next slot, it would be hidden there, however visibly it may appear. For it can *literally* be said that something is missing from its place only of what can change its place, only of the symbolic. For the real, whatever upheaval we subject it to, is always in its place; it carries it glued to its heal, ignorant of what might exile it from it.[72]

Thus the operation of quilting proposed here either assumes that the real can in fact be at once hidden, and forever found by the signifier, or that

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72 Jacques Lacan, "Seminar on 'The Purloined Letter'," *The Purloined Poe: Lacan, Derrida & Psychoanalytic Reading*, ed. John P. Muller, and William J. Richardson. trans. Jeffrey Mehlman, (Baltimore: Johns Hopkins University Press, 1988), p. 40. The translation of the last line of this passage has been modified as per Muller and Richardson's "'The Purloined Letter': Notes to the Text," in the same volume (p. 92).

the signifier — through its assumed equivalence with the signified real, could never be lost, could never go missing. In the first instance, the real of the waste is simultaneously denied, hidden, and resurrected by the signifier. And in the second instance, the signifier is assumed to be frozen in an intimate and magical bond with the signified.

Note too, that within this figure of the retroactive operation of signification, we can see a configuration that anticipates (or describes) the operation of trauma. At least one can see in the confused relations between cause and effect, and the kind of temporal trick undertaken through the operation of quilting, a similarity. I will return to this.

The Demand of Threat

To all of the things of which we prefer not to speak, death, for example, or madness, I would like to add another category — ecological or nuclear threat. By this I mean the threats posed by such things as the waste that will lie beneath the monument.

For now, let us say that I mean by this kind of threat the threat of a disaster of an ontological character. Threat of a disaster of an ecological sort is not just about its vast scale, it seems to me. It's not just about being big; as I've said, it's also — or perhaps because — it operates both above and below a threshold. There are other components, other movements, other modalities that must be taken into account when thinking about such threats.

This is not a simple threat, the sort of threat that can be accounted for in terms of risk and reparation. It is more complex, diffuse, and as such presents a problematic that exceeds traditional (or at least conventional) modes of conceptualization.

The Lacanian trinity of the Imaginary, Symbolic, and Real offers a way of positioning what I see as the difficulty of writing about ecological threat. Note that what I say here is that it positions the difficulty, not, in other

words, the thing itself. It would, I think, be far too easy, perhaps dishonest, to simply pour my problem into the real. But at the same time, it is important to disentangle what I might mean by this real, and how it might provide a direction, a route in which to travel.

And what might Lacan have to say about ecological threat? A great deal, really. But let us begin with Žižek. Buried in an otherwise playful exploration of Lacanian concepts set adrift in the sparkling filmic traditions of Hollywood, Žižek chooses ecological crisis to illustrate the "answer of the real."

What Lacanian concepts offer, he says, toward an understanding of ecological crisis

> [I]s simply that we must learn to accept the real of the ecological crisis in its senseless actuality without charging it with some message or meaning.[73]

Žižek suggests that there are three typical responses to the threat of ecological crisis. The predominant reaction, he says, belongs to those who resist the very idea of a crisis. This operates in the register of disavowal (*Verleugnung*) — *I know it's true, but all the same...*

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73 Slovoj Žižek, *Looking Awry: An Introduction to Jacques Lacan through Popular Culture*, (Cambridge: The MIT Press, 1991), p. 35.

For those who respond to the threat of ecological crisis outside of the register of disavowal, there are, says Žižek, two typical modes: there are those who respond with obsessive activity, and those who elect to read into the crisis a message issuing from the real.

In the first instance, the threat elicits an obsessional economy such that frenzied activity must be maintained in order that the calamitous *X* does not take place. Much like Kristeva's description of the obsessional as valuing the procedural over the declarative, the obsessional in this case associates each situation with a requirement to *do* something — if x, then *do* y (not x *means* y).[74] A "paradoxical doing," Kristeva has called it, "acts (-1)." A kind of doing that is deprived of its *logical* relation to an affect, where the signifier is dissociated from the "psychic representative of affect." The result is a compulsion to search for other semiotic means of (displaced) expression (gestural, visual, mobile).[75] One might ask if the

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74 Julia Kristeva, *New Maladies of the Soul*, (New York: Columbia University Press, 1995), pp. 46-49.

75 Kristeva, Ibid., p.49. In the Rat Man case, Freud reports the following in support of his contention that the obsessional neurotic is always marked by a misdirected affect: "The patient, who was a government official, was troubled by innumerable scruples. I was struck by the fact that the florin notes with which he paid his consultation fees were clean and smooth. (This was before we had a silver coinage in Austria.) I once remarked to him that one could always tell a government official by the brand-new florins that he drew from the State treasury, and he then informed me that his florins were by no means new, but that he had them ironed out at home. It was a matter of conscience with him, he explained, not to hand any one dirty florins; for they harbored all sorts of dangerous bacteria and might do some harm to the recipient. At that time I

near magical construction of an organic earth — Gaia — might not amount to an instance of such a displacement, and procedural obsession. Whether, in other words, a disruption and displacement of an affect at one level (the social, the family) finds its way into a caring and nurturing position with respect to the biotic, "Mother" earth. Or indeed, one could ask whether the massive expenditure on a monument to warn of danger might not qualify in this regard.

In the second case — which also resonates somewhat with the *nature bats last* school of environmentalism — threat and crises are taken to be a very specific kind of sign. As signs, the ecological crisis is presumed to be indexically related to a normatively charged (and pissed-off) nature. The crises — global warming, ozone depletion, population, nuclear weapons,

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already had a vague suspicion of the connection between neurosis and sexual life, so on another occasion, I ventured to ask the patient how he stood in regard to that matter. 'Oh, that's quite all right,' he answered airily, 'I'm not at all badly off in that respect. I play the part of a dear old uncle in a number of respectable families, and now and then I make use of my position to invite some young girl to go out with me for a day's excursion in the country. Then I arrange that we shall miss the train home and be obliged to spend the night out of town. I always engage two rooms ... but when the girl has gone to bed, I go in to her and masturbate her with my fingers.'— 'But aren't you afraid of doing her some harm, fiddling about in her genitals with your dirty hand?'—At this he flared up: 'Harm? Why what harm should it do to her? It hasn't done a single one of them any harm yet, and they've all of them enjoyed it. [I] could only account for his fastidiousness with the paper florins and his unscrupulousness in abusing the girls ... by supposing that the self-reproachful affect had become *displaced*. Sigmund Freud, "Notes upon a case of Obsessional Neurosis (1909)," *Collected Papers, Volume 3*. trans. Alix and James Strachey, (New York: Basic Books, 1959)pp. 334-36.

the Soviet nuclear industry, post-industrial Eastern Europe, and AIDS come to mind — are read symptomatically as providing a link between a manifest crisis, and a disrupted or transgressed nature. The crises tell a story — or at least are implicated in a narrative — concerning the ecological, and therefore moral, improprieties of "Man."

Žižek takes these three responses — "a fetishistic split, and acknowledgment of the fact of the crisis that neutralizes its symbolic efficacy; the neurotic transformation of the crisis into a traumatic kernel; a psychotic projection of meaning into the real itself" — and organizes them as essentially means of — or strategies for — avoiding an encounter with the real.

The observation that the instance of disavowal impedes any adequate response to crisis seems clear. But Žižek develops the idea that the psychotic and neurotic responses — that are certainly *instances* of response — err by blinding one to the fact of "the irreducible gap separating the real from the modes of its symbolization."[76] The only "proper" attitude, he says, is one that

> fully assumes this gap as something that defines our very *condition humaine*, without endeavoring to suspend it through fetishistic disavowal, to keep it concealed through obsessive

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76 Žižek, *Looking Awry*, p. 36.

> activity, or to reduce the gap between the real and the symbolic by projecting a (symbolic) message into the real.[77]

What about the ecological crisis makes its location the real? To answer this, I must make some effort to determine what it is that we may mean by it. The real (le Reél) for Lacan was many things. Nothing of course was ever easy; his preference was always to make language shudder just enough to remind one that it was necessary to remain aware of the symbolic's limits. The point at which the real takes on meaning (and obviously this is a problem), is in its relation to the symbolic and imaginary. It is clearly not to be conflated with "reality." For reality is everything that has already passed into a symbolic and imaginary matrix. To put it a succinctly, the real is the null point at which symbolization fails, it is independent of and indifferent to attempts to symbolize it, and thus to grasp it, is to necessarily lose it.

Chernobyl illustrates well the liminal characteristics of the real's irruption into reality.[78] The Russian film-maker, Vladimir Shevchenko,

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77 Ibid., p. 36.

78 An it may well irrupt into reality again. "Nine years after its erection, the Sarcophagus structure, although still generally sound, raises concerns for its stability and long-term resistance and represents a standing potential risk. Some supports for the enclosure are the original Unit 4 building structures which may be in poor condition following the explosions and fire, and their failure could cause the roof to collapse. This situation is aggravated by the corrosion of internal metallic structures due to the high humidity of the Sarcophagus atmosphere provoked by the

headed the first film crew that was permitted into the "red zone" (a 30 km^2 area that was emptied of 100,000 residents in the day and weeks following the accident). The short, part black and white, part colour documentary that was produced, *Chernobyl: Chronicle of Difficult Weeks*, is in one sense simply a clumsy piece of propaganda meant to show how well the Soviet scientific, technical, and military, and Party authorities came together in the face of great adversity to overcome the severity of the accident. We see footage of many meetings, Party officials extolling the virtues of cooperation and hard work, and evacuees warmly embracing their hosts in their new communities.[79] But what was extraordinary about this film was a sequence in which the film crew was aboard a helicopter circling, not very high, above the smoldering remains of the reactor building. The voice-over, dubbed in english, was saying something about "black and white, the colour of disaster." But what we *see* on the surface of the film stock itself are millions of tiny explosions as decay particles strike

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penetration of large quantities of rain water through the numerous cracks which were present on the roof and were only recently repaired. The existing structure is not designed to withstand earthquakes or tornadoes. The upper concrete biological shield of the reactor is lodged between walls, and may fall. There is considerable uncertainty on the condition of the lower floor slab, which was damaged by the penetration of molten material during the accident. It this slab failed, it could result in the destruction of most of the building." Anon. "The Site and Accident Sequence." *The Chernobyl Report* (1996). Online. Available: http:// www.nea.fr/html/rp/chernobyl/c01.html.

79 Vladimir Shevchenko, Chernobyl: Chronicle of Difficult Weeks, 16mm b&w and color, trans. to video, 54 min., (Oakland, CA: The Video Project, 1986).

the film in the camera. The irradiated film captured a trace of the real, a pointillism of the real. There is simply no correspondence of the film and its heroic worker narrative spin, with the brut irruption of the real that is captured, incidentally, as the paradoxical urtext of the film.

Writes Žižek,

> The paradox of the Lacanian Real, then, is that it is an entity which, although it does not exist (in the sense of "really existing," taking place in reality), has a series of properties — it exercises a certain structural causality, it can produce a series of effects in the symbolic reality of subjects.[80]

Yet it is not as though the real is simply the raw material from which, and upon which the symbolic makes a world. The thing with the real is that, to paraphrase Žižek, it is both presupposed and posed by the symbolic. It is only discovered by the distortions it produces in the symbolic world, but in turn, the symbolic can only function by circulating about the these zones of distortion, these hard places where symbolization falters.

Lacan engages with the cultural implications of the real of nuclear threat in his Seminar on Ethics (1959-60). Here we find a Lacan that does say something about the ecological crisis. For example:

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80 Žižek, *Sublime Object of Ideology*, p. 163.

> I don't want to indulge in overdramatization. All ages had thought they had reached the most extreme point of vision in a confrontation with something terminal, some extra-worldly force that threatened the world. But our world and society now brings news of the shadow of a certain incredible, absolute weapon that is waved in our faces in a way that is indeed worthy of the muses. Don't imagine that the end will occur tomorrow; even in Leibniz's time, people believed in less specific terms that the end of the world was at hand. Nevertheless, that weapon suspended over our heads which is one hundred thousand times more destructive than that which was already hundreds of thousands of times more destructive than those which came before — just imagine that rushing toward us on a rocket from outer space. It's not something I invented, since we are bombarded everyday with news of a weapon that threatens the planet itself as a habitat for mankind.[81]

Lacan here points to a general imperiled condition. A condition that he set apart, historically, as a function of the destructive power (presumably

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81 Jacques Lacan, *The Seminars of Jacques Lacan: Book VII: The Ethics of Psychoanalysis 1959-1960*, (New York: W.W. Norton Books, 1992), p. 104.

of the bomb). And he does so through a gradual explication of the real. The real, that is, that "resists symbolization absolutely."[82]

To speak of the real, Lacan says, one must of necessity speak of the real's relationship to moral activity, and to ethics as such.

> [M]y thesis is that the moral law, the moral command, the presence of the moral agency in our activity, insofar as it is structured by the symbolic, is that through which the real is actualized — the real as such, the weight of the real.[83]

Yet the real, insofar as it is actualized through moral activity or otherwise, is mediated always by the symbolic. There is no other way. Even the events of the *chance of the real*, the "random" throw of the die, as Lacan said elsewhere, are submitted to the law of the symbolic.[84] Lacan

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82 Jacques Lacan, *The Seminars of Jacques Lacan: Book I: Freud's Papers on Technique 1953-1954*, (New York: W.W. Norton Books, 1988), p. 66.

83 Lacan, *The Ethics of Psychoanalysis*, p. 20.

84 See, for example, Jacques Lacan, "Seminar on 'The Purloined Letter'," *The Purloined Poe: Lacan, Derrida & Psychoanalytic Reading*, ed. John P. Muller, and William J. Richardson. trans. Jeffrey Mehlman, (Baltimore: Johns Hopkins University Press, 1988) or Bruce Fink, "The Nature of Unconscious Thought or Why no one Ever Reads Lacan's Postface to the "Seminar on 'The Purloined Letter'"," *Reading Seminars I and II: Lacan's Return to Freud*, ed. Richard Feldstein, Bruce Fink, and Maire Jaanus, (Albany: State University of New York Press, 1996) (particularly p. 188, n. 5). Fink's paper is exemplary in that he makes sense of Lacan's mathematical games involving odd/even. Far more so than Muller and Richardson's "The Purloined Letter: Overview"—which, as

develops this idea in his work on Poe's story, *The Purloined Letter.*[85] Commentator Bruce Fink writes,

> We assume the real event in question — the tossing of the coin — to be *random*, that is, we presuppose that the coin was not loaded. But what does it mean for a coin *not* to be loaded? Generally it means that it is exactly as likely to turn up heads as it is tails. How is this determined? By throwing it over and over, and counting the number of times each possibility turns up, an acceptable coin being one which, out of 1000 tosses, gives us 500 heads and 500 tails. Which is tantamount to saying that it is our already existing symbolic system which determines whether the event in question is considered *random* or not ... Which is to say that the "raw

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near as I can tell, is simply wrong in places—Fink works through the complicated example from *Écrits* in a step-by-step fashion that shows what Lacan may have meant by his contention that the raw events of the world are never innocent, never —well, almost never—untouched by the symbolic.

85 One may note a certain parallelism in the manner that the letter in Poe's story operates in the hands of the Minister, and the way that threat, as threat, operates as virtual. The letter confers upon the Minister a certain power on the condition that he not exercise it. It must remain a pure potential. Likewise, threat must remain virtual (but real nonetheless) in order to be threat. To become actual, it would *be* something else. The retention of threat as virtual becomes paramount, and this is contingent precisely upon it being understood as utterly real. cf. Jacques Lacan, "Seminar on 'The Purloined Letter'," *The Purloined Poe: Lacan, Derrida & Psychoanalytic Reading*, ed. John P. Muller, and William J. Richardson. trans. Jeffrey Mehlman, (Baltimore: Johns Hopkins University Press, 1988), pp. 46-7.

> event" with which we began was already symbolically determined, and that the symbolic matrices are never "innocent," that is never lacking in incidence on our supposedly "pregiven reality." The event is thus retroactively constituted as random by the signifier.[86]

And in the words of Lacan:

> The very notion of probability and chance presupposed the introduction of a symbol into the real. In the real, at each go [throw of the dice], you have as many chances of winning or of losing as on the preceding go. This only begins to have meaning when you write a sign, as long as you are not there to write it, there is nothing that can be called a win. The pact of the game is essential to the reality of the experience sought after.[87]

It is, I believe, critical to make clear the extent to which he sees the symbolic as that which constitutes the "reality" of events. And the real, the real is that which shows up in the cracks. Indeed as Lacan puts it, it is

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86 Fink, "The Nature of Unconscious Thought," pp. 188-9.

87 Jacques Lacan, "Odd or even? Beyond Intersubjectivity," *The Seminars of Jacques Lacan: Book II: The Ego in Freud's Theory and in the Techniques of Psychoanalysis 1954-1955*. trans. Sylvana Tomaselli, (New York: W.W. Norton Books, 1988), p. 182.

in relation to the symbolic as Law, that the real is understood as cause, and "there is cause only in something that doesn't work."[88]

To come back to my question then — What about the ecological crisis makes its location the real? — we can first of all correct the question, and begin to offer an answer. The question is wrong in the sense that it is not a matter of a location as much as it is a matter of a failure of location. Perhaps this is to be too pedantic, but the point is that to have a location is to be already within a symbolic network. It's not as though there was a place of ecological crisis just awaiting our symbolization. The real of the ecological crisis can only be inferred, retroactively, through its repercussions within the symbolic. And these repercussions are felt only as holes, or gaps in the symbolic itself. The ecological crisis, or ecological threat as I would prefer to call it, has a location precisely in the sense that it determined only by cracks and fissures, and holes in the symbolic itself.

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88 Jacques Lacan, "The Freudian Unconscious and Ours," *The Four Fundamental Concepts of Psycho-Analysis (Seminar XI)*. trans. Alan Sheridan, (New York: W.W. Norton Books, 1977), p. 22.

Death, Again

For Žižek, as with Lacan, there is a constitutive derailment that must be understood. Threat of an ecological sort issues from the real, and the symbolic, as such, is incapable of jumping, suturing, or even fully apprehending that gap. Such threats as the "unrepresentability" of radiation — entirely chimerical "objects" — manifest an indifference to our modes of symbolization. This, we could say, is the being of ecological threat; it presents itself, unrepresentably, as the threat of a "second death." A manner of death, that is, unconnected (in the sense that its locus is not the symbolic) to the death drive:

> Death insofar as it is regarded as the point at which the very cycles of the transformation of nature are annihilated.[89]

Lacan illustrates this idea of a "second death" from the writings of Sade. The passage he quotes is Sade's *System of Pope Pius VI*, wherein Sade writes:

> Murder takes only the first life of the individual whom we strike down; we should also seek to take his second life, if

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89 Lacan, *The Ethics of Psychoanalysis*, p. 240.

> we are to be even more useful to nature. For nature wants annihilation; it is beyond our capacity to achieve the scale of destruction it desires.[90]

The first death is organic. The death of the biological body. But the second death robs death from death. The second death annihilates the very cycle of life and death. Which for Sade may have freed nature from its own laws, for us points to the very kernel of ecological threat: the annihilation of the cycle of life and death, and with it the symbolic universe within which it is staged.

Chernobyl, then, represents a point at which the "open wound of the world" erupts, shaking the very ground of being.[91] But this recognition,

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90 Ibid., p. 211. It is possible to hear in this idea of a second death a reference to the apocalyptic vision of The Revelation of St. John the Divine. For example, (2.11) "He that hath an ear, let him hear what the Spirit saith unto the churches; He that overcometh shall not be hurt of the second death"; (20.6) "Blessed and holy is he that hath part in the first resurrection: on such the second death hath no power, but they shall be priests of God and of Christ, and shall reign with him a thousand years"; (20.14) "And death and hell were cast into the lake of fire. This is the second death"; (21.8) "But the fearful, and unbelieving, and the abominable, and murderers, and whoremongers, and sorcerers, and idolaters, and all liars, shall have their part in the lake which burneth with fire and brimstone: which is the second death." So really there are three deaths: a spiritual death (a separation from god), a physical death (of the body), and a second death (which annihilates the very cycle of death and resurrection).

91 In Lacanian terms, says Žižek, the (our) relation to Chernobyl is given as the formula for phantasy: $\Diamond a$. And I suppose this is the case providing that what we see in Chernobyl is a *nature disrupted*. Lacan attributes the formula to Jean-Claude Milner (see Jacques

this point at which the gap becomes visible is only a point of *re*cognition; that is, the gap was already there. And this, on the Lacanian axis, is the constitutive nature of the gap. Ecological threats are thus a symptom of a prior disconnection, the locus of which is not biological, but the "drive potential of man" — already denaturalized and derailed from the principle organic life processes. Indeed, it would seem that this is the condition upon which rests the very possibility of a "second death."

The lesson which Žižek wishes to draw from events such as Chernobyl consists precisely in the adequacy of "our" response to such events. It is his desire to rid us of an "obsessive economy" that only imagines — through a retroactive projection — a nature out of equilibrium. All attempts to regain this imaginary equilibrium, he says, must be abandoned, and further, we must

> renounce the very idea of a "natural balance" supposedly upset by the intervention of man as "nature sick unto death."[92]

Whereas this notion of a "second death" animates some of the meaning of threat as I would like to develop it, Žižek's insistence on the gap or wound as the *condition humaine* sets modern threat as only an *exemplary* expression. And Chernobyl, and the manner of threat it poses, seems to become only a figure; a figure in the sense that Hitchcock's films become figures for Lacanian concepts. I think, though, that this is my problem with Žižek, and not with the sense in which Chernobyl presents us with an event of the real.

In any case, I wish to gather the force of this "second death" and simultaneously assert the uniqueness of modern threat. Not simply unique in the sense that such threats are more profound or pervasive, but unique in that they really are a different register of threat. To dwell upon

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Lacan, *Écrits: A Selection*, (New York: W.W. Norton Books, 1977)Lacan, *Écrits*, p. 334), and Wilden explains it thus: The ◊ refers to the relationships of envelopment - development - conjunction - disjunction, and the refers to the Other subject in the subject's division from himself. The *a* denotes an object of identification. (see Jacques Lacan, and Anthony Wilden, *Speech and Language in Psychoanalysis*, (Baltimore: Johns Hopkins University Press, 1968), p. 267). Žižek places it as the "unrepresentable point where the very foundation of our world seems to dissolve itself, there the subject has to recognize the kernel of its most intimate being" p. 37.

92 Žižek, *Looking Awry*., p. 38.

the disconnection, is to lose sight of the urgency and uniqueness of ecological threat.

Žižek's displacement of threat into a prior condition of disconnection deflects threat in the same manner as, for example, Blanchot's disaster is displaced in relation to threat. Blanchot writes

> The disaster, depriving us of that refuge which is the thought of death, dissuading us from the catastrophic or the tragic, dissolving our interest in will and all eternal movement, does not allow us to entertain this question either: what have you done to gain knowledge of the disaster?[93]

The disaster and the "second death" both operate on the outside of death. Both are the beyond of threat. But when confronted by either, are there no means for speaking of such prospects?

Both seem to enact an impossibility *of* death in the face of the disaster and the "second death." For the disaster, one is always past danger, "even when we are under the threat of ——— ."[94] For Blanchot the disaster is the event that cannot have taken place, and for Žižek, the "second death" is the manner of death that must not be allowed to take place. The former

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93 Maurice Blanchot, *The Writing of the Disaster*, (Lincoln: University of Nebraska Press, 1986), p: 3.

94 Ibid., p. 4.

suggesting strategies for thought and writing (the disaster is the limit of writing, yet not its beyond), and the latter, the limit of the thinkable (the "second death," like the real itself, marks thus a pathology to be inferred through its symptoms).

Perhaps we should regroup. Žižek was invoked as one possible trajectory within which to explore and advance some ideas about threat. The idea (image?) of "second death" provides the beginnings of a speculative ontology of threat. It is a register of death that must remain speculative, but in doing so, gathers its force as a meta-horror. A horror, in other words, that deprives and threatens the foundations of horror itself? Or is it a threat that ultimately would free us from horror? In either case, the death of a second order is what is at issue. Blanchot's disaster enters the scene as a means for saying that "second death" is not such because of a gap rendered by a human condition — a chasm beyond which lies a nature — but by the very nature of the disaster itself. *The disaster takes care of everything.* The disaster annuls, and in a sense undermines the horrific of horror:

> The disaster does not put me into question, but annuls the question, makes it disappear — as if along with the question, "I" too disappeared in the disaster which never appears. The fact of disappearing is, precisely, not a fact, not an event; it does not happen, not only because there is no "I" to undergo the experience, but because ... the disaster

> always takes place after having taken place, there cannot possibly be any experience of it.[95]

If there is to be an algebra of threat, it is as yet incomplete. As "second death" domesticates the *outside* of the disaster, disaster depersonalizes the threat of "second death." But the *in between* of disaster and "second death" is the point we wish to explore. The threat as the mode of transmission; the vehicle by which death and the disaster are brought in/to life. Threat as trauma, as *das Ding*.

But before we get to threat, and how it might be conceived, I will return to the desert and the plans for the future.

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95 Ibid., p. 28.

FOUR

THE MARKER

This panel member therefore recommends that the markers and the structures associated with them be conceived along truly gargantuan lines. To put their size into perspective, a simple berm, say 35 meters wide and 15 meters high, surrounding the proposed land-withdrawal boundary, would involve the excavation, transport, and placement of around 12 million m^2 of earth. What is proposed of course, is on a much grander scale than that. By contrast, in the construction of the Panama Canal, 72.6 million m^2 were excavated and the Great Pyramid occupies 2.4 m^2. In short, to ensure probability of success, the WIPP marker undertaking will have to be one of the greatest public works ventures in history.
Frederick Newmeyer — "Team A" member.

LET us switch channels here. In the next pages I will step through various aspects of the project to design a monument.

Work to accomplish a design system for the marker has proceeded using the opinions of "experts" as identified and solicited by the Department of Energy. In 1983, several scholars were asked to prepare reports on aspects of waste burial and marking; these original works established the organizing themes that were to direct and shape subsequent deliberations on both the questions of storage, and marking schemes. The basic presuppositions that informed the Human Interference Task Force involved some fairly straight forward ethical and pragmatic conclusions drawn from the growing stock of nuclear wastes.

The ethical kernel of the Human Interference Task Force is identified as the responsibility on the part of the present with respect to future generations. The simple fact that "we" know the waste that now exists does indeed impinge on the fate of future persons is taken as cause to assume a moral burden to reduce those risks. In a way this marks a wish on the part of the present to earn the praise of the future. On this account, to fail to take necessary steps now to reduce a threat that is clearly understood, beyond a default on an understood moral responsibility, is to diminish the present in the eyes of the future.[96] Related to this is the presupposition that the responsibility of the present to make future

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96 This hope, this desire to be remembered is certainly not new: "Let us now praise famous men, and our fathers that begat us. The Lord has wrought great glory by them through his great power, from the beginning. Their seed standeth fast, and their children for their sakes. Their seed shall remain for ever, and their glory shall not be blotted out. Their bodies are buried in peace; but their name liveth for evermore." (Sirach 44: 1, 2, 12-14).

persons aware of the threat of interred waste is considered discharged on the condition that sufficient knowledge (in the proper form, whatever this turns out to mean) has been made available to these as yet non-existent persons. The collective sigh of relief may be exhaled once the marker system is in place. The corollary to this is that should future persons, acting — we can assume — with knowledge of the waste, the repository and the risks, elect to breach the repository, they and not the present would be solely responsible. In addition, the assumption was that the future to which the message would be sent would be one in which technologies adequate to breaching a repository would exist; accordingly, the mode of communication must be directed at a diverse array of activities that *might* take place (e.g., land surveys, aerial recognizance). Also, language (spoken and written) cannot and must not be assumed to be static. And finally, future societies can be assumed to have some basic knowledge of nuclear physics.[97]

In 1984, Thomas Sebeok published (through the Office of Nuclear Waste Isolation) a technical paper entitled "Communication Measures to Bridge Ten Millennia." This paper, part Peirceian semiotics primer, and part treatise on information theory has been the only significant contribution from the semiotic world. This paper introduced many semiotic and

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97 Human Interference Task Force, *Reducing the Likelihood of Future Human Activities that could Affect Geologic High-Level Waste Repositories*, (Columbus OH: Office of Nuclear Waste Isolation, Battelle Memorial Institute, 1984).

information concepts — made palatable and understandable in Sebeok's erudite fashion — and particularly reinforced the idea of "redundancy" as the hedge against temporal semiotic decomposition. Several other papers were published at this time documenting strategies for reducing the likelihood of inadvertent human intrusion into a repository.

Sebeok's paper invokes the "persistent mythical symbol" of Pandora's box as both a metaphor for the security of the repository, and an analogy for the task of designing a monument. Accordingly, his first recommendation was

> that information be launched and artificially passed on into the short-term and long-term future with the supplementary aid of folkloristic devices, in particular a combination of an artificially created and nurtured ritual-and-legend. The most positive aspect of such a procedure is that it need not be geographically localized, or tied to any one language-and-culture.[98]

His idea was that "we" could design a kind of epistemological *false trail* such that people would be disinclined to even visit the site. And this disinclination would not necessitate any particular knowledge of the *meaning* of the site, the nature of the materials interred, nor of radiation

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98 Thomas A. Sebeok, *Communication Measures to Bridge Ten Millennia*, (Columbus OH: Office of Nuclear Waste Isolation, Battelle Memorial Institute, 1984), p. 24.

and its mode of toxicity. "A ritual annually renewed can be foreseen, with the legend retold year-by-year (with, presumably, slight variations)."[99]

The hacking of a contemporary mythological deep-structure, the manufacture of a *new* tradition, designed to secure the site is, in Sebeok's view, insufficient. In addition, he saw the need for a transhistorical assembly of experts. The "truth" of the site

> would be entrusted to — what we might call for dramatic emphasis — an "atomic priesthood," that is, a commission of knowledgeable physicists, experts in radiation sickness, anthropologists, linguists, psychologists, semioticians, and whatever additional expertise may be called for now, and in the future. Membership in the "priesthood" would be self-selective over time.[100]

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99 Ibid.

100 Ibid. I note that the appeal to a quasi-Jungian, deep mythological structure has not pleased certain Jungian analysts. In Susan Garfield. ""Atomic Priesthood" is Not Nuclear Guardianship: A Critique of Thomas Sebeok's Vision of the Future." *On The Responsible Care of Radioactive Nuclear Guardianship Forum, and Materials* .3 (1994). Online. Available: http://www.ratical.com/radiation/NGP/AtomPriesthd.html, Garfield writes that Sebeok's Pandora program can perhaps be read as a morality tale on the failure of secrecy and denial. It demonstrates that the very premise of "out of sight, out of mind" deep geological burial of radioactive materials leads inevitably to procedures in the social, political and spiritual life of the people that are not any less destructive because they are absurd." And furthermore, she argues that Sebeok's proposal to tinker with myths is based on only a superficial understanding of their operation and function. "[Myths] are

The priesthood would thus be charged with mythological supervision, and the production of metamessages as necessary. Another significant aspect of Sebeok's recommendations involve the subdivision of the 10,000 year period into periods that correspond to three generation relays (person to great-grandchild). The primary message on the site would be a plea to renew the message — in terms most appropriate to the time — every three generations. Thus my grand-children would have the responsibility of overseeing the reinscription of the monument in terms that are most relevant for them, and their perception of the times. Should future generations fail to obey the imperative to reinscribe the site, "the atomic priesthood would be charged with the added responsibility of seeing to it that our behest, as embodied in the cumulative sequence of metamessages, is to be heeded — if not for legal reasons, then for moral reasons, with perhaps the veiled threat that to ignore the mandate would be tantamount to inviting some sort of supernatural retribution."[101]

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expressions of deep human patterns [that] can never be deliberately or consciously created ... It is questionable if an 'artificial' myth will last long if not supported by some evidence. Rich with meaningful symbols that spring spontaneously from deep, knowing layers of the human psyche, the function of myth and ritual is to relate individuals to the ultimate conditions of their existence. Perhaps the greatest danger of Sebeok's vision of the future is its trivialized perception of human nature, one that has no confidence in the individual's capacity for a relation to reality itself."

101 Sebeok, "Communication Measures to Bridge Ten Millennia," p. 27.

Weitzberg, also involved with the Task Force, wrote a paper entitled "Building on Existing Institutions to Perpetuate Knowledge of Waste Repositories," that focused on techniques for deploying existing systems of knowledge archiving (libraries, online databases, National Archives), incorporation into widely used means for symbolically presenting information (maps), and incorporation into existing systems of land classification (geodetic survey).[102] The deployment of existing practices of knowledge, from maps to periodic tables, as we will see, has become an important feature of the marker design proposals. Indeed, the very idea of an archive as a place where knowledge can survive independent of a culture that produced it is fundamental to this project; knowledge, in other words, without a knowing subject.[103]

Another contribution to the early years of this project came from Percy Tannenbaum. Entitled "Communication Across 300 Generations: Deterring Human Interference with Waste Disposal Sites," his work focused on what he saw as universal characteristics of the human perceptual makeup.[104] Determining these basic elements of human

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102 A. Weitzberg, *Building on Existing Institutions to Perpetuate Knowledge of Waste Repositories*, (Columbus OH: Office of Nuclear Waste Isolation, Battelle Memorial Institute, 1982).

103 For a discussion of a Popperian approach to this problem, see Jan Nolin, "Communicating with the future: implications for nuclear waste disposal," *Futures (London, England)* 25, Summer (1993): 778-791, 781-3.

104 Percy H. Tannenbaum, *Communication Across 300 Generations: Deterring Human Interference with Waste Disposal Sites*, (Columbus

perception, whether facial expression, or fear reactions to menacing figures, became a prominent theme in discussions concerning the philosophy of the marker design; equal parts Jungian and behaviorist, a design that can be propped up by an *essential* human dimension became a seductive proposition.

The archaeological expert, Maureen Kaplan's contribution, "Archaeological Data as a Basis for Repository Marker Design," was quite a fascinating work in that it both contextualized the problem *as* an historical problem (i.e., the transmission of meaning across time as itself an historical question), and extends the work of Givens[105] on a four-level taxonomy of information to convey:

i) something is here;

ii) it's dangerous;

iii) it's dangerous and here's why you should go away; and,

iv) here's some detailed symbolic information.[106]

OH: Office of Nuclear Waste Isolation, Battelle Memorial Institute, 1984).

105 See D.B. Givens, "From here to Eternity: Communicating with the Distant Future," *Et Cetera: A Review of General Semantics* 39.2 (1982): 159-79.

106 Maureen Kaplan, *Archaeological Data as a basis for Repository Marker Design*, (Columbus, OH: Office of Nuclear Waste Isolation, Battelle Memorial Institute, 1982).

This pragmatic taxonomy of layered messages, with the theoretical support derived from Sebeok's flagging of redundancy, informed all subsequent design ideas.

Following from and building on the work of the Human Interference Task Force, two new teams were recruited in 1990 — the Markers Panel.[107] The disciplinary areas of expertise represented were materials science, architecture / environmental design, anthropology, linguistics, archaeology, astronomy, communications, geomorphology, scientific illustration, semiotics, and environmental engineering. Each team (A and B) was briefed concerning the project, its history and specifications, and the process of expert judgment elicitation. The teams then met separately on one occasion to deliberate, then again together to present their findings.

Both teams approached the problem as a kind of time capsule puzzle. They were interested to a certain extent in the materials that would be utilized, and their likely durability, but their principle concerns were

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107 Team A: Dieter G. Ast (Cornell University); Michael Brill (Buffalo Organization for Social and Technological Innovation, Inc.); Ward Goodenough (University of Pennsylvania); Maureen Kaplan (Eastern Research Group, Inc.); Frederick Newmeyer (University of Washington); Woodruff Sullivan (University of Washington). Team B: Victor R. Baker (University of Arizona); Frank R. Drake (University of California at Santa Cruz); Ben R. Finney (University of Hawaii at Manoa); David B. Givens (American Anthropological Association); Jon Lomberg (independent artist, designer, and writer); Louis Narens (University of California at Irvine); Wendell Williams (Case Western Reserve University).

how to design a system of marking that would convey the danger of the site.

It was clear to the teams that to rely upon language — written texts — to carry the burden of meaning was dangerous. But both teams also felt that textual accounts of the area were necessary at least in the near future (100-500 years). The presumption of linguistic mutation, and perhaps even the emergence of unique languages over such a period of time set up a kind of internal tension with respect to the polysemiosis that was felt to be required. Both teams deployed a leveled message taxonomy I mentioned above, and both acknowledged the idea that linguistic indeterminacy did not foreclose the use of signs. But what I found very interesting is that apart from the informational aspects of the design, both teams approached the problem of the marker as though the site itself could be made to *look* dangerous. The design wouldn't in fact be dangerous; it would signify danger. Or at least this is the wish.

Messages to Others

The problem of the time capsule is an interesting one. It was once a very popular cultural pastime; a message in a bottle from the cold war years. And even today one can buy a wide selection of time capsule kits (in various sizes, and including access to a Time Capsule Registry, an international database file of time capsules) from places such as "Future Packaging" in Covina, California.

Like the Rosetta Stone, plucked from the Western delta of the River Nile, in 1799, time capsules are both a wish to be understood by the future, and an acknowledgment of the incomprehensibility of the past. The stone bore an inscription in two languages and three scripts (Greek, Demotic and hieroglyphs) and its discovery led to the first decipherment of ancient Egyptian inscription. The time capsule that was buried during the 1964 World's Fair — emblazoned with a stainless steel plate bearing an inscription in the then official languages of the United Nations (Chinese, English, French, Russian and Spanish) contained such things as a bikini, and birth control pills. This seems rather kitsch now, but it wasn't meant for us. Even today, however, as we approach the millennium, we are about to become the recipient of hundreds of time capsules addressed to us c/o the year 2000.

Perhaps one of the most elaborate such messages, also not addressed to us, was the project to send an interstellar record with the Voyager spacecraft. Two Voyager craft were launched in 1977. The spacecraft were to collect and transmit back to Earth images of the outermost planets. Once these vessels completed their work in our solar system, they would simply carry on into space.

Since this was the time of a growing interest in extraterrestrial communication — the Search for Extraterrestrial Intelligence (SETI) project having recently begun — all space probes that were launched with trajectories that would exit our system were seen as potential extraterrestrial greeting cards.

Carl Sagan was asked at the time to design a "message" for the outside of these vessels.[108] He assembled a team of scientific overachievers and, predictably, an extraordinary project ensued. A phonographic record containing sound and image data was chosen as the medium.[109]

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108 This was not the first time Sagan had been asked to design a message for distant others. In 1974 he designed a plaque for the LAGEOS satellite. This very high, very stable orbit satellite is designed to orbit the earth for 8 million years. As Sagan notes, "this is sufficiently far in our future that a great deal of information may be lost between now and then," Carl Sagan, F.D. Drake, Ann Druyan, Timothy Ferris, Jon Lomberg, and Linda Salzman Sagan, eds., *Murmurs of the Earth: the Voyager Interstellar Record*, (New York: Random House, 1978), p. 9.

109 The Voyager spacecraft will be the third and fourth human artifacts to escape entirely from the solar system. Pioneers 10 and 11, which preceded Voyager in outstripping the gravitational attraction of the

Within the astronomical scientific community this project was contentious. Some saw it as a mobile and preemptive greeting, of advancing evidence of our intelligence to *like minded* others. Lewis Thomas, for example, wanted to send the complete works of J.S. Bach, but is said to have added as an aside, "but that would be boasting." On the other hand, the British astronomer and Nobel laureate, Martin Ryle (brother of Gilbert), actively attempted (unsuccessfully) to have the International Astronomical Union vote a resolution — in the interest of the safety of the Earth from malevolent others — to the effect that no such messages should *ever* be sent.

Once the Voyager spacecraft leave the solar system (as of 1990, they have passed the orbit of Pluto), they will find themselves in empty space. It will be forty thousand years before they come within a light year of the star AC + 79 3888, and millions of years before either might make a close approach to any other planetary system. As Carl Sagan has noted,

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Sun, both carried small metal plaques identifying their time and place of origin for the benefit of any other spacefarers that might find them in the distant future. With this example before them, NASA placed a more ambitious message aboard Voyager I and 2—a kind of time capsule, intended to communicate a story of our world to extraterrestrials. The Voyager message is carried by a phonograph record-a 12-inch gold-plated copper disk containing sounds and images selected to portray the diversity of life and culture on Earth. Each record is encased in a protective aluminum jacket, together with a cartridge and needle. Instructions, in symbolic language, explain the origin of the spacecraft and indicate how the record is to be played. The 115 images are encoded in analog form. The remainder of the record is in audio, designed to be played at 16 2/3 revolutions per second.

> The spacecraft will be encountered and the record played only if there are advanced spacefaring civilizations in interstellar space. But the launching of this bottle into the cosmic ocean says something very hopeful about life on this planet.

Sagan and his colleagues — undeterred by any suggestion that the interstellar greeting was anything other than a necessary testimony to the uniqueness of humanity — were able to design a recording that contained, in addition to operating instructions, and a stylus:

118 *National Geographic / Family of Man* - type photographs (reminiscent of Foucault's Borges),

> Calibration circle; solar location map; mathematical definitions; physical unit definitions; solar system parameters; the Sun; solar spectrum; Mercury; Mars; Jupiter; Earth; Egypt, Red Sea, Sinai Peninsula and the Nile; chemical definitions; DNA structure; DNA structure magnified; cells and cell division; anatomy; human sex organs; diagram of conception; conception; fertilized ovum; fetus diagram; fetus; diagram of male and female; nursing mother; father and daughter (Malasia); group of children; diagram of family ages; family portrait; diagram of continental drift; structure of Earth; Heron Island (Great Barrier Reef of Australia); seashore; Snake

River and Grand Tetons; sand dunes; Monument Valley; forest scene with mushrooms; leaf; fallen leaves; Sequoia; snowflake; tree with daffodils; flying insect with flowers; diagram of vertebrate evolution; seashell (Xancidae); dolphins; school of fish; Tree Toad; Crocodile; Eagle; Waterhold; Jane Goodall and chimps; sketch of Bushmen; Bushmen hunters; man from Guatemala; dancer from Bali; Andean girls; Thailand craftsman; Elephant; old man with beard and glasses (Turkey); old man with dog; mountain climber; Cathy Rigby; sprinters; schoolroom; children with globe; cotton harvest; grape picker; supermarket; underwater scene with diver and fish; fishing boat with nets; cooking fish; Chinese dinner party; demonstration of licking, eating and drinking; Great Wall of China; house construction (African); construction scene (Amish country); house (Africa); house (New England); modern house (Cloudcroft, New Mexico); house interior with artist and fire; Taj Mahal; English city (Oxford); Boston; UN Building; UN Building, night; Sydney Opera House; artisan with drill; factory interior; museum; X-ray of hand; woman with microscope; street scene, Asia (Pakistan); rush hour traffic, India; modern highway (Ithaca); Golden Gate Bridge; train; airplane in flight; airport (Toronto); Antarctic expedition; radio telescope (Westerbork, Netherlands); radio telescope (Arecibo); page of book (Newton, *System of*

the World); astronaut in space; Titan Centaur launch; sunset with birds; string quartet (Quartetto Italiano); Violin with music score (Beethoven's "Cavatina").

90 minutes of "the World's greatest music":

Bach's Brandenberg Concerto No. Two, First Movement; "Kinds of Flowers," Javanese Court Gamelan; Senegalese percussion; Pygmy girl's initiation song; Australian Horn and Totem song; "El Cascabel," Lorenzo Barcelata; "Johnny B. Goode," Chuck Berry; New Guinea Men's House "Depicting the Cranes in Their Nest,"; Bach's Partita No. Three for Violin; Gavotte et Rondeaus; Mozart Magic Flute, "Queen of the Night" (Aria Number 14); Chakrulo; Peruvian Pan Pipes; Melancholy Blues; Azerbaijan Two Flutes; Stravinsky, "Rite of Spring, Conclusion"; Bach's Prelude and Fugue No. One in C Major from the Well Tempered Clavier, Book Two; Beethoven's Fifth Symphony, First Movement; Bulgarian Shepherdess Song "Izlel Delyo Hajdutin"; Navajo Indian Night Chant; The Fairie Round from Pavans, Galliards, Almains; Melanesian Pan Pipes; Peruvian Woman's Wedding Song; "Flowing Streams" Chinese Ch'in music; "Jaat Kahan Ho" Indian Raga; "Dark Was the Night"; Beethoven String Quartet No. 13, Opus 130, "Cavatina."

An audio essay on "The Sounds of Earth,"

> The sound bytes included: whales; volcanoes; mud pots; rain; surf; crickets, frogs; birds; hyena; elephant; chimpanzee; wild dog; footsteps; heartbeats; laughter; fire; tools; domestic dogs; herding sheep; blacksmith shop; sawing; riveter; tractor; kiss; Morse code; truck; baby; auto gears; ships; life signs — EEG, EKG; horse and cart; jet; horse and carriage; lift-off Saturn 5; pulsar; train whistle; and a rocket.

And salutations from the President of the United States, the Secretary of the United Nations, and a whale.

It is interesting that the languages recommended by the Markers Panel make up only the six languages of the United Nations (Arabic, Chinese, French, Russian, English and Spanish), as well as Navajo. The Voyager, on the other hand, was equipped with greeting in 60 languages including: Sumerian, Akkadian, Hittite, Hebrew, Aramaic, English, Portuguese, Cantonese, Russian, Thai, Arabic, Roumanian, French, Burmese, Spanish, Indonesian, Kechua, Dutch, German, Bengali, Urdu, Hindi, Turkish, Vietnamese, Welsh, Sinhalese, Italian, Greek, Nguni, Latin, Sotho, Japanese, Wu, Punjabi, Korean, Armenian, Polish, Netali, Mandarin, Gujoratilla (Zambia), Nyanja, Swedish, Kannada, Ukrainia, Telugu, Persian, Oriya, Serbian, Hungarian, Luganada, Czech, Amoy, Rajasthani, and Marathi.

I think it is fascinating to consider the kind of self-representation that took place with the Voyager. As one wades through the contents of the message, it is a very strange sensation to consider that this is/was intended to be a metonymic distillation of us. A Rosetta-esque cultural composite. But apart from the general mendacity of the message itself (the *Cavatina* notwithstanding) it is also quite ironic that the space-born monument to humanity was conceived as though it were somehow the first message to issue from the Earth to unknown (intelligent) Others. The irony consists precisely in the "noise" that has been ceaselessly beamed outward from the Earth since the time that Guglielmo Marconi started bouncing signals around his father's estate. If any message is asserting its importance, it must surely be the redundancy of the barrage of popular programming. Laurie Anderson captured this beautifully with the image of dozens of *I Love Lucy* episodes racing outward from the Solar System ("Looooseeee!"). I don't mean to be glib about this. I think it points to an important parallel between Voyager and the marker. Just as the Voyager plaque is disingenuous with respect to everything that precedes it, and just as Voyager pretends to operate as though it were *the* disembodied Rosetta-thought of/for Humanity, so the marker attempts to convey its message apart from everything that precedes it, and as though it can be a millennial thought-without-a-thinker. A disembodied thought.[110]

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110 cf. Jean François Lyotard, "Can Thought go on Without a Body?," *Materialities of Communication*, ed. Timothy Lenoir, and Han Ulrich Gumbrecht. trans. Bruce Boone and Lee Hildreth, (Stanford: Stanford University Press, 1994).

The relationships between the Voyager spacecraft and the marker are both remarkable and provocative.[111] Yet, with the notable exception of two individuals on the Markers Panel who were also involved with the Voyager project (Drake and Lomberg), to my knowledge there have been no explicit links. That both projects assume a sign that can be made to contain its own interpretation is more than curious. (Wittgenstein was clearly not on either agenda, nor was the observation that rules for any language game are always and significantly an abridgment of practice.)

In the case of the Voyager spacecraft, the oversight can be ignored (and it's too late to do much about it). But the problem in our case is far less playful; the stakes are higher.

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111 In thinking about the problems of transmission and otherness, I conducted a small experiment in the winter of 1995. I sent twelve friends an email message containing an encoded message similar to that sent on the Voyager. The message contained a short introduction explaining the problem, and was followed by a string of 551 zeros and ones. To "decode" this properly required a number of steps. First, one would likely need to recognize that 551 is a prime number. But in any case, one would have to *see* that the data both could and should be arranged in 29 rows of 19 characters. Then, having made these harmonic leaps of brilliance, one would have to recognize the whole matrix as a "picture" with the 1s representing the figure, and the zeros, the ground. (In order to do this, one would almost have to think of this as a kind of television signal; and only then would the question of *resolution* become relevant.) Thus visualized, the "picture" contained an image of a bilaterally symmetrical being, the configuration of our solar system, "likenesses" of atoms of carbon and oxygen, and the numbers one through five in binary. Apart from one family member, none of my original corespondents solved the problem. The experiment subsequently "escaped" on the internet yielding much additional interest, but only one additional solution.

Designs for Danger

Team A founded their design upon the conviction that "communication technology cannot bypass the problem of the certain transformation and succession of cultures, but the use of fundamental and enduring psychology can"; and "the entire site must be experienced as an integrated system of mutually reinforcing messages, and designed accordingly."[112] Thus the object of their design work was to apprehend the fundamental and enduring, and deploy these sign elements in an integrated fashion.

> Modern understanding of the communications enterprise shows that there can be little separation of the content of a message from its form, and from its transportation vehicle. They affect each other, and all of it is message. McLuhan and Fiore take that even further, arguing that "the medium is the message." Given this, rather than our attempting to first articulate messages, then to select their form, and then to design their vehicle, we choose to do as much of this simultaneously as is reasonable, attempting to accomplish — a *Gestalt*, in which more is received than sent,

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112 Trauth, et al, *Expert Judgment on Markers to Deter Inadvertent Human Intrusion into the Waste Isolation Pilot Plant*, p. F-27

> — a *Systems Approach*, where the various elements of the communications system are linked to each other, act as indexes to each other, are co-presented and reciprocally reinforcing, and
> — *Redundancy*, where some elements of the system can be degraded or lost without substantial damage to the system's capacity to communicate.
>
> Everything on the site is conceived of as part of the message communication ...from the very size of the whole site-marking down to the design of protected inscribed reading walls and the shapes of materials and their joints. In this report, the various *levels* of message content are described, as is the *content* of each level, the various *modes* of message delivery, and the most appropriate *physical form* of each.[113]

Accordingly, the design they developed is roughly as follows.

The Level I message would be the site itself; the site as a gestalt of danger. The organization of the elements, and the phenomenology of the place for its witness (any witness) would be:

> *This place is a message ... and part of a system of messages ... pay attention to it!*

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113 Ibid., p. F-33.

Sending this message was important to us. We consider ourselves to be a powerful culture.

This place is not a place of honor ... no highly esteemed deed is commemorated here ... Nothing valued is here.

What is here was dangerous and repulsive to us. This message is a warning about danger.

The danger is in a particular location ... it increases towards the center ... the center of danger is here.

The danger is still present, in your time as it was in ours.

The danger is to the body, and it can kill.

The form of danger is an emanation of energy.

The danger is unleashed only if you substantially disturb this place physically. The place is best shunned and left uninhabited.

The Level II message would be inscribed on surfaces throughout the marker area in the 6 languages of the United Nations and "a local language such as Navajo." It would read as in Figure 6.

DANGER
POISONOUS RADIOACTIVE WASTE BURIED HERE
DO NOT DIG OR DRILL HERE BEFORE 12,000 A.D.

Figure 6. Proposed Level II message to indicate the presence of "Danger." Reproduced from Trauth, et al. *Expert Judgment on Markers to Deter Inadvertent Human Intrusion into the Waste Isolation Pilot Plant.* p. F-115

Pictured to the left of the text is a likeness of the head from Evard Munch's *The Scream*, and to the right, a face picturing "nausea" from Irenäus Eibl-Eibesfeldt's *Human Ethology*.[114]

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114 Irenäus Eibl-Eibesfeldt, *Human Ethology*, (New York: Aldine de Gruyter, 1989). Eibl-Eibesfeldt, a student of Lorenz, is characteristically behaviorist in his approach to questions phylogenetic. The ethogram of man is a map upon which phylogenetic adaptation shapes and constrains behavior. In part a reaction to the extreme environmentalism—of which cultural relativism is held to be the zenith (or nadir)—Eibl-Eibesfeldt's ethographic work proceeds from the assumption that "man has been given some universal guide lines of how to behave," and that "[h]is

The Level III message is to give a textual explanation of the site and its purpose, but contains no detail or specialized language concerning the contents or the mechanisms of threat.

> These standing stones mark an area used to bury radioactive wastes. The area is ... by ... kilometers (or ... miles or about ... times the height of an average full-grown male person) and the buried waste is ... kilometers down. This place was chosen to put this dangerous material far away from people. The rock and water in this area may not look, feel, or smell unusual but may be poisoned by radioactive wastes. When radioactive matter decays, it gives off invisible energy that can destroy or damage people, animals, and plants.
>
> Do not drill here. Do not dig here. Do not do anything that will change the rocks or water in the area.
>
> Do not destroy this marker. This marking system has been designed to last 10,000 years. If the marker is difficult to read, add new markers in longer-lasting materials in languages that you speak. For more information go to the building further inside. The site was known as the WIPP (Waste Isolation Pilot Plant) site when it was closed in ...

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inborn nature is the benchmark." Irenäus Eibl-Eibesfeldt, *Ethology: The Biology of Human Behavior*, (New York: Holt, Rinehardt and Winston, 1975), p. 534.

The Level IV message is the message with the most content and detail concerning the site. They propose two rather long texts as two possible variations on the Level IV message. Both detail the nature of the waste, the mechanisms of toxicity, the depth at which it is buried, maps of the site, a periodic table, star maps to indicate the decline of radioactivity by showing the passage of time, the location of all other known waste sites, a description of the symptoms of radioactive sickness, and instructions to reinscribe the surfaces of the marker with updated information.

Some of the proposed information, and particularly its mode of presentation is very difficult. Consider the following two figures (Figure 7 and 8). The first diagram is to assist in the location of the sites of waste throughout the globe. The outer circle is to indicate longitude, and the inner circle, latitudes (I still have a difficult time with this one). As with all level IV messages, there would be text to support this image, but nonetheless, it is a startling abstract picture of the globe.

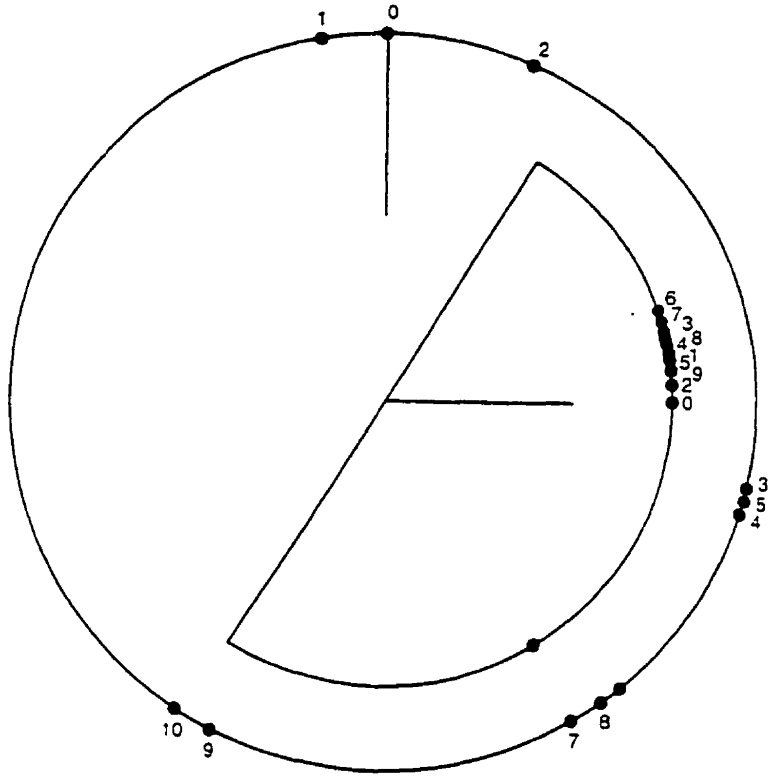

Figure 7. Level IV diagram to show the location of global waste storage facilities. Reproduced from Trauth, et al. *Expert Judgment on Markers to Deter Inadvertent Human Intrusion into the Waste Isolation Pilot Plant.* p. F-117

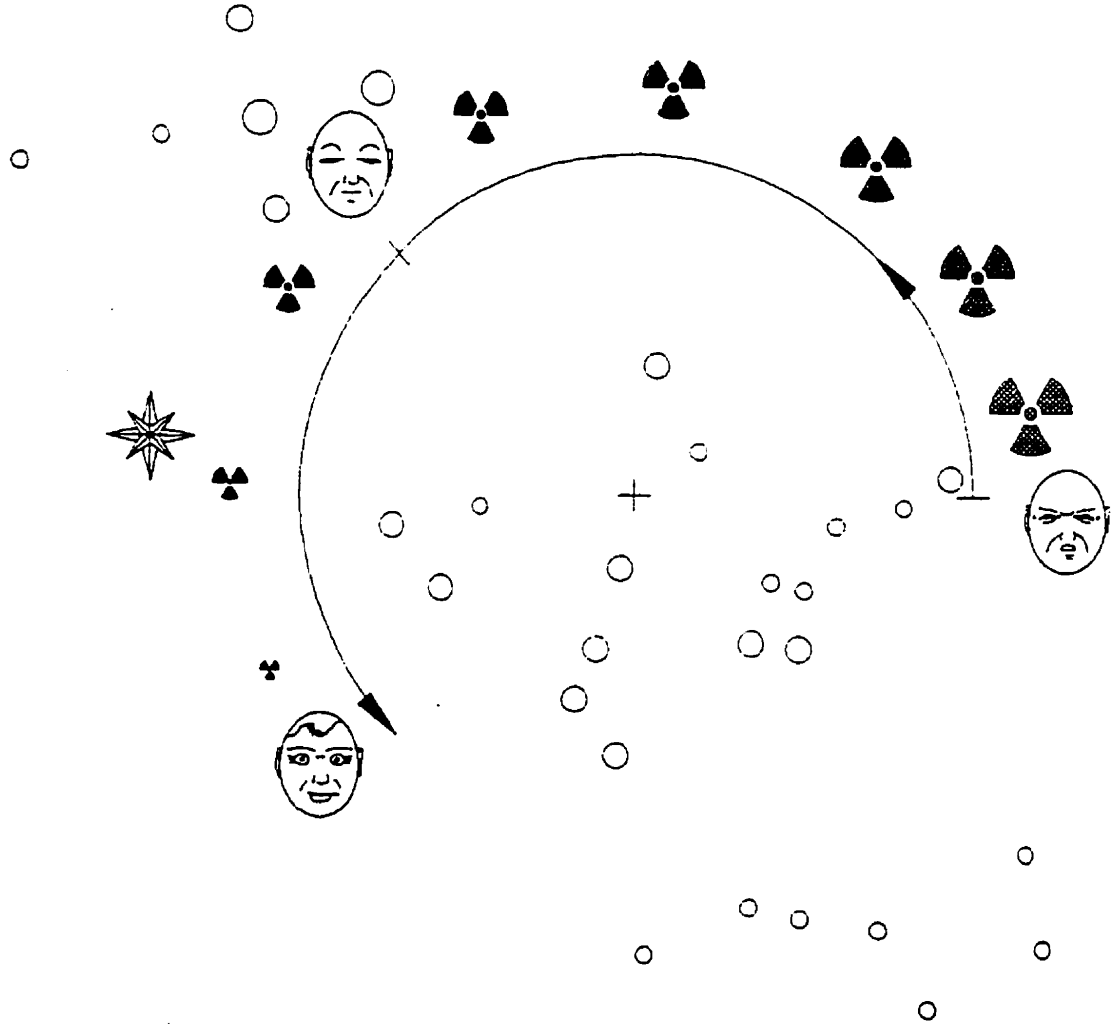

Figure 8. Level III diagram to indicate the passage of time (and thus the decrease in radioactivity) as an indexical function of the "movement" of stars about the Polaris. The retrograde movement of the diagram passes from the anxiety face to the happy face, and the (as yet unknown) international symbol for burial diminishes in size. Reproduced from Trauth, et al. *Expert Judgment on Markers to Deter Inadvertent Human Intrusion into the Waste Isolation Pilot Plant.* p. F-121.

I find Figure 8 (a Level III message conveying "basic information" and thus by definition "easier" than Figure 7) equally perplexing. They write, "[t]o those not able to understand any languages, this diagram [Figure 7] will indicate both the epoch of burial, and the period of danger."[115]

The report of Team B also used the idea of multiple levels of messages, though their design was less grand than the other team. They specified that berms of earthworks be constructed around the perimeter of the site to an elevation of thirty feet. The shape of the earthwork could be either a skull and crossbones, or a nuclear trefoil. One-piece granite monoliths (ten by twenty-five feet) would be arranged at intervals around the perimeter.[116] A central structure would be placed at the center (this would be the repository for the Level IV information). Small "time-capsules" would be buried around the site containing Level II and III information. The contents of the time capsules would be such things as "durable tablets," samples of wood for C-14 dating, and small-scale cross-

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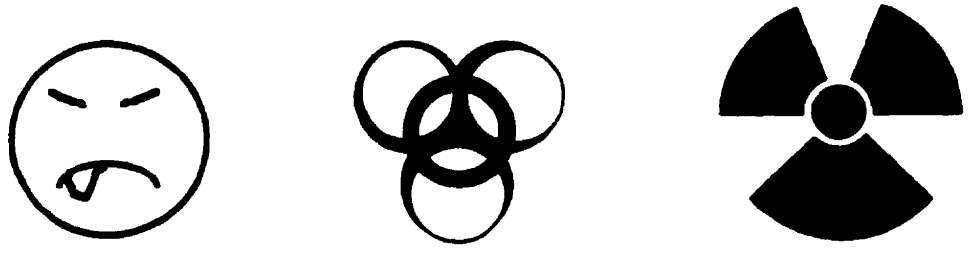
115 Trauth, et al, *Expert Judgment on Markers to Deter Inadvertent Human Intrusion into the Waste Isolation Pilot Plant*, F 120.

116 The sheltered surface of each monolith would be used for various Level II inscriptions. In order to accommodate the possibility that some monolith might be removed or toppled, the report suggests that their total number be a power of two so "the original configuration of the ring" could be inferred by future investigators.

sectional models of the geological substrate, mine shafts and depository rooms.

There are two principle areas of conflict concerning design philosophy. Although the two Teams basically agreed to the majority of design concepts, they differ concerning the nature of sign units to be deployed, and as to the question of a center.

The dispute over sign units turns on the question of whether and how much to rely upon various types of "graphics." Team B based their design upon the assumption that pictographs have a pancultural character and as such ought to be deployed in order to display a narrative concerning the development of the site, and the danger of intrusion. Because they felt that "symbols have more emotional content than other signs," they recommended that the choice of symbols should be left for future researchers, and in any case, should be "defined pictographically."



i) ii) iii)

Figure 9. Variations on Pictographs. "Mr. Yuk" (i) is presumed to have less inherent ambiguity than either the International Biohazard symbol (ii), or the Standard Nuclear Trefoil (iii).

This is of course muddled language if read semiotically. What they attempt to say is that an image such as "Mr. Yuk" (which has apparently been adopted as the international symbol for use as a children's warning on prescription medicines), has less inherent ambiguity than signs such as the international biohazard symbol, or the standard nuclear trefoil. In other words, Mr. Yuk — and never mind the Asian resonance of the name or indeed the caricature of the face — is taken to be iconic in a very Peircian manner. Whereas the other two signs, biohazard and trefoil, are simply conventional, i.e., symbols in Peirce's sense.

Two monument schemes proposed by this Team are shown in Figures 10 and 11.

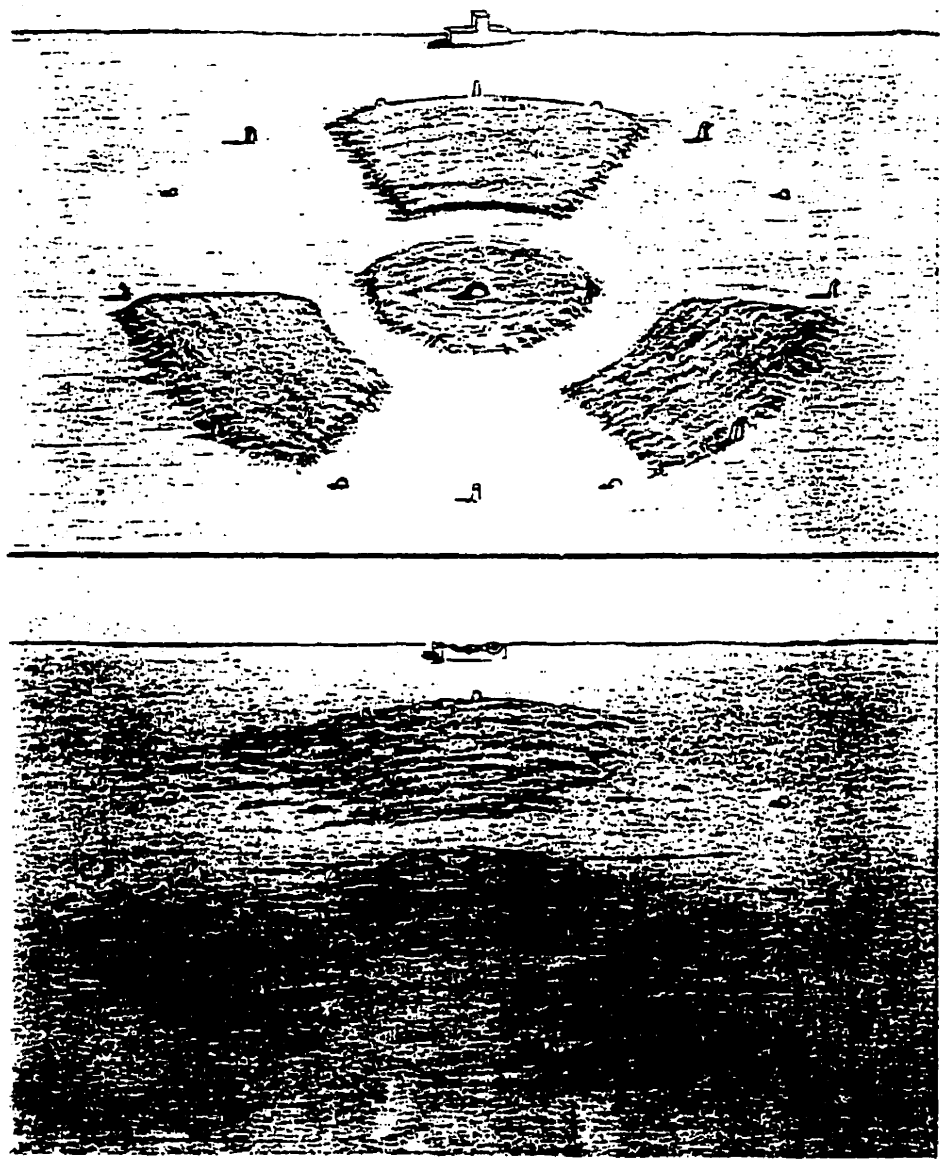


Figure 10. Marker concept proposal showing nuclear trefoil pattern at time of construction (top), and after 5000 years. Reproduced from Trauth, et al. *Expert Judgment on Markers to Deter Inadvertent Human Intrusion into the Waste Isolation Pilot Plant.* p. G-12.

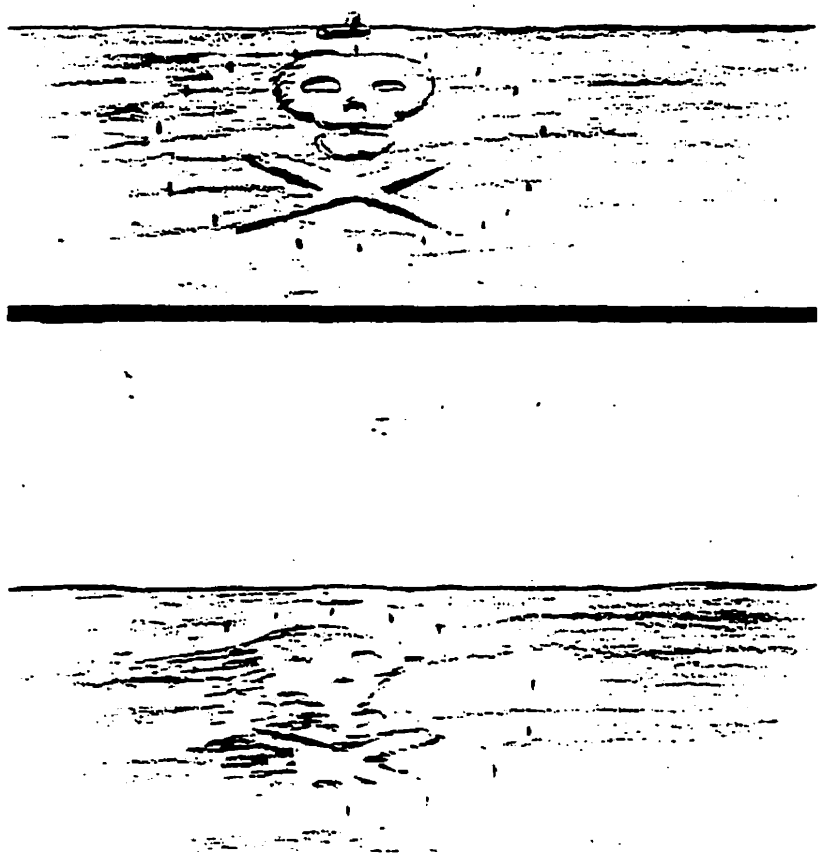


Figure 11. Marker concept proposal showing Skull and Crossbones design at time of construction (top), and after 5000 years. Reproduced from Trauth, et al. *Expert Judgment on Markers to Deter Inadvertent Human Intrusion into the Waste Isolation Pilot Plant.* p. G-13.

The skull and crossbones motif was suggested by Carl Sagan in a letter he wrote to Sandia Laboratories to indicate that he could not take part in the Markers Panel. Of it, he wrote:

> I think the only reason for not using the skull and crossbones is that we believe the current political cost of speaking plainly about deadly radioactive waste is worth more than the well being of future generations.[117]

Team A, on the other hand, identified what they saw as philosophical difficulties inherent in the use of "graphics." Specifically they identified the danger of ambiguity (citing the Thematic Apperception Test[118]), the

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117 Carl Sagan, Letter to Dr. Richard Anderson, Sandia National Laboratories, 8 August, 1990. Reprinted in *Expert Judgment on Markers to Deter Inadvertent Human Intrusion into the Waste Isolation Pilot Plant*, pp. G-88-9.

118 It is important to reflect somewhat on the gravity of introducing the T.A.T. as an argument against the use of iconographic materials in the marker. As I understand it, the utility of the T.A.T. is its ability to read the overdetermined expressive content of apperceptive distortion(s). It is not *simply* an example of the subjective manner in which signs are perceived. It certainly has something to say with respect to cultural aspects of perception, but as I understand it, it is not principally interested in the nomothetic content of apperception. Rather, its strength is as an idiographic instrument. see Leopold Bellak, "Theoretical Foundations for Projective Testing," *The Thematic Apperception Test, The Child's Apperception Test, and the Senior Apperception Test in Clinical Use*. Third ed, (New York: Grune and Stratton, 1975)

danger that graphics be removed from the site (the ambiguity of art), and in general the culturally restricted manner in which graphics may operate as signs.

The only "universal" sorts of graphics they recommend for use are that of the human face in various "emotive" states (e.g., "pain, anger, disgust, fear"). Signs, in other words that convey affect.

Whereas Team B advocates extensive use of cartoon pictographs throughout the marker site (Figures 12 and 13), Team A wrote a strong section claiming that written language has a higher probability of being understood. Their argument was simply that the *symbols* associated with, say, alchemical texts are more obscure today than are the *texts* associated with them. "We suspect," they wrote,

> that 500 years from now, it will be correspondingly easier to uncover the meanings of the English words "radioactivity" and "hazardous waste" than of the symbols now used to denote them.[119]

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119 Trauth, et al, *Expert Judgment on Markers to Deter Inadvertent Human Intrusion into the Waste Isolation Pilot Plant*, p. F-44.

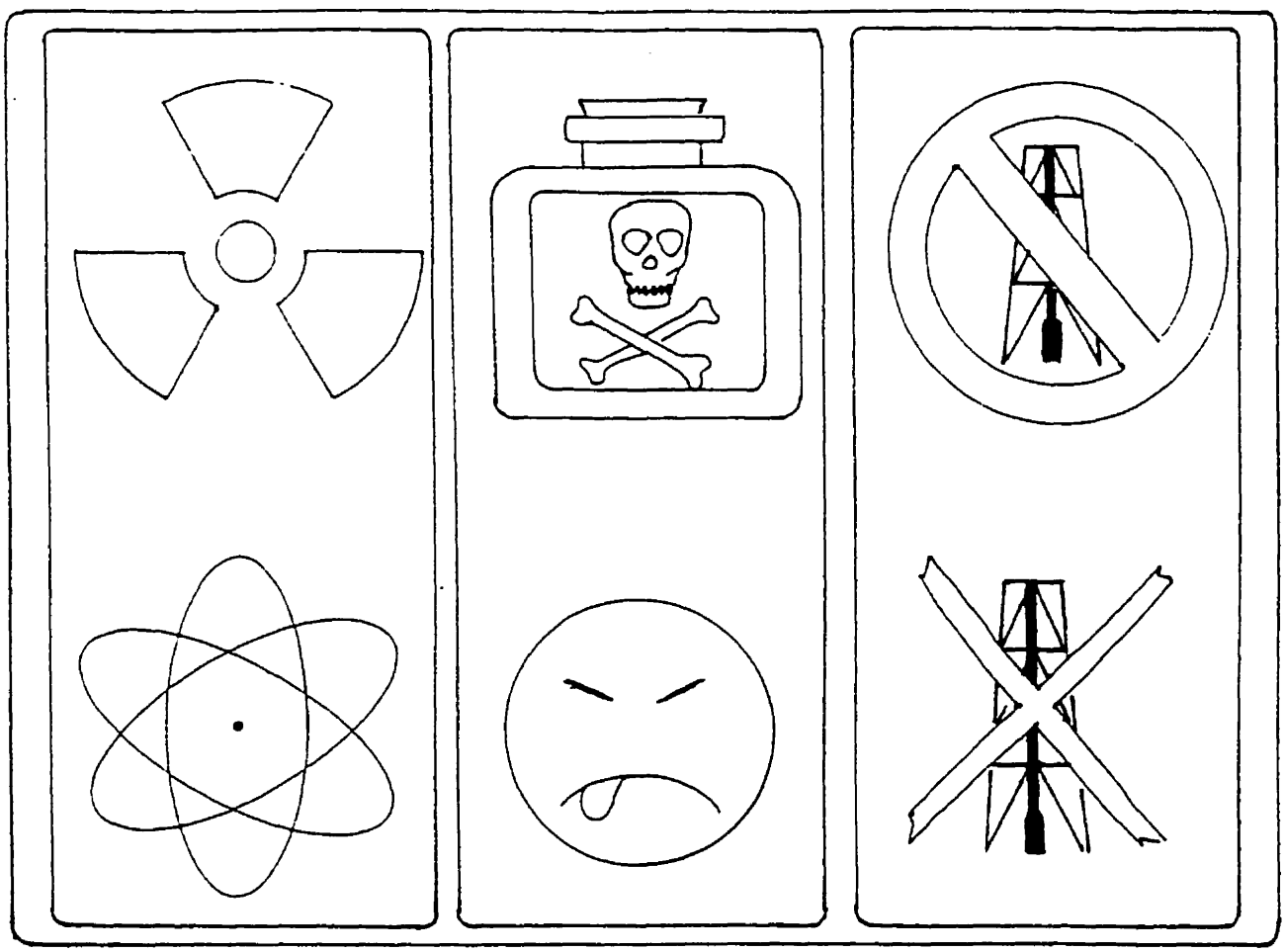

Figure 12. Proposed series of pictographs to define the equivalence of symbols. Reproduced from Trauth, et al. *Expert Judgment on Markers to Deter Inadvertent Human Intrusion into the Waste Isolation Pilot Plant.* p. G-21.

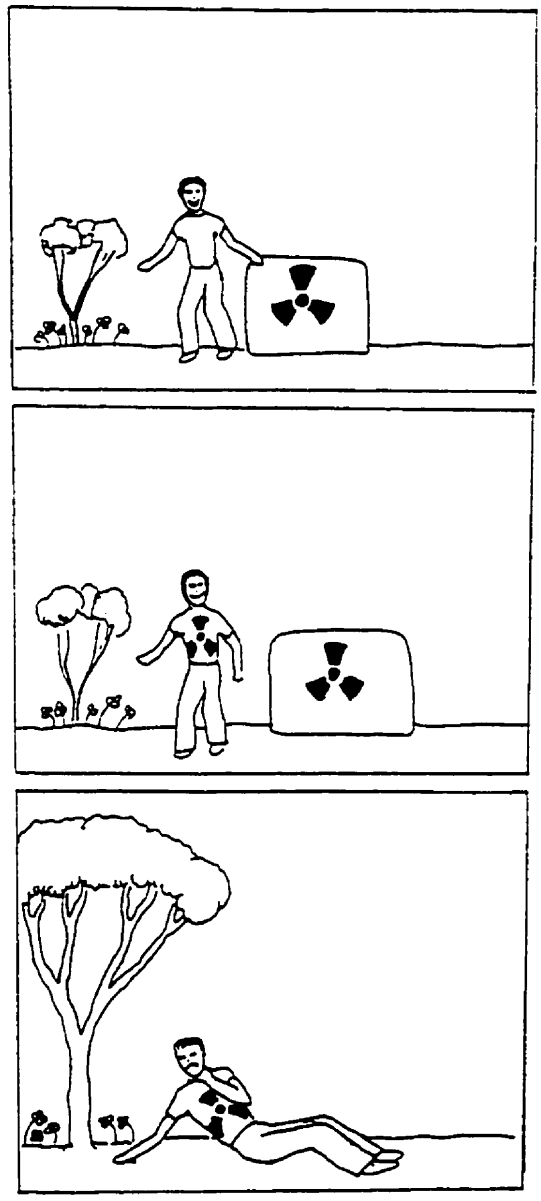

Figure 13. Pictograph series to "define" radiation trefoil symbol. Reproduced from Trauth, et al. *Expert Judgment on Markers to Deter Inadvertent Human Intrusion into the Waste Isolation Pilot Plant.* p. G-20.

In Figure 12, Team B shows how what they call symbols can be used algorithmically to form equivalencies. And Figure 13 shows the application of what they think of as the same idea to the definition of a single symbol. It is, I think quite clear how these are not the same procedures. In the first case, it must be read as a series of transpositions based on equivalence (trefoil → atom, poison → Mr. Yuk, prohibited cross → conventional cross-out X). Whereas in the second case (Figure 13), the procedure is not one of assigning equivalence at all. Rather it must be *read*, top to bottom, as a temporal sequence in which something takes place. And what exactly takes place is a tough call. For example, either there is linear perspective involved, or the tree grows considerably larger. In addition, one wonders what becomes of the small monument that accomplishes the transfer of the graphic onto the t-shirt.

The second point of dispute between the two teams concerns the center of the site. As I mentioned above, Team B incorporated a central structure into their design as a principle focus for the site. They wrote:

> Central placement of [the] rock shelter would draw future visitors through the encircling earthwork and the ring of monoliths to the center of the marker, where inscriptions inside would carry pictographic, linguistic, diagrammatic

> and scientific information. The designed shape itself would attract people to the structure ...[120]

The other team suggests a very different design philosophy:

> For human beings, making a center ("here we are") is the first act of marking order (Cosmos) out of undifferentiation (Chaos). The meanings of center have always been of a highly valued place ... the holy of holies; the statue centered within the temple; the dancing ground; the sacred place as the physical and spiritual center of a people ... In this project we want to invert this symbolic meaning, to suggest the center is not a place of privilege, or honor, or value, but its opposite. In symbolic terms, we suggest that the largest portion of the Keep, its center, be left *open*, and few (if any) structures placed there, so that symbolically it is: uninhabited, shunned, a void, a hole, a non-place.[121]

Whereas the point made here about the center is provocative, and perhaps in some sense correct, one can see the almost impossible task that has been created. Only by abstracting the site itself from its immediate desert context could this argument about symbolic inversion make sense. In other words, whether the installation itself has a center would seem to be

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120 Ibid., p. G-46.

121 Ibid., p. F-52.

incidental to the fact of the installation standing alone in the desert. Its very presence would appear to make an assertion. An ambiguous assertion to be sure, but clearly an assertion of its presence.

In any case, the designs that have been most thoroughly considered — in addition to the bearm design mentioned above — are unified in the sense that they "utilize archetypal images whose physical forms embody and communicate meaning."[122]

In other words, they are said to *look dangerous.*

And accordingly, they are given dangerous sounding names: Landscape of Thorns (Figure 14); Spike Field; Spikes Bursting through Grid; Leaning Stone Spikes; Menacing Earthworks; Black Hole (Figure 15); Rubble Landscape; Forbidding Blocks.

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122 Ibid., p. F-57.

Figure 14. Landscape of Thorns design. Reproduced from Trauth, et al. *Expert Judgment on Markers to Deter Inadvertent Human Intrusion into the Waste Isolation Pilot Plant*. p. F-61.

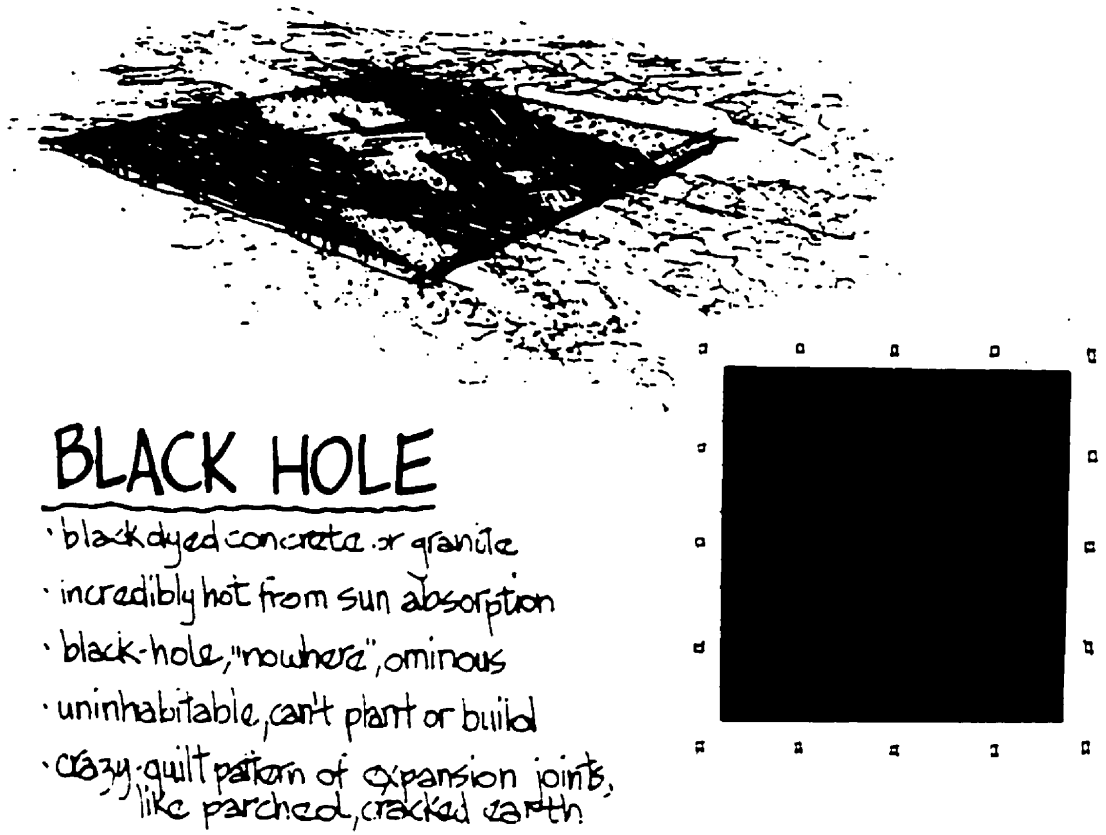

Figure 15. Black Hole design. Reproduced from Trauth, et al. *Expert Judgment on Markers to Deter Inadvertent Human Intrusion into the Waste Isolation Pilot Plant.* p. F-70.

Like their names, the shapes of these designs are said to "suggest danger to the body ... wounding forms, like thorns and spikes, even lightening."[123]

It is curious though, that none of these designs really *are* dangerous. They may provide an inhospitable environment for certain activities, for machinery perhaps. They may indeed provide a real challenge for one who may want to *be* there. But they do not present real danger. The only exception, and the thing that I think contains part of the idea that will unravel this whole problem, is the Black Hole design (Figure 15).

> A masonry slab, either of black basalt, or black dies concrete, is an image of an enormous black hole; an immense nothing; a void; land removed from use with nothing left behind; a useless place ... The blackness absorbs the deserts high sun-heat ... The heat of this slab will generate substantial thermal movement.[124]

If we pass over the description of its "nothingness," for it surely is not nothing, the interesting idea that marks this as a unique moment in design thinking, is that only in this case is it a sign that will at least hurt. It

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123 Ibid., p. F-57.

124 Ibid., p. F-58.

doesn't refer to pain, in fact its distinctive features do not point at all. It has a far more intimate connection with bodies — its design is such that it would deliver pain. In a small way it short-circuits the need for *re*presentation, by fusing itself as a thermal sign. The distinctiveness of this design — an awareness that it contains the idea of a radically *different* kind of sign — has not been noticed by the designers (as far as I can tell), or those in charge of this project. The only other sign that has been considered that challenges the kind of representation under consideration is the mention (by Team B) of an Aeolian structure. A sign that might moan or scream. In the very final section of their report, they write,

> Communication of the basic Level I message could also take place through sound. Although probably not lasting the full 10,000 years, structures designed to resonate in the wind could be placed around the site. The effect of the various sounds generated should be consonant [so to speak] with the overall site design, namely a place of great foreboding. Indeed sounds that can readily be generated by long-lasting aeolian structures turn out often to be dissonant and mournful ...

Assurance

In a significant way the question of *what to do* was answered long before the Panels were assembled. The question of whether the site will contain written language or iconic sequences, have a central structure or an impenetrable wall of "thorns," whether it is organized as information, or event, or whether it is designed as a vast aeolian structure moaning in the desert throughout the millennia ... these are questions that follow from everything that was assumed from the start. And all of these questions that have been hanging in abeyance must (and can) now be answered. As of 1997, the fix is in, as it were. As I mentioned above, the Compliance Certification Document was submitted, and the question of the sign has largely been answered (see also Appendix A). And it appears, insofar as I have been able to read through the vastness of this document, it appears that the Department of Energy has met the requirements, the burden of "proof" that they were called upon to demonstrate. This is certainly not the first time that science has been responsible to put an answer in the place of a philosophical question. This may, however, be one of the most significant. Henceforth, we can only infer what the ethical questions may have been which are now definitively laid to rest in the material features of what is now the solution.

The most important question, in my view, that has now been excised from the realm of the problem concerns the entire question of permanent disposal. Other options exist. For instance, as with the Nuclear Guardianship Project, the waste could be kept in above ground, isolated, and monitored storage. And the knowledge about practices around the waste would be an ongoing matter of ethical and social concern. (I will come back to this, because in a way it is the best, the worst, and really the only option.) Or, the waste might have been kept in sites in which the waste would be retrievable, on the assumption (or wish) that upon appropriate future technological developments, other arrangements could be made. The name used for this sort of site is negotiated, monitored, retrievable storage (NMRS), and it has been persuasively argued by critics of permanent geological storage.[125] This kind of proposal can be supported on either scientific or ethical grounds: the argument being, we owe it to the future to make the best decisions concerning their well being, and we tend to make better decisions with more time to make them, therefore we should wait until we are better equipped to make decisions about the final disposition of waste; and from a scientific posture, waiting

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125 The most detailed treatment and critique of permanent geological storage that I have seen to date is K.S. Schrader-Frechette, *Burying Uncertainty: Risk and the case against Geological Disposal of Nuclear Waste*, (Berkeley: University of California Press, 1993). Her concern is about discourses of risk, uncertainty, and ethics. As an ethicist steeped in the theory of risk, of particular note in this work is the manner in which she systematically uncovers the embedded assumptions, and normative foundations of risk assessment, and ultimately, the entire inductive conundrum of waste disposal.

is simply a tactic to reduce uncertainty concerning the behavior of various radionuclide wastes over time. Clearly these are hardly distinct arguments, but the point is that this discussion will not be taking place.[126]

The preferred options for the design of the marker are rather plain in relation to the designs set forth by the Markers Panel. Three designs were evaluated. One, Design A, was a variant of the trefoil design (Figure 10), and another, Design C, was a variant of the menacing earthworks design. The rationale for not choosing either of the designs is given as follows:

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126 In a recent "Collective Opinion" rendered by the OECD Nuclear Energy Agency, they affirmed that disposal was consistent with global ethical principles for the future, and furthermore, that it is consistent with the vision of the future as set out in the Brundtland Commission report (World Commision on Environment and Development, *Our Common Future*, (New York: Oxford University Press, 1987)). The stated that: [we] confirm that the geological disposal strategy can be designed and implemented in a manner that is sensitive and responsive to fundamental ethical and environmental considerations; [we] conclude that it is justified, both environmentally and ethically, to continue development of geological repositories for those long-lived radioactive wastes which should be isolated from the biosphere for more than a few hundred years; and [we] conclude that stepwise implementation of plans for geological disposal leaves open the possibility of adaptation, in the light of scientific progress and social acceptability, over several decades, and does not exclude the possibility that other options could be developed at a later stage. Radioactive Waste Management Committee OECD Nuclear Energy Agency. *The Environmental and Ethical Basis of the Geological Disposal of Long-lived Radioactive Waste*. 1994. Online. Available: http://faraday.ee.latrobe.edu.au/%7Ekhorsell/anti-nukes/disposal/geodisp.html.

> The quantity of material and general configuration of the berms give rise to a significant construction effort in their erection. For total quantity of material required, designs A and C each represent on the order of 1,400,000 cubic meters. Design B is approximately 750,000 cubic meters. In addition, the shape of the various berm sections for design C add an additional degree of construction complexity over that of designs A and B. Although design C is more "menacing", the actual warning of danger is conveyed effectively by the inscribed information on the monuments.[127]

Thus there is a significant shift away from the conceptual problems of marking, toward the pragmatics of design and construction (Figure 16).

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127 U.S. Department of Energy. *Waste Isolation Pilot Plant Compliance Certification Application to the EPA*. 1996. Online. Available: http://www.wipp.carlsbad.nm.us/cca/cca.htm, Section XIII.

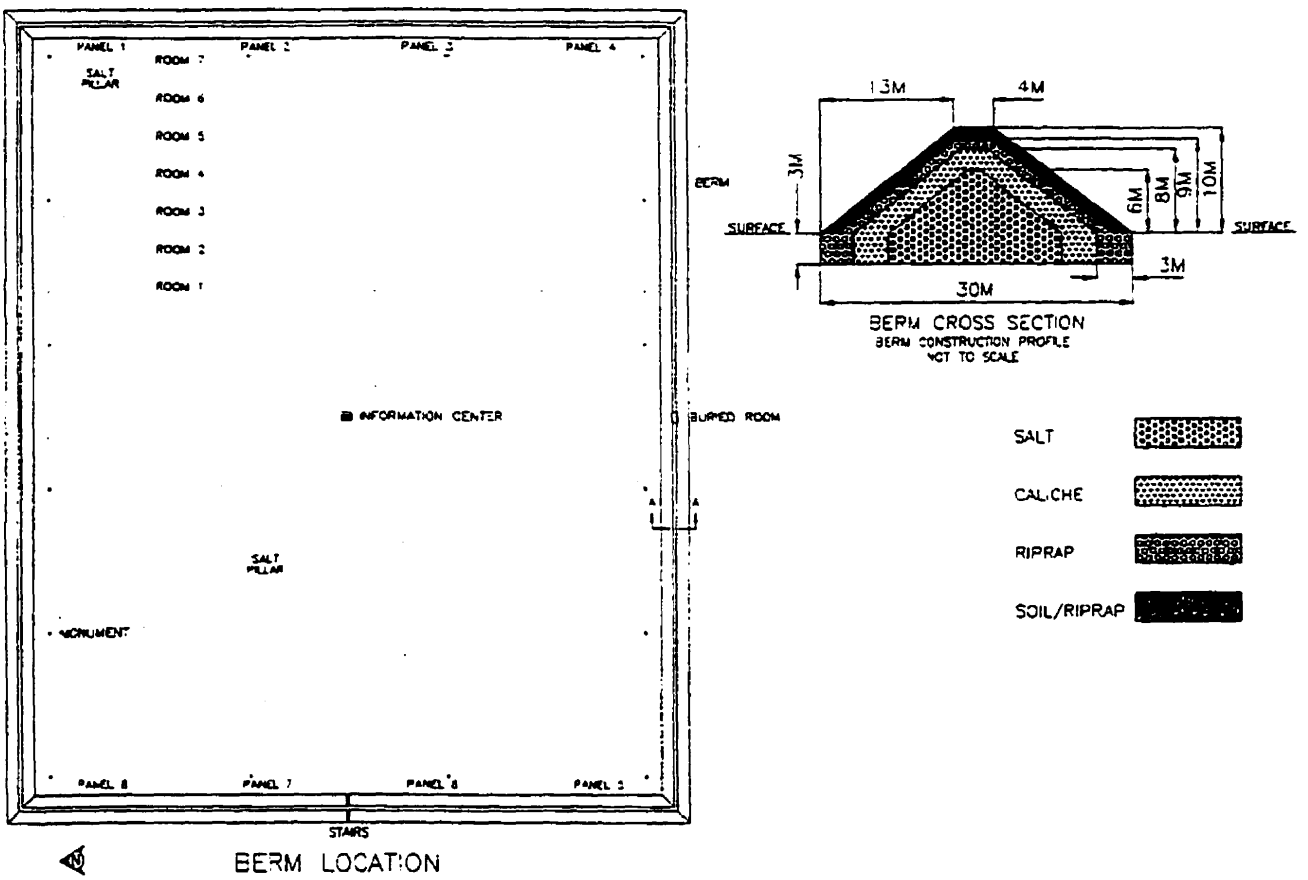

Figure 16. Repository Footprint Berm Construction with Monument Locations, and Information Center. Reproduced from DOE, *Compliance Certification Application*, Figure XI-1.

The semiotics of the site itself, however inadequate that discussion may have been, is passed over in favor of textual and pictorial inscription on the individual monuments.

> The primary purpose of the berm is to convey the Level I message that something manmade is here. All of the berm configurations will perform this function. Design A does not provide the degree of "protection" (i.e., enclose the repository footprint) that is conveyed by either design B or C. It is acknowledged that access to much of the footprint is inhibited by an additional 10 meters of material when design A is considered. However, other than causing some additional effort to set up a drilling platform on the design A berm, it adds little when considering that the repository is 655 meters below the surface. The volume of material required to construct the Trefoil shaped berm is considerably more than that required to construct design B. In addition, design A would not provide the same degree of protection from wind drive erosion of the monuments as does design B. The proximity of the monuments to the berm in design B will provide more protection to at least one face of a monument than would be available to the more exposed monuments in design A. Although barriers can be erected to

> improve protection of the inscribed material there is no apparent advantage of the Trefoil over that of the perimeter berm. The elevated location of the Information Center at the center of the design A berm will also be subjected to greater wind driven erosion effects than the more protected location provided by design B berm. The berm aspect of the three permanent marking concepts considered is the major design variable. The Monuments, the Information Center, the Storage Rooms, and the Subsurface Warning markers will not significantly vary in cost for any of the three configurations. When all the salient features including total materials required, ease of construction, meeting design requirements/criteria, and establishing permanence are compared, the conceptual configuration using a rectangular berm to enclose the entire repository footprint is the most practicable. For this reason, Concept B is the configuration of choice for the Permanent Marker System.[128]

The entire marking system, including the controlled area and monuments is shown in Figure 17.

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128 Ibid., Section XIII.

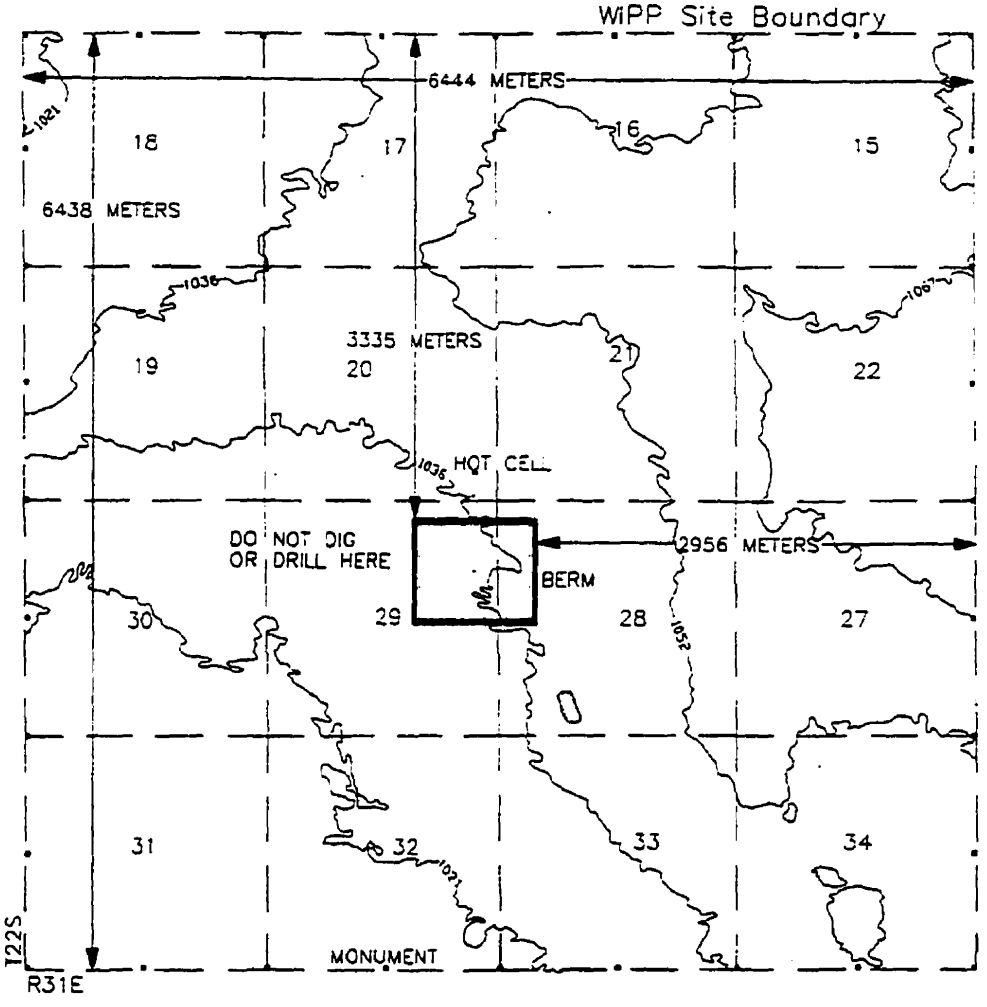

Figure 17. Controlled Area Map showing Monuments and Repository Footprint. Reproduced from DOE, *Compliance Certification Application*, Figure V-4.

The DOE contends that the assurance criteria can be met with the following design components:

> A controlled area of 41 square kilometers. About this perimeter of this controlled area will be 32 monuments, placed 805 apart.[129] Each monument will be a two-piece, one meter square, granite monolith. And each will extend 5 meters below the surface, and 7 meters above ground (Figure 18). Each of the four sides of the monolith will be inscribed — both above and below ground — with a star azimuth map (Figure 19), a map similar to Figure 16, and a warning message inscription (Figure 20).

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129 In keeping with earlier work on the Marker, the DOE has elected to keep the number of monuments as a function of the power of 2.

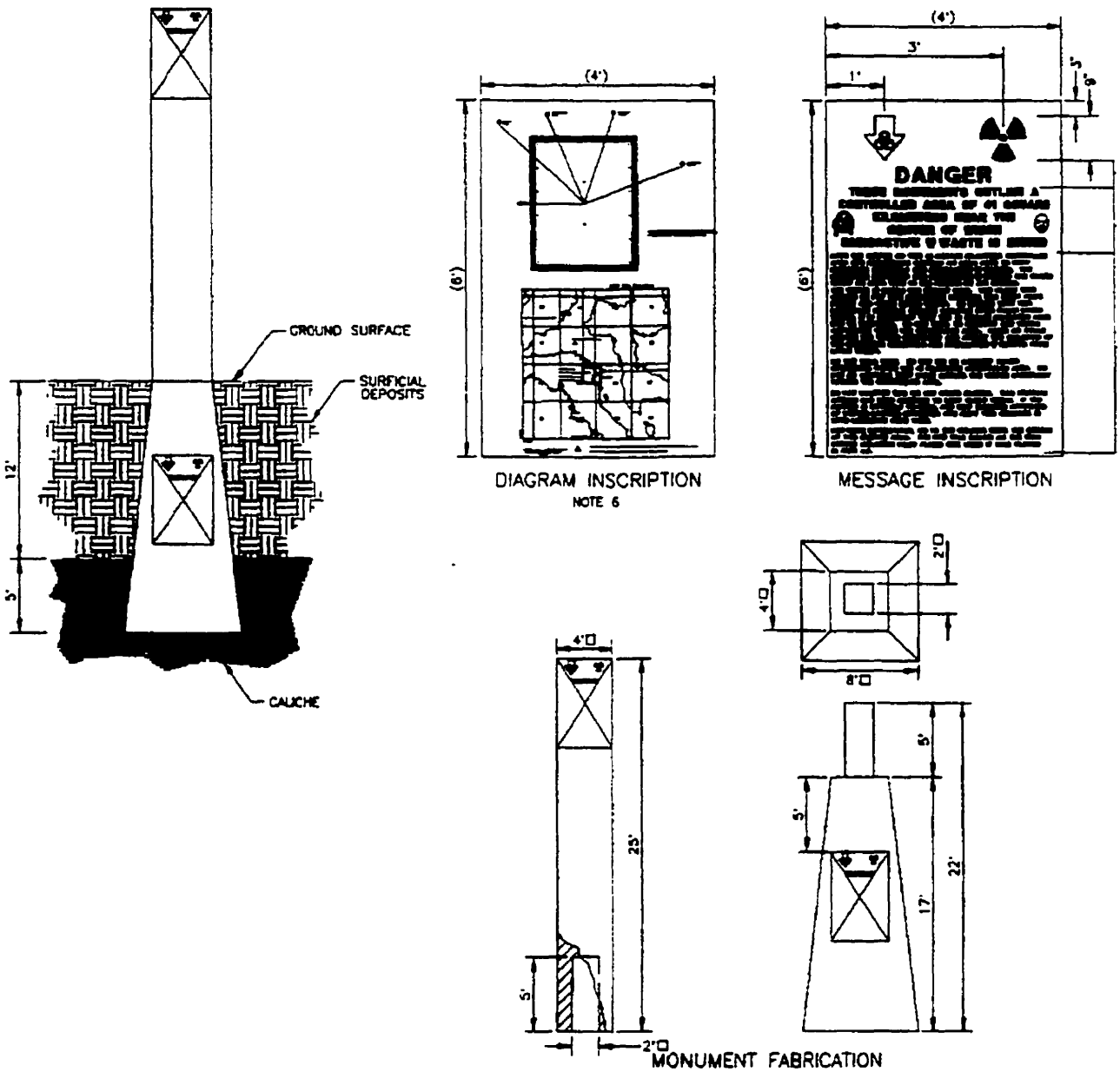

Figure 18. Controlled Area perimeter Monument design. Reproduced from DOE, *Compliance Certification Application*, Figure V-1.

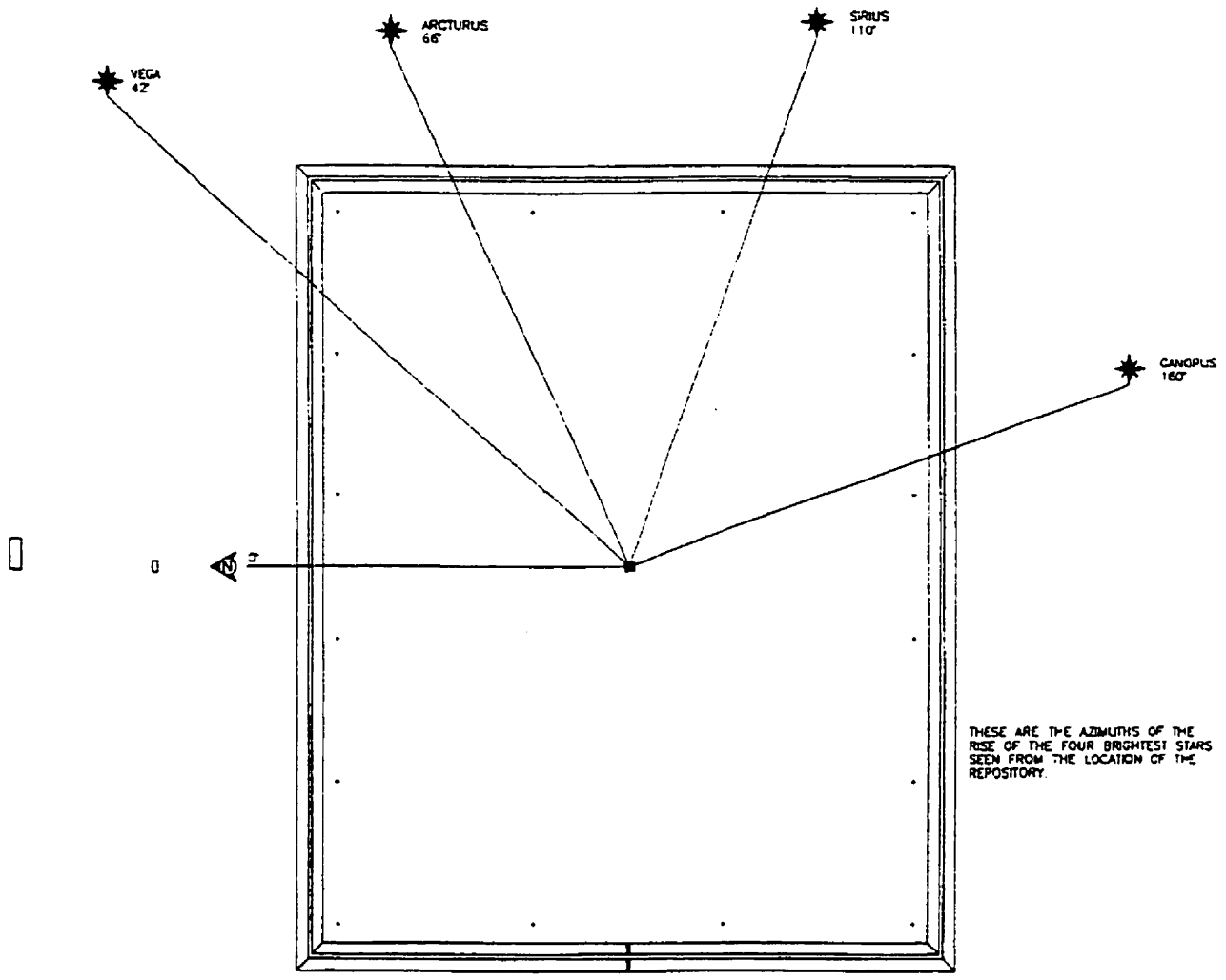

Figure 19. Star Rise Azimuths at WIPP. Reproduced from DOE, *Compliance Certification Application*, Figure IV-8.

THESE MONUMENTS OUTLINE A
CONTROLLED AREA OF 41 SQUARE KILOMETERS NEAR
THE CENTER OF WHICH RADIOACTIVE ☣ WASTE IS BURIED

NEAR THE CENTER OF THIS 41 SQUARE KILOMETER CONTROLLED AREA ARE STRUCTURES MARKING AN AREA USED TO BURY RADIOACTIVE ☣ WASTES AND HAZARDOUS MATERIALS. THE RADIOACTIVE ☣ WASTES AND HAZARDOUS MATERIALS ARE BURIED WITHIN AN AREA THAT IS 660 METERS BY 810 METERS. THE WASTE IS BURIED 655 KILOMETERS DEEP. THIS PLACE WAS CHOSEN TO PUT THIS DANGEROUS MATERIAL FAR AWAY FROM PEOPLE AND OTHER LIVING THINGS. TO ENSURE THAT THIS DANGEROUS MATERIAL REMAINS ISOLATED FROM OTHER LIVING THINGS, IT IS IMPORTANT THAT THE 41 SQUARE KILOMETER AREA NOT BE DISTURBED. DO NOT DRILL OR CONDUCT ANY MINING OPERATIONS WITHIN THE CONTROLLED AREA. DOING SO COULD CHANGE THE WATER HYDROLOGY AND AFFECT THE ISOLATION OF THE RADIOACTIVE ☣ WASTES AND HAZARDOUS MATERIALS FROM LIVING THINGS.

DO NOT DRILL HERE. DO NOT DIG OR CONDUCT MINING OPERATIONS WITHIN THE 41 KILOMETER CONTROLLED AREA. DO NOT DO ANYTHING THAT MIGHT DISTURB THE WATER HYDROLOGY WITHIN THE CONTROLLED AREA.

DO NOT DESTROY THIS OR ANY OTHER MARKER. THIS MARKING SYSTEM HAS BEEN DESIGNED TO LAST 10,000 YEARS. IF THE MARKER IS DIFFICULT TO READ, ADD NEW MARKERS COMPOSED OF LONGER-LASTING MATERIALS AND COPY THIS MESSAGE IN YOUR LANGUAGE ONTO THEM.

FOR MORE INFORMATION, GO TO THE BUILDING NEAR THE CENTER OF THIS MARKED AREA. THE SITE WAS KNOWN AS THE WIPP (WASTE ISOLATION PILOT PLANT) SITE WHEN IT WAS CLOSED IN 2030 A.D.

Figure 20. Controlled Area Perimeter Monument Inscription Message. Reproduced from DOE, *Compliance Certification Application*, Appendix 3.

An Earthen Berm configuration will enclose the entire repository footprint (roughly 870m by 720m, see Figure 16). The berm will be 30 meters at its base, tapering to 4 meter flat surface, with an elevation of 10 meters. A number of materials will be used for construction. The surface soil will be excavated to a level of subsurface claiche soil (about 3 meters). A core will be built up using salt left over from the excavation of the repository. On top of this, a 2-3 meter compacted layer of claiche soil, then a meter of riprap, then a meter of a soil riprap mixture.

Large strontium ferrite permanent magnets buried within the berm at intervals of 75-100 meters will be used to give the berm a distinct magnetic signature.

Trihedral shaped metallic objects will be emplace at random to give the area an anomalous radar signature.

Small buried warning markers — 23 centimeter disks made of granite, aluminum oxide, and fired clay — will be placed at random depths and intervals throughout the berm area.

Within the repository footprint berm area, granite monuments — constructed identically to the controlled area monuments — will be spaced evenly (150 meters apart)

within the perimeter (see Figure 16). Each meter-square granite monolith will stand approximately 7 meters above ground, and extend 5 meters below the surface (Figure 21).[130] As with the controlled area monuments, of the four sides of the monuments will be inscribed — above and below ground — with two pictographs, Figure 8, and Figure 22 — and each will be inscribed with the level II and III messages in seven languages, the six official United Nations languages (English, French, Spanish, Chinese, Russian, and Arabic) and Navajo.

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130 "The conceptual configuration represent a simple design for ease of fabrication. Quarries contacted regarding the feasibility of producing large monoliths stated that fabrication of stone with flat surfaces were significantly simpler to quarry than those with curved surfaces. The wastage of material (and thus cost) is also significantly less for flat surface stones. Thus the choice was made to produce a foundation monolith in the shape of a truncated pyramid and a surface monolith as a regular four sided prism." http://reserve.wipp.carlsbad.nm.us/cgi-in/foliocgi.exe/App_pic.nfo/.

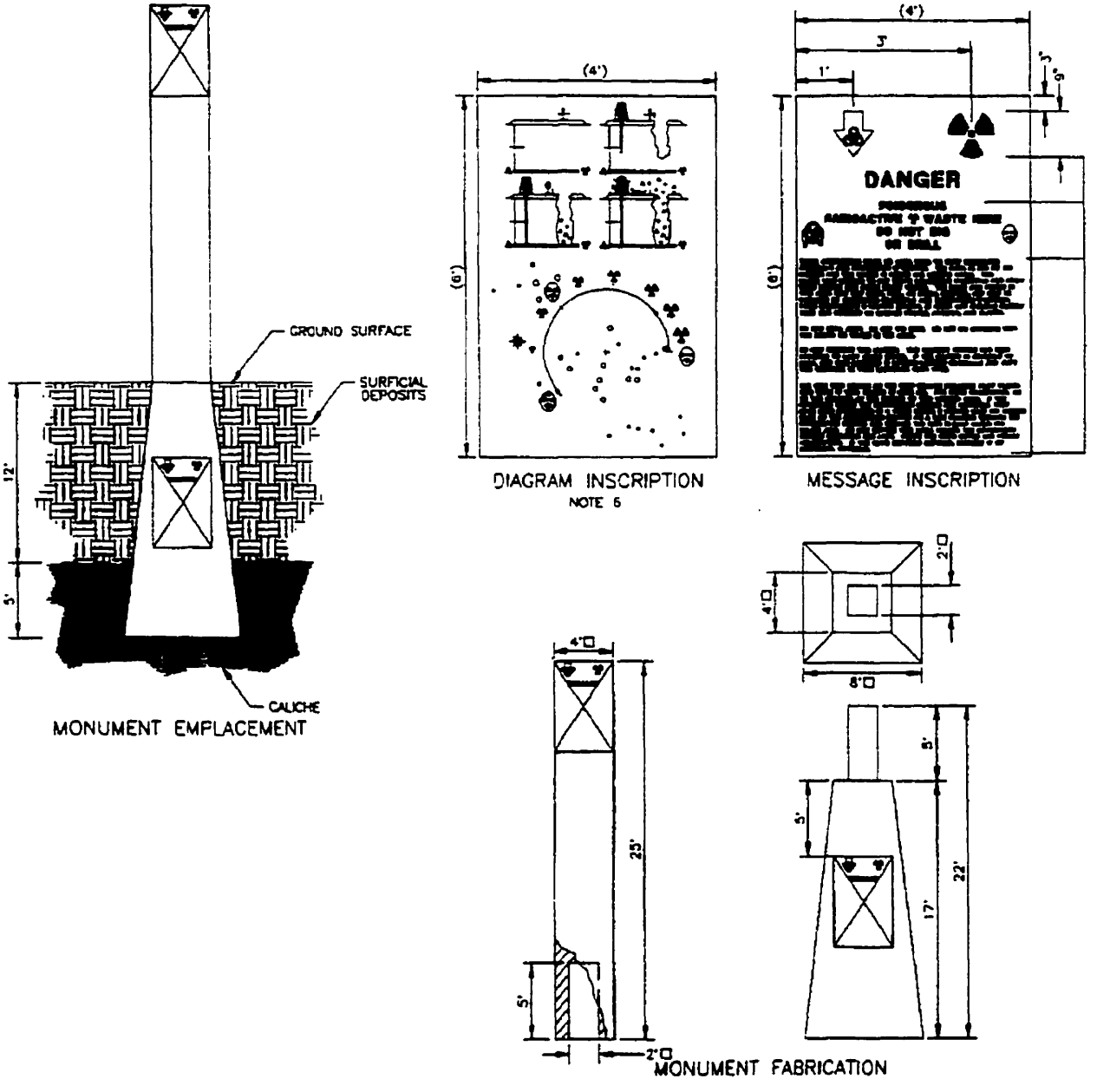

Figure 21. Repository Footprint Monument design. Reproduced from DOE, *Compliance Certification Application*, Figure V-2.

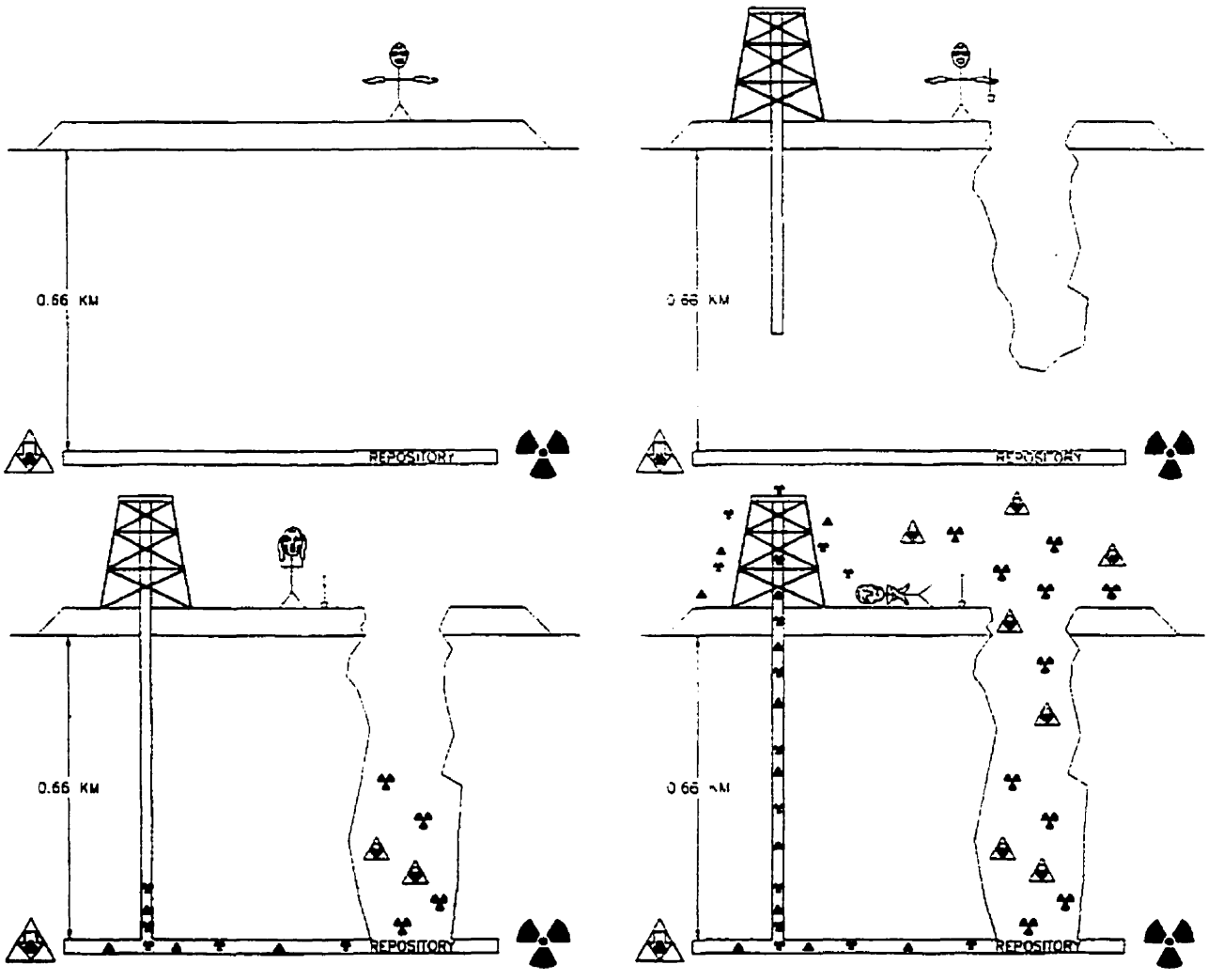

Figure 22. Repository Footprint Monument Pictograph. Reproduced from DOE, *Compliance Certification Application*, Figure IV-3.

> A granite information center will be located at the precise center of the berm area. This will be a kind of kiosk containing all of the information presented elsewhere on the site.
>
> A single building from the existing WIPP facility, the hot cell, located 320 meters north of the berm, will be left standing as an *archaeological artifact.*
>
> A buried storage room will be located 6 meters below the surface, 160 meters north of the berm on a line passing through the information center, the center of the northern and southern sections of the berm, and the hot cell concrete artifact. An identical storage room will be constructed inside the berm itself. The location of both of these underground chambers will be documented off-site.

In the language of the Markers Panel, the site itself retains the integrity of Level I message. That is, the berm and surface structures delineating the controlled area boundary and the repository footprint boundary adhere in presenting a sign that a manmade production is there. They write,

> The monuments, information center, and buried Storage Rooms provide the surfaces upon which to engrave the Level II, III, and IV messages. The Level I message

> includes the earthen berm, the granite monuments, and the information center. The physical size of these structures should clearly convey the notion that the marker system is a manmade facility which required a significant amount of effort to construct ... This should provide the inspiration for any organization with sufficient resources to dismantle the surface structures to investigate and attempt to understand the purpose of the site prior to initiating activities which are counter to maintaining the site's integrity. Individuals intent on vandalism or artifact collection may cause some superficial damage. However, due to the size of the structures and the physical attributes of granite, it is very doubtful that they could significantly reduce the structures sufficiently to destroy the implication that something manmade occupies the site.[131]

And here, the story of the marker is awaiting resolution in the form of a legislative permission. I have by now spent a good deal of energy explaining how this project has proceeded, how some of the difficulties have been approached, and how, in the end, those in charge would like to proceed. It is easy to look at all of this and say, "well, it's all insane." And

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131 Ibid.

of this I would agree, at least if the stakes weren't so high. In a culture such as ours, in a history such as we have, in a time like our own, where every problem has a solution, one cannot be too surprised by these events.

The monument, and its ultimate wish for a sympathetic and understanding witness, issues a tremendous challenge. It challenges one to ask *what is this supposed to be doing?* And, in a similar vein, *how does it attempt to accomplish this task?* But most importantly, it challenges one to ask *what might we really be doing in undertaking a solution in the form of a monumental expenditure*, and *how might we proceed otherwise*.

It is with the first two of these questions that I have so far been engaged in a kind of interaction or dialogue. I have attempted to provide a contextual and epistemological frame within which to place the issue of the nuclear. And we have seen how the conception of the problem as a technical question of security has lead to an equally technical solution of burial and a monument.

I have, in other words, given an account of the manner of response that has been provoked by the imperative of nuclear threat. As is probably clear by now, I can't solve the riddle of the waste, or of the monument. But I can, I think, suggest how it is that the problem itself — that is, the appropriate response to the presence of nuclear materials — has been profoundly misunderstood.

We will rely on a sign and the vehicle of a monument in order to convey meaning for 300 generations. And the strategy is to make the waste safe through concealment, then dangerous again through the work of the monument. The semiotic decomposition of the sign must take place at a slower pace than the nuclear decomposition of the waste. And what is truly frightening about this project, is that it is assumed that this meaning will simply transpire without us. That the signs of "enduring significance" will be enduringly significant without anyone there to point this out. There is no grief, and there is no mourning. There will simply be an installation that must be read correctly.

FIVE

THREAT NEEDS LIFE ...

Question: And what does Death need time for?
Control: Death needs time for what it kills to grow in.
William S. Burroughs — *Dead City Radio.*

AT this point we need to switch channels again. I want to step back a bit and look more broadly at what is perhaps involved in the advent of ecological threat; at what it is about it that makes our attempts to reduce it, to displace it, to contain it, to rename it, to administrate it, and to otherwise capture it into preexisting categories of risk more readily seen as features of our incomprehension (or features of a necessary incomprehension). The slow motion catastrophy of the nuclear, even as it has dropped from the popular agenda (both in terms of deterrence, and protest/opposition), is turning the world toward unheard of levels of administration and control. The magnitude of each of the variables in Diefenbaker's (modified) equation of nuclear war — "us," "them," or by mistake — have certainly changed. That is, the "mistake" (he called it

miscalculation), tacked on in the heat of the Cold War as a preemptive alibi and token of human fallibility, now comes to organize the entire field. In order to retain the practices (both weapons and energy), techniques of administration must become realigned toward the calculus of the "accident." Paul Virilio observes that what was, at the end of the Second World War, the critical boundary/threshold between the presence of weapons and their deployment, is mirrored in the case of a nuclear power plant in the threshold between the function of chance, and the crossing of that threshold to the accident.[132] The politics of nuclear war permutates into the politics of risk? In any case, whether we wish to see this movement as a development of the *means of destruction* into the *means of production*, of paramount concern becomes time and its administration. Of course we see this raised to near infinite proportions in the case of the burial of nuclear waste. But we see it elsewhere as well. We see it in the need, or more accurately, the requirement, to organize society such that a rapid response to a catastrophy becomes an operative feature. And from a very different perspective, we see it in the requirement that the very temporal aspect of an accident becomes reorganized to account for casualties that are not yet born.

Writes Virilio:

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132 See Paul Virilio, "The Primal Accident," *The Politics of Everyday Fear*, ed. Brian Massumi. trans. Brian Massumi, (Minneapolis: University of Minnesota Press, 1993)

> The breakdown of the American nuclear plant at Three Mile Island calls into question the breakdown of war, nuclear deterrence, and thus in the long run peaceful coexistence itself: the intense publicity surrounding the event and the risks incurred by the people in the area *transforms the lifestyle question*. Forced acceptance of that kind of threat must inevitably change the psychological behavior of the society concerned.[133]

But for the grace of a few seconds, or hours, or days, the incidents at Harrisburg and Chernobyl were prevented from realizing their full potential. Accordingly, time becomes the only variable the matters, and risk becomes the discourse that supports time's administration. And in all of this, society is transformed administratively and psychologically to account for the presence of nuclear threat.

Threat. There are a number of paths one could take through the idea of threat. One that works for me is a reading of theorists François Ewald and Ulrich Beck. Together, these two theorists of risk and culture help to circumscribe the dimensions of threat that pertain both to its uniqueness, and its troubling ontological character.

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133 Ibid., p. 216.

Ecological Risks

Let us begin with Ewald. He would call the threats to which I refer a form of "ecological risk." Ewald would concur with me in the thesis that modern threat is unique. In both elaborating threat as a feature of modern life, and disclosing the limits of traditional and classical means of relating (thinking/writing/reacting) to threat, Ewald illuminates both the transformations wrought by threat, and the lack of *fit*, between these transformations and the traditional means for thinking about such things.

The "new generation" of risks, he says, exist in an uneasy relation with the traditional conception of responsibility. Such risks share the following characteristics:

> In terms of potential damage that has to be covered by insurance, they are on the level of natural catastrophes. They concern entire populations, whose withdrawal, removal, or exodus must be planned for (Seveso, Three Mile Island). They are on the order of a disaster. Unlike an earthquake, however, they derive from human activity, from technological progress, and as such are if not known then at least foreseeable, extrapolatable, and accepted: they are artificial catastrophes ... they do not concern individuals

> taken separately ... so much as the biological balances between a population and its environment.[134]

Ewald would seem also to concur that the uniqueness of ecological threat is seen in the manner in which it is distributed both above and below thresholds; specifically he see it as novel in that it is situated both above and below the threshold of classical conceptions of risk. Above, in the sense of the transnational (and we suspect transgenerational) character of Chernobyl. And below, in the sense of risks that operate at and below the level of biology. In the former sense the effect is direct, but simply too large to be dealt with in terms of a model of responsibility. And in the latter, the risk is insidious, and even though it may represent a threat to continued life, it is significantly non-localizable, and as such is displaced in relation to a victim/perpetrator model. In both movements of ecological threat, there is a convergence on a point that is subsumed by the real. Not the body-as-Capital — as with traditional insurance — but the very ontological status of the body-in-environment.

Given that threats of an ecological sort result from human (technological) activity, and that they are manifest on the order of what is traditionally thought of as a natural disaster (earthquake, volcano, mud slide), artificial

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134 François Ewald, "Two Infinities of Risk," *The Politics of Everyday Fear*, ed. Brian Massumi. trans. Brian Massumi, (Minneapolis: University of Minnesota Press, 1993), pp. 222.

catastrophes, as he puts it[135], it is not surprising that they are thought of as only quantitatively different than traditional threats. However, such events, he says, can be only partially understood in terms of cost / benefit analysis. If we assume that risk is the term that mediates between cost and benefit, we must also allow that there exists some degree of objective ground upon which to make a comparison, some way to provide a fulcrum between the two terms. But to evaluate a cost, one must have a conceptual grasp of its lineaments; one must be able to point to an activity and say *this exceeds*, in its distributive character, *any possible benefit.* But no such judgment can be made on the order of costs and benefits. Such judgments operate on incommensurables. Do we thus end up back at Hardin's doorstep with *nature will commensurate the incommensurables?* Beck, for example, thinks that we do so only if we fail to see the stakes of doing so. He would claim that such a conclusion can too easily be a means of tacitly giving into the instrumentality of technological demands. He levels this charge against Niklas Luhmann; he claims that Luhmann's assent to living with the virtuality of catastrophy amounts to delivering sociological enlightenment to the hands of an industrial and technological teleology.[136] He asks if sociological enlightenment will not — in the face of potential catastrophy — become, *mutatis mutandis*, an industrial fatalism.

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135 Since such threats are decidedly without artifice, I find this term puzzling.

136 Ulrich Beck, *Ecological Enlightenment: Essays on the Politics of the Risk Society*, (New Jersey: Humanities Press International, 1995), pp. 113-4.

At the level of the social, Ewald sees in ecological threats first and foremost a threat to democracy, and any idea of a fundamental social contract. No longer do threats turn on distinctions of public versus private interest.

> Ecological risk divides society against itself at it most intangible, least measurable, and perhaps most essential point: it divides society on what is supposed to unite it, on its values, on the definition of its collective interest.[137]

We cannot, it seems, decide amongst ourselves either what sorts of risks are worth taking, nor how we might go about making such decisions.

The point for Ewald seems to be that ecological risk, and the social rift that it opens, does in fact speak to us. What it does not disclose though, even under the most objective of conditions, is anything at all to do with limits and propriety.

There is, says Ewald, no such thing as an objective risk in and of itself. Risk is manifest only insofar as a group elects to allow its existence. In other words, risk becomes acceptable simply through the paradox (he calls it tautology) of ecological threat:

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137 Ewald, *Two Infinities of Risk*, p. 224.

> [T]he bigger the objective risk (for example, one on the scale of a catastrophe), the more dependent its reality is on a system of values.[138]

If we think of the desert monument, we can immediately see that this relationship between risk and value makes sense. On the one hand we can see that the magnitude of the risk is in a sense acknowledged by the magnitude of the response. But on the other hand, the fact that we wish to dispose of the problem through a burial without mourning, suggests that the "reality" it is granted is only sufficient for it to be laid to rest.

Ewald's observation also draws out a stunningly important dimension of risk: it is *both* virtual and real. Hold this thought.

It is perhaps not too difficult to see where Ewald is going with this. He is of course not saying that there are no risks, but he *is* saying that once confronted by threats of sufficient magnitude, there is no outside "reality" to which to appeal. To put this in terms we have been using here, ecological threats issue from the real. But their "reality," as such, is contingent upon the symbolic.

The result is that any appeals to nature as an arbiter in our disputes about risk are operationally pointless, and politically foolish. It would be incorrect, in other words, to assume that in ecological risk one finds a firm

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138 Ibid., p. 225.

objective grounding upon which to contest political or economic practices.

> With ecological risk, nature becomes social through and through; the problematic of nature is overtaken by radical artifice. The ineluctable conclusion of the logic of balance: everything becomes political, down to what seems the most natural in nature.[139]

Nature is thus not a well of true speech, speaking in a language foreign and forgotten; it simply is a manner of concealing the fact that we are condemned to live in an order of *pure politics*, and *pure decision*. And here Ewald meets Žižek; two unlikely partners in the renunciation of a nature.

A transformation takes place in the becoming political of nature (or the becoming natural of politics?) whereby death is no longer situated beyond the edge of life. Such risks as ecological threats resituate death into life in the form of risk. And for Ewald, the realization of this new relation between life and death can either give way to anxiety, to a kind of "collective and individual frenzy of self protection," and "denial behavior," but — and this is the utopic moment — it can also give rise to a form of life of new intensities. A manner of life *with death* that would radically, and revolutionarily transform new kinds of subjects. A provocative notion.

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139 Ibid., p. 225.

Ewald gives as an example — and it is difficult to tell if it is really a provocation — the "American survivalists." He sees them as constituting a manner of being stronger than death, as an attempt at a "conquest of a new identity." This would hardly seem to be an example of *survival as the only game in town*; survivalists as the proletariat of threat? After all, isn't the real refuge of survivalists founded by, and more or less accommodated within an idea of the "natural"?

In a certain sense, survivalists may have undertaken a radical decoding and flight on the level of particular aspects of the social, but they retain and deepen territorial linkages with some deeply historical principles of righteousness, autonomy, and freedom, etc. One could think on the one hand, that the European imaginary contains some odd conceptions of the American social landscape (*pace* Baudrillard *via* de Tocqueville).[140] But on the other hand, to take him at his word, Ewald's totalizing of threat can too easily validate any consensus, any capture of a new identity, as a revolutionary practice.

If I find myself somewhat revulsed by Ewald's conclusion, it is not simply because I find survivalist practice pernicious. What troubles me is that he gives up too much, too quickly. Having reached the point that the quasi non-objective status of threat writ large cannot be adequately

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140 A text relevant to this notion that I have discovered too late to address properly here is Jean-Philippe Mathy, *Extrême-Occident: French Intellectuals and America*, (Chicago: University of Chicago Press, 1993).

responded to by traditional notions of risk and responsibility, he moves to place the entire category of *response* into the groundless play of persuasion. He is missing the fact that it is precisely at the intersection of agency and the real (ecological threat in the this case) that moral action takes place. Lacan implies as much in his *Ethics*, and I come to see how this may make sense. "Moral action is grafted onto the real.... It introduces something new into the real," he said.[141] And although this is an odd way to put it, I take him to mean that moral action, conceived as a manner of human agency, and insofar as it is structured by the symbolic, is that through which the real is actualized. Accordingly, our response to threat can be seen as in a necessary proximity to a moral realm.

And I think that Ewald is also missing the nuance of ecological threat as a demand for a response. Or perhaps more accurately, he concludes that since any response can only be political (read, subjective), and that under such conditions life is radically altered, that the only response operates in the service of survival. His example says as much. But such a response responds not to threat — it responds to death. The future of life is thus overwritten by strategies concerning the presence of death. If, to paraphrase William Burroughs, threat needs life for what it threatens to grow in, the question I wish to draw from this is how, in life's new proximity with/to death, can the demands of threat be met?

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141 Lacan, *The Ethics of Psychoanalysis*, p. 21.

Risk Society

Consider another possibility for thinking about all of this. In contrast to Ewald, Beck prefers to speak not of risk and the individual, but the *risk society*.[142] Beck would certainly agree with Ewald that contemporary threats are politically constituted. This much is not controversial. However in Beck's analysis, a society of risk differs from early industrial configurations in that there is no such thing as either the promise or the fact of an ecological proletariat (survivalist or otherwise). Ecological risk constructs a cartography that is largely foreign to such divisions of class. Ecological risk has propensity to cut through rigid social divisions, assembling new lines of affinity, new constituencies of *those at risk*.

It is, quips Ewald, "paradoxically, creative!"

Beck maintains that the distinction between risk and threats is the result of a fault line between early industrial societies, and modern. In the former, conflicts turned on the distribution of "positive" value: profits, prosperity, progress and its promise. There was something at stake for which a decision, a trade-off, could be made. On the one hand, and on the

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142 Beck, *Ecological Enlightenment*, pp. 1-17.

other. Thus the negative side of the equation could be conceptualized as risk, *because* the positive side could be readily identified and evaluated.

In modern societies, however, risk is subsumed and transformed by threat. Modern industrial practices embody externalities that exceed both social and temporal limits. They exceed, as well, limits of accountability, and in light of this, exceed any standard notion of compensation. It is a game, he writes, between "losers, who refuse to admit the damage, who shrug it off, and repress it."[143] And further this is the reason why threat and knowledge of it are so difficult to disentangle. Risk is calculable (arguably). Threat on the other hand, is not.

Beck would say that the presence of modern threat is in no meaningful way an environmental problem. Rather, he sees it as an institutional crisis. Threats, he observes with admirable concision, "are produced industrially, externalized economically, individualized juridically, legitimized scientifically, and minimized politically."[144] In the language of game theory, ecological threat is a negative-sum game of collective self-damage.[145] Thus a global strategy asserts itself in the form of determining an equitable manner of distributing loss.[146]

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143 Ibid., p. 122.

144 Ibid., p. 2.

145 Claus Offe, quoted in Beck, *Ecological Enlightenment*, p. 3.

146 This is what Beck would call "negative conflict"—the distribution of loss.

Threats, in Beck's estimation, are slippery beasts. In the public consciousness the surplus of possible threats allows for easy substitution and transposition — if ozone depletion is the threat *du jour*, nuclear power generation may reenter the market "defensively," through the back door, so to speak.

To Ewald's claim that *the bigger the objective risk the more dependent its reality is on a system of values*, Beck adds the corollary that resistance to acknowledgment of threat grows in direct proportion to the threat's size and proximity. In other words, disavowal varies in direct proportion to threat. So, it's not just that threats of magnitude are dependent on "values," it's also that the greater the magnitude, the greater the resistance there is to constituting them symbolically.

Unlike Ewald, Beck is concerned with the manner in which threats ultimately impinge upon rights. Indeed, a good deal of his critique is contained within a discourse of rights *vis a vis* the freedoms upon which threat impinges. Perhaps this is necessary in the sense that it gives a kind of ground upon which to contest the global and other practices that are actively engaged in the manufacture of these threats. But it falls short of dealing on a more fundamental level with what to do in the face of these threats that are, so to speak, performative.

Perhaps this is the thing. I attempt to gather these bits and pieces from various places — a "second death," an ecological threat, a risk society, an open wound, a disaster — but these things operate either prior to or after

the advent of threat. Threat as either symptom, or pathology. But we have as yet no way to conceptualize the manner in which threat goes about its threatening.

As threat, it is something that threatens to take place. The condition of the being of threat is that it is always displaced in relation to itself; it is never fully contained as an abstraction. Rather, it gathers its force by threatening to *be* precisely where it is least welcome. *The threat is such, but it threatens to* be *here.*

We can say that threat performs itself; that is, it threatens. We can say that it is always in advance of its promise. Once realized, once threat makes good on its promise, it becomes, in other words, an event. It is thus no longer threat and has become something equally abstract: a kind of disaster. Blanchot tells us that disaster is something that can only happen outside of thought; it is that which escapes the possibility of experience — the unverifiable, the improper.

> The disaster is not somber, it would liberate us from everything if it could just have a relation with someone; we would know it in the light of language with a *gai savoir*. But the disaster is unknown; it is the unknown name for that in thought itself which dissuades us from thinking it, leaving us, by its proximity, alone. Alone, and thus exposed to the thought of the disaster which disrupts solitude and

> overflows every variety of thought, as the intense, silent and disastrous affirmation of the outside.[147]

Again — *the disaster takes care of everything*. But again, we pass over threat into the outside of disaster. We advance little by making of threat an unknowable and terrifying otherness. We must somehow reach the point where we can say that threat itself is an event. An event in advance of the disaster, in advance of a second death, and in advance of our knowledge of it.

Threat transforms, incorporeally so. I think here of Deleuze and Guattari's *A Thousand Plateaus*. I'm not referring to a kind of linguistic performativity, though something close to it, and involved with it. I mean to say that threats are performative in the sense that once such threats are acknowledged — that is, granted an epistemological and ontological status —an incorporeal transformation takes place such that the world is fundamentally altered. Prior to such threats, to say *I worry about the future*, no matter how deeply existential the motivation may be, can not mean the same thing *after* the acknowledgment of such threats. In the former case one may mean that one worries about the state of the future, and perhaps one's mark upon it, but one would have no reason to mean *whether* in fact the future will take place at all.

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147 I think here of Blanchot in *The Writing of the Disaster*, p. 5.

We could say that what I have established to this point is that there are a number of attributes organized around threat. And further, that these attributes refer in various ways to bodies and as well to actions and passions. We could say that there are various bodies which arrest our attention while under risk. There are of course the actual bodies of those at risk, but as well there are the various bodies of the social, the body of the earth, corporate bodies, international bodies, and so on. For example, for Ewald the social body insofar as it was organized around some kind of social contract, becomes detached from such a common bond when under threats that are ecological. And likewise, bodies themselves, while once subject to a certain choice and autonomy concerning the acceptance of risks (as a trade-off against wages and benefits, for example), become simply *subject to* an ambient and pervasive risk while under ecological threat.

We have also seen how threat may be implicated in actions and passions that affect the bodies. To follow Ewald, risk calculation and estimation in the face of ecological threat becomes groundless, without any manner of purchase upon a system of reference other than a pure politics. And within such a conception, denunciation of threatening practices (Greens, aboriginals) becomes equally political and equally contingent.

I am not sure of the adequacy of this language to speak of threat. What recommends it is its elegance concerning how one might alter one's conception of modern threats. It allows us to begin to see how it is that

traditional modes of conceptualization presuppose a particular manner of threat that fails to correspond to modern threats.

Virtual Threat

I mentioned above that threat was both virtual *and* real. I will conclude this section with some consideration of what one might mean by this. In the case of ecological or nuclear threat I have said that it is virtual in that it is always in advance of itself. It is always the *threat of*. It seems to me that this illustrates perfectly a distinction that Deleuze makes concerning the movement from structure to actualization. The virtual, he says, "has a reality characteristic of it, but which is not confused with any actual reality or with any past or present actuality."[148] In *Difference and Repetition*, he writes:

> We opposed the virtual and the real ... this terminology must be corrected. The virtual is opposed not to the real but to the actual. *The virtual is fully real insofar as it is virtual.* Exactly what Proust said of states of resonance must be said of the virtual: "Real without being actual, ideal without being abstract"; and symbolic without being fictional. Indeed, the virtual must be defined as strictly a part of the real object — as though the object had one part of itself in

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148 Gilles Deleuze, *How does one recognize Structuralism?*, (Peterborough, Ont.: Trent University, C.V. Boundas, unpublished translation, 1996), p. 418.

> the virtual into which it plunged as though into an objective dimension.... The reality of the virtual is structure.[149]

This is a very difficult and elaborate argument in Deleuze, and I won't even attempt to present its full complexity. What is of relevance to our discussion is what Deleuze is attempting to do with a philosophy of ontology conceived as a creative force of becoming rather than the static state of Being. And the key, I think to understanding this hinges on the distinctions between the couples "possible and real," and "virtual and actual."[150] In the former, the relationship or opposition between the possible and the real is based purely upon resemblance. The real is already given in the possible (because it was already there in a sense, waiting *qua* possible); it simply "has existence or reality added to it ... there is no *difference* between the possible and the real."[151]

> to the extent that the possible is open to "realization," it is understood to be an image of the real, while the real is supposed to resemble the possible. That is why it is difficult to understand what existence adds to the concept

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149 Gilles Deleuze, *Difference and Repetition*, (New York: Columbia University Press, 1994), pp. 208-9.

150 Note that this real is not the Lacanian real. This real can be thought of as more or less synonymous with "reality."

151 Deleuze, *Bergsonism*, quoted in Michael Hardt, *Gilles Deleuze: An Apprenticeship in Philosophy*, (Minneapolis: University of Minnesota Press, 1993), p. 17.

> when all it does is double like with like. Such is the defect of the possible: a defect which serves to condemn it as produced after the fact, as retroactively fabricated in the image of what resembles it.[152]

The possible is thus an image of the real that — through a process of limitation — either does or does not get realized. It is a kind of preformed proto-reality, or "pseudo-actuality," as Michael Hardt puts it, that is subjected first to a process of limitation (in other words, not all possibilities are realized), and then to a process of realization.[153] And the real is consigned to the realm of resemblance. Existence—*being real*—is therefore just a doubling with what was already there as the possible. After all, "what difference can there be between the existent and the non-existent if the non-existent is already possible, already included in the concept and having all the characteristics that the concept confers upon it as possibility?"[154] No creation, just identity. It strikes me that discourses of risk proceed entirely from this frame of possible-real. The accident, the unlikely event must preexist itself in the form of a probability. Its occurrence or realization then becomes a matter of a more or less determinant series of judgments. But to be probable is to already be

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152 Deleuze, *Difference and Repetition*, p. 212.

153 Hardt's careful commentary on this aspect of Deleuze's work is most helpful.

154 Deleuze, *Difference and Repetition*, p. 211.

possible. Thus in a sense risk is a game played that involves guessing which possibility is more probable. Like the guessing game I related in the beginning, the position of risk is that the word was there waiting in advance.

Hardt explains the relationship between the couples possible-real, and virtual-actual as follows:

> the transcendental term of each couple relates positively to the immanent term of the opposite couple. The possible is never real, even though it may be actual; however, while the virtual may not be actual, it is nonetheless real. In other words there are several contemporary (actual) possibilities of which some may be realized in the future; in contrast, virtualities are always real (in the past, in memory) and may become actualized in the present.[155]

Deleuze explains the status of the virtual, of structure as that which is completely differen*t*iated as varieties of relations, and singular points. It is not, however, differen*c*iated. To be differen*c*iated is precisely to be actualized according to two aspects: "one concerning the qualities or diverse species which actualize the varieties, the other concerning

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155 Hardt, *Gilles Deleuze*, p. 17.

number or the distinct parts actualizing the singular points."[156] Genes, for example, as a differential structure are actualized both as species (varieties) and as the individual parts or organs (singular points) of which the species is composed.[157]

Threat works its way into this precisely in the sense that as virtuality it cannot be said to exist in the sense that something actual exists. Nor does it exist as an image, or prototype, of an event or occurrence that might become realized. Rather, threat *subsists*, as Brian Massumi puts it, as virtual *and* real.[158] The movement of the threat of the nuclear concerns us in two ways. First, in the movement from virtual to actual (the *event*, the accident) there is an actualization in which what was virtual becomes swept up into a specific social configuration. To paraphrase Deleuze, there is no total threat in which all possible kinds of threat are incarnated; rather there are specific instances in which certain elements of the entire virtual field of threat becomes actualized.[159] Yet we could also say that as

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156 Deleuze, *Difference and Repetition*, p. 210. In "How to recognize Structuralism," Deleuze puts it this way: "Every differenciation and every actualization is made along two lines: species and parts. The differential relations are incarnated in qualitatively distinct species, while the corresponding singularities are incarnated in the extended parts and figure that characterize each species." p. 420.

157 Ibid.

158 See Brian Massumi, *A User's Guide to Capitalism and Schizophrenia: Deviations from Deleuze and Guattari*, (Cambridge: The MIT Press, 1992), pp. 35-7.

159 See Deleuze, "How to Recognize Structuralism," pp. 419-20.

threat becomes actualized, it becomes something else. And the "else" it becomes is dependent upon the host of specific relations into which and through which it becomes actualized. This is exactly the sense in which it can be conceived of as a creative force; there is no simple mimetic correspondence between threat as virtual and the event.

And second, as regards threat as virtuality, we have something else entirely. Real but not actual, threat has no existence of its own apart from its various actualizations. And its paradox — formulations of which we saw with Beck and Ewald — is that it can only be read in its effects. This is very similar to how Deleuze describes the perception of structure:

> Structures are unconscious, being necessarily masked by their products of their effects.... We cannot *read*, *discover*, or *rediscover* structure except on the basis of these effects.[160]

I think that this is precisely the direction we need to travel in order to understand the workings of ecological threat (and this is essentially what Žižek does in reading the responses to ecological crisis — see above, chapter 3). And this involves the realization that our strategies cannot simply be directed at constructing lines of defense against the possible. Our experience with nuclear practices would seem to bear this out. But the response has been a renewed effort to further define the possible (more refined techniques of risk analysis, probability assessment, etc.).

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160 Ibid., p. 423.

From this point of view, the burial in the desert amounts to the extension of thinking about the possible to its absolute temporal limits. Yet what is excluded from this picture is everything that threat *may* accomplish that does not resemble what its possibilities are thought to include.

To take stock a bit here, I have suggested a couple of ways of conceptualizing threat. I have tried to show how threat is something that issues from the (Lacanian) real. And the real, as such, is that which is only discovered in the distortions it produces in the symbolic. I neither want, nor do I think it appropriate to consider any equivalence between this Lacanian reading of threat and what Deleuze has to say about the virtual. A better word would be a *correspondence*. In other words, one doesn't have to posit a parallel between the real and structure. Indeed from a Lacanian perspective to do so would appear to be an imaginary splitting and projection, while from a Deleuzian perspective Lacan's emphasis on the symbolic would short-circuit any attempt to bring them together.[161] However, perhaps we can get away with this much: in both cases

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161 Although, in the case of Deleuze's essay, "How to recognize Structuralism," if one were to consider only this, one could make much stronger claims for a parallelism. In this essay — which Deleuze was not apparently keen to have translated on the grounds that his position had changed considerably (Constantin V. Boundas, personal communication, August 29, 1995) — he advances a conception of the symbolic order "irreducible to the order of the real, or to the order of the imaginary, and deeper than both of them." p. 405.

(Deleuze and Lacan) we are faced with a situation in which ecological threat can only be discovered through its effects; and it is to these effects that I have been attending. Let us say that the important point is that we can no more conceive of the entirety of ecological threat as structure/virtual, than we can symbolically determine threat as real.

SIX

THREAT OF TRAUMA / TRAUMA OF THREAT

> The function of the *tuché*, the real as encounter — the encounter in so far as it may be missed, in so far as it is essentially the missed encounter — first presented itself in the history of psycho-analysis in a form that was in itself already enough to arouse our attention, that of trauma.
> Jacques Lacan — *The Four Fundamental Concepts of Psycho-Analysis*.

WE could ask: What does it mean to be threatened, to be under threat? And what is the relationship to trauma? I have been attempting to show how certain agencies of threat that are ecological constitute a modern form of threat. And I have been suggesting that threat bears a relationship to death — to a second death — and to the real, and to the virtual. One might, I suppose claim on the contrary that responses to situations of threat may involve other modalities: for example, fright, or fear, or anxiety of some sort. But I think that, as Freud points out, these states are neither

equivalent, nor do they capture the specificity of threat, nor threat as trauma in a relation to some manner of danger.

> 'Anxiety' describes a particular state of expecting the danger or preparing for it, even though it may be an unknown one. 'Fear' requires a definite object of which to be afraid. 'Fright,' however, is the name we give to the state a person gets into when he has run into danger without being prepared for it; it emphasizes the factor of surprise.[162]

To this trio of modalities we could add pain. But only on the condition, I suppose, that we think of these as specific (if fuzzy) subjective configurations, or affects. And as affects, I will insist on asking *to what* are these states a response. To what, in other words, are fright, or fear called upon to answer.

Ecological threat seems unique in that, though it may provoke these sorts of affective responses, it cannot be prepared for, it is not a particular "object" to which a fear may be attached, nor is it simply a shock or surprise that frightens. We have had by now a series of such events as ecological "accidents," a few of which I have spoken about above. To see how ecological threat stands alone, distinct in its relations to an ongoing traumatic encounter I now want to give some consideration to the language

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162 Sigmund Freud, "Beyond the Pleasure Principle (1920)," *On Metapsychology: The Theory of Psychoanalysis*, ed. James Strachey. trans. James Strachey, (New York: Penguin Books, 1984), pp. 281-2.

of trauma as a conceptual and operational tool to set an agenda for what might be a theory of ecological threat.

Experience Missed

There has been a great deal of renewed interest in trauma theory of late. This invigorated area of research is both heir to and a reworking of classical notions of trauma. Of significance here is the attempt to move trauma away from the limited and bounded sense of a blow or injury sustained to the body, and toward a sense of trauma that encompasses the social.

As Freud put it,

> We describe as "traumatic" any excitations from the outside which are powerful enough to break through the protective shield. It seems to me that this concept of trauma necessarily implies ... a breach in an otherwise efficacious barrier against stimuli. Such an event as an external trauma is bound to provoke a disturbance on a large scale of the functioning of the organism's energy and to set in motion every possible defensive measure.[163]

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163 Ibid., p. 301.

It would seem that the majority of recent trauma work is engaged explicitly or otherwise with a Freudian reading of trauma. In *Beyond the Pleasure Principle*, Freud reaches a point where he must deal directly with the seemingly paradoxical force of trauma.[164] The binary model he had established — pleasure principle/reality principle — became exceedingly difficult to support in the face of the specific pathologies he witnessed in war neuroses, and survivors of war. Traumatic neurosis, at least insofar as it interacts within the pleasure/unpleasure economy, was more than a conundrum. Now whether we view this moment in Freud's work as the insertion of an epicycle onto an unwieldy theoretical apparatus — the death drive is often said to be the point at which Freud slips most directly into anthropological fiction — or the point at which he most directly grapples with the *conditione humaine*, he did show how trauma is an event unlike any other.

Trauma is marked by two necessary features. The first is that trauma represents an experience that exceeds one's capacity to understand. It is paradoxical experience. It is to *have been there*, yet to be unable to integrate

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164 Freud had previously concerned himself with trauma in his work with Breuer (see Josef Breuer, and Sigmund Freud, *Studies on Hysteria (1893-1895)*, (New York: Basic Books, 1957)). In the "Miss Lucy R." case, he points to the presence of a primary, or actual traumatic moment—the moment of the original trauma which undergoes repression—and the "auxilliary" trauma as the event that, for some duration, succeds in breaking though the defensive psychical barriers which had been earlier erected. See also his 1894 paper, "The Defense of Neuro-psychosis," in *The Collected Papers, Volume 1.*

the experience into one's biography, into one's practicable universe. An experience, says Dominic LaCapra, that is not fully owned.

But it is more than this. Trauma is something that effectively happens after it happens. It is experienced as the effect preceding the cause. The unrepresentability, and unassimilability of the traumatic event when it occurs sets up a hole in the subject's symbolic universe, a place where the symbolic falters. Such experience is to suffer the effect of a causeless cause. Trauma is the non-place that stands as the location of limit events, a foreign and strange place in the subject.

We could thus say that trauma persists somewhere between an event, and the impossibility of that event's symbolization. Accordingly, trauma is intimately connected with the real, and equally connected with the symbolic. Yet the mode of its connection is obscure. On the one hand, Lacan explained that the real is a kind of encounter that is always missed, *essentially* missed. Yet on the other, this encounter is somehow preserved and marked with such an insistence that it — or scenes *of* it — are subject to repetition. "It is through its 'repetition,' through its echoes within the signifying structure, that the cause retroactively becomes what it always-already was."[165]

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165 Slavoj Žižek, "Hegel with Lacan, or the Subject and Its Cause," *Reading Seminars I and II: Lacan's Return to Freud*, ed. Richard Feldstein, Bruce Fink, and Maire Jaanus, (Albany: State University of New York Press, 1996), p. 399

> The cause qua real intervenes where symbolic determination stumbles, misfires, that is, where a signifier falls out. For that reason, the cause qua real can never effectuate its causal power in a direct way, as such, but must always operate intermediately, in the guise of disturbances within the symbolic order.[166]

Thus it is through the symbolic that the real appears. And though (in his first seminar) Lacan has said that the real itself, however, is without gaps, without fissure,[167] he will change this position to say that there are indeed holes in the real; holes that result from the fashioning of the signifier, and from such events as trauma. In both cases, there is a kind of creation, *ex nihilo*, in which something is fashioned from the emptiness. And the production of a hole creates, simultaneously, the possibility for filling it.[168] In the case of the traumatic event, the hole in the real, and the corresponding gap or disturbance in the symbolic take on the status for Lacan of a Thing, or *das Ding*.

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166 Ibid., p. 398.

167 On this point about the real see *The Seminars of Jacques Lacan: Book II: The Ego in Freud's Theory and in the Techniques of Psychoanalysis*, pp. 97-8.

168 The analogy Lacan uses is that of the potter and the vase. "It [the vase] creates the void and thereby introduces the possibility of filling it. Emptiness and fullness are introduced into a world that by itself knows not of them. It is on the basis of this fabricated signifier, this vase, that emptiness and fullness as such enter the world." *The Ethics of Psychoanalysis*, p. 120.

> *das Ding* is at the center only in the sense that it is excluded. That is to say, in reality *das Ding* has to be posited as exterior, as the prehistoric Other that it is impossible to forget — the Other whose primacy of position Freud affirms in the form of something *entfremdet*, something strange to me, although it is at the heart of me, something that on the level of the unconscious only a representation can represent.[169]

The Thing is always veiled. Like the Freudian dream navel, it is both a place and a gap that resists interpretation. It is the *beyond of the signifier* and cannot be apprehended as such. For Lacan — perhaps not so surprisingly — the original *Ding*, at the level of culture, is the prohibition of incest, and at the level of the subject, it is the mother, the maternal *Ding*. Thus the traumatic event, insofar as it lies outside of the possibility of symbolization, insofar as it takes on the status of *das Ding*, is inaccessible.

Žižek situates the field of *das Ding* as the place between the two deaths — between the organic death of the body and the (symbolic) second death. This place, he writes,

> is the site of *das Ding*, of the real-traumatic kernel in the midst of symbolic order. The place is opened by symbolization/historicization: the process of historicization

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169 Lacan, *The Ethics of Psychoanalysis*, p. 71.

> implies an empty place, a non-historical kernel around which the symbolic network is articulated.[170]

Das Ding, then, as the place that cannot be symbolized, yet is produced by the very operation of symbolization ("it secretes, it isolates the empty 'indigestible' place of the Thing"[171]), brings us to the point where we can see that trauma comes very close to the idea of the real itself; this missed event that fails to be symbolically integrated. And to further complicate matters, there is an inherent difficulty, because of the retroactive aspect of trauma, in determining and sorting out the traumatic memory in relation to the historic traumatic event. Jean Laplanche, commenting on a passage in Freud's *Project for a Scientific Psychology* (where Freud states that "we invariably find that a memory is repressed which has only become a trauma *after the event*,"[172]) writes

> here is the heart of the argument: we try to track down the trauma, but the traumatic memory was only secondarily traumatic: we never manage to fix the traumatic event

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170 Žižek, *The Sublime Object of Ideology*, p. 135

171 Ibid., p. 135

172 Sigmund Freud, "Project for a Scientific Psychology (1895)," *Origins of Psychoanalysis: Sigmund Freud's Letters to Wilhelm Fliess (1887-1902)*, ed. Marie Bonaparte, Anna Freud, and Ernst Kris. trans. Eric Mosbacher and James Strachey, (New York: Basic Books, 1954), p. 413, quoted in Jean Laplanche, *Life and Death in Psychoanalysis*, (Baltimore: Johns Hopkins University Press, 1976), p. 41.

> historically. This fact might be illustrated by the image of a Heisenberg-like "relation of indeterminacy": in situating the trauma, one cannot appreciate its traumatic impact, and *vice versa.*[173]

The second feature of trauma relates to the status of the traumatic memory. In Freud's little Hans analysis, he writes "a thing which has not been understood inevitably reappears, like a ghost, it cannot rest until the mystery has been solved and the spell broken."[174] The ghost-like reappearance is but an instance of repetition. In analytic practice is seems to be simply a commonplace that certain symptoms are marked by a repetitive character. And furthermore, that the repetitions tend to involve aspects of past conflicts. Yet it seems that if the traumatic event only attains the consistency of a memory after the fact, in other words, because it is by definition unsymbolized, the event itself must be psychically retained in some manner of neutral affective state; held in abeyance awaiting some kind of sequence of integration and resolution.[175]

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173 Laplanche, *Life and Death in Psychoanalysis*, p. 41.

174 Sigmund Freud, "Analysis of a Phobia in a Five-Year-Old Boy (1909)," *Collected Papers, Volume 3.* trans. Alix and James Strachey, (New York: Basic Books, 1959), pp. 263-4. Quoted in Jean Laplanche, and J.-B. Pontalis, *The Language of Psychoanalysis*, (New York: W.W. Norton Books, 1973), p. 79.

175 Research into post-traumatic stress syndrome suggests that the experience of trauma disrupts declarative memory, but not the non-declarative or implicit memory. From this point of view, while the intentional recall of the "traumatic event" is constrained,

Laplanche says as much, but to draw out an explanation for how this works would require a much more elaborate account of the unconscious, repression, and defense than I am prepared to give here. What I would like to highlight is that, empirically, those who have undergone *limit events*, events that exceed the bounds of the subject's current state of understanding, make a paradoxical attempt to internalize the events that are not fully apprehended.

The medical diagnostic criteria for post-traumatic stress syndrome include the following elements:

> The person has been exposed to a traumatic event in which both of the following were present:
>
> (1) the person experienced, witnessed, or was confronted with an event or events that involved actual or threatened death or serious injury, or a threat to the physical integrity of self or others;
>
> (2) the person's response involved intense fear, helplessness, or horror. (Note: In children, this may be expressed instead by disorganized or agitated behavior.)
>
> The traumatic event is persistently reexperienced in one (or more) of the following ways:

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that part of memory responsible for emotive and affective responses, and sensations related to past experience is not.

(1) recurrent and intrusive distressing recollections of the event, including images, thoughts, or perceptions. (Note: In young children, repetitive play may occur in which themes or aspects of the trauma are expressed.);

(2) recurrent distressing dreams of the event. (Note: In children, there may be frightening dreams without recognizable content.);

(3) acting or feeling as if the traumatic event were recurring (includes a sense of reliving the experience, illusions, hallucinations, and dissociative flashback episodes, including those that occur on awakening or when intoxicated). (Note: In young children, trauma-specific reenactment may occur.);

(4) intense psychological distress at exposure to internal or external cues that symbolize or resemble an aspect of the traumatic event;

(5) physiological reactivity on exposure to internal or external cues that symbolize or resemble an aspect of the traumatic event.

Persistent avoidance of stimuli associated with the trauma and numbing of general responsiveness (not present before the trauma), as indicated by three (or more) of the following:

(1) efforts to avoid thoughts, feelings, or conversations associated with the trauma;

(2) efforts to avoid activities, places, or people that arouse recollections of the trauma;

(3) inability to recall an important aspect of the trauma;

(4) markedly diminished interest or participation in significant activities;

(5) feeling of detachment or estrangement from others;

(6) restricted range of affect (e.g., unable to have loving feelings);

(7) sense of a foreshortened future (e.g., does not expect to have a career, marriage, children, or a normal life span).[176]

Such is the outline of post-traumatic stress syndrome. Largely in the twentieth Century, and more specifically since World War I, trauma has moved from the outside to the inside.[177] The blow specified by a medical

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176 From the DSM-IV. One notes that the final 4 avoidances — points (4)-(7) — are hardly related to trauma in any recognizably proprietary fashion.

177 Robert Jay Lifton makes the point that the second world war can in a significant sense be only understood as a survival response to World War I. See Robert J. Lifton, "An Interview with Robert J. Lifton," *Trauma: Explorations in Memory*, ed. Cathy Caruth, (Baltimore: Johns Hopkins University Press, 1995), pp. 128-38.

conception of trauma has just become "metaphorically transposed to the mental sphere"[178]; from a wound to the living tissue, to an experience of such extremity that it wounds the *inside*, and from a feature of an experience to causal agent of an anxiety disorder. This is the profile of the pathological side of trauma as constructed from the experiences of survivors. The World Health Organization, ICD has a similar classification:

> This [post-traumatic stress disorder] arises as a delayed and/or protracted response to a stressful event or situation (either short- or long-lasting) of an exceptionally threatening or catastrophic nature, which is likely to cause pervasive distress in almost anyone (e.g., natural or man-made disaster, combat, serious accident, witnessing the violent death of others, or being the victim of torture, terrorism, rape, or other crime). Predisposing factors such as personality traits (e.g., compulsive, asthenic) or previous history of neurotic illness may lower the threshold for the development of the syndrome or aggravate its course, but they are neither necessary nor sufficient to explain its occurrence. The onset follows the trauma with a latency period which may range from a few weeks to months (but rarely exceeds 6 months). The course is fluctuating but recovery can be expected in

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178 Laplanche and Pontalis, *The Language of Psychoanalysis*, p. 471.

> the majority of cases. In a small proportion of patients the condition may show a chronic course over many years and a transition to an enduring personality change.[179]

In both the DSM and the ICD there is a provision for the traumatic event in question to be of a threatening nature. But essentially the threat is the threat of death, the threat to the body and to life.

> This disorder should not generally be diagnosed unless there is evidence that it arose within 6 months of a traumatic event of exceptional severity. A "probable" diagnosis might still be possible if the delay between the event and the onset was longer than 6 months, provided that the clinical manifestations are typical and no alternative identification of the disorder (e.g., as an anxiety or obsessive-compulsive disorder or depressive episode) is plausible. In addition to evidence of trauma, there must be a repetitive, intrusive recollection or re-enactment of the event in memories, daytime imagery, or dreams. Conspicuous emotional detachment, numbing of feeling, and avoidance of stimuli that might arouse recollection of the trauma are often present but are not essential for the diagnosis. The autonomic

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179 The ICD-10, Classification of Mental and Behavioral Disorders, World Health Organization, Geneva, 1992. F43.1 Post-Traumatic Stress Disorder.

> disturbances, mood disorder, and behavioral abnormalities all contribute to the diagnosis but are not of prime importance.[180]

Within the diagnostic criteria for the pathological features of trauma we can see the paradoxical dimensions I have been talking about. Trauma is given by its evidence, by its effect; evidence in terms of flashbacks, recollections, dreams, hallucinations, etc. The assumption is that because the initial events were not abreacted at the time (either for reasons mentioned above, or because of the specific condition of the individual at the moment of the event[181]), that there is, over a sometimes prolonged period of time, a continued attempt to assign an affective valence to the "event." To paraphrase LaCapra, the repetition is an attempt to *fully own* the experience; an attempt to overcome the fact that the experience was not (and could not be) fully grasped to begin with. Thus by means associative or otherwise, the traumatized individual is subjected to recurring and disturbing psychical and somatic symptoms. And also we can see that the traumatic event need not directly threaten the traumatized individual; the witness as victim. But what cannot be seen is a social dimension to trauma. It is the person that gets wounded. It is the

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180 Ibid.

181 See Sigmund Freud, and Joseph Breuer, "On the Psychical Mechanism of Hysterical Phenomena (1892)," *Collected Papers, Volume 1*. trans. Alix and James Strachey, (New York: Basic Books, 1959), pp. 32-3, where Breuer and Freud establish these two initial conditions which may found the onset of traumatic neurosis.

person whose capacity to *function* is diminished through the traumatic experience.

Communities of Disaster

Historically there has been considerable interest in "disasters," and the way that communities respond in the wake of various sorts of disastrous events, but there has not been a great deal of work that attempts to link these events as trauma. Rather, disaster literature has tended to emphasis disasters as being events which result in an upsurge of community togetherness, caring, and other virtuous responses. It is as though the instinct for survival, and in the aftermath, the odd feeling of *having been spared*, results in the suspension of the pettiness of the everyday, and a surge of humanitarian goodness.

In a frequently quoted study on the psychology of disaster, Mary Wolfenstein wrote:

> Following a disaster there is apt to be a great upsurge of good will and helpfulness among the survivors and on the part of outsiders who come to their aid ... Those who have undergone the impact of a disaster have in that moment concentrated their emotional energies on themselves. Afterwards there is a compensatory expansion of feelings towards others, partly motivated by the guilt of not having cared what might happen to them when one's own life was

> in danger. In the moment of impact ... the victim is apt to have an illusion that he alone is affected and to suffer painful feelings of being abandoned by others and by fate. The discovery that one did not suffer alone and the sight of friendly hands held out to help one are all the more prized against this background of loneliness. Also, having been chastened by the punishment of disaster, one is eager to be exceptionally good to make up for past derelictions and to ward off further retribution.[182]

The point she is working toward in this passage is that there is a post-disaster utopia in which survivors — through guilt at having survived, or sorrow for those who did not — rise up, and overcome. The Christian overtones of surmounting adversity, putting aside one's petty interests in the interest of the greater good, etc., are palpable. Variously termed the "city of comrades," "democracy of distress," "community of sufferers," "altruistic community," there has been a tendency to foreground the disaster as a prelude to rebirth.

One of the most interesting and provocative challenges to this particular tradition in sociological and psychological disaster theory has come from sociologist Kai Erikson. In 1973, Erikson was involved in the aftermath of a disaster that occurred in the Appalachia community of Buffalo Creek. In

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182 Mary Wolfenstein, *Disaster: A Psychological Essay*, (London: Routledge & Kegan Paul Ltd., 1957), p. 189.

this disaster, a coal mine tailing-pond embankment burst sending a wall — some million and a half gallons — of mud and debris down a very narrow valley which contained the homes of the five thousand residents. In less than five minutes, one hundred and thirty-two people were killed, and four thousand were left homeless. Erikson's book that chronicles his time in the remains of the Buffalo Creek community is a fascinating, methodologically traditional work based upon field work and interviews. What is of interest here is that in the writing of this book Erikson essentially runs out of reasons to support the received orthodoxy of disaster research in which surviving a disaster amounts to a moral accomplishment.[183]

In the conclusion to *Everything in its Path*, Erikson suggests a slight but important shift in thinking that he sees as necessary to develop the idea of collective or community trauma. Specifically, he suggests that rather than seeing trauma as an *effect* of some manner of injury, rather, in other words, of finding trauma as a causally induced condition in the wake of the "disaster," that we reverse the procedure. This would mean that the important criteria become the traumatic reaction, and not prevailing definitions of "disasters."

> In the first place, we would be required to include events that have the capacity to induce trauma but that do not have

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183 Kai T. Erikson, *Everything in Its Path: Destruction of Community in the Buffalo Creek Flood*, (New York: Simon and Schuster, 1976).

> the quality of suddenness or explosiveness normally associated with the term. For example, people who are shifted from one location to another as the result of war or some other emergency ... And one might add here that thousands of American Indians, confined to reservations for the better part of a century, continue to show effects of traumatization. Our list might also have to include such slow developing but nonetheless devastating events as plague, famine, spoilage of natural resources ...[184]

By opening up the concept of disaster so that it, too, may be retroactively constituted, trauma gains a kind of mobility and diagnostic scope not traditionally accorded it. By changing what can count as a disaster, one approaches the notion that

> *chronic conditions* as well as *acute events* can induce trauma, and this, too, belongs in our calculations. A chronic disaster is one that gathers force slowly and insidiously, creeping around one's defenses rather than smashing through them. The person is unable to mobilize his normal defenses against the threat, sometimes because he has elected consciously or

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184 Ibid., p. 255.

> unconsciously to ignore it, and sometimes because he cannot do anything to avoid it in any case.[185]

And in the concluding passage to this work, he offers:

> I have suggested that human reactions to the age we are entering are likely to include a sense of cultural disorientation, a feeling of powerlessness, a dulled apathy and a generalized fear about the universe. These, of course, are among the classic symptoms of trauma, and it may well be that historians of the future will look back on this period and conclude that the traumatic neurosis were its true clinical signature.[186]

Erikson has continued work on areas of disaster, and recently published a collection of essays concerning the social and ecological disasters of Grassy Narrows, Immokalee, Three Mile Island, the Yucca Mountain project, Hiroshima, and homeless persons in America. Throughout this work he attempts to develop the idea that social relations suffer profoundly under modern economic, political and ecological conditions. While it is true that one may detect a kind of theoretical naiveté in Erikson's writing — for example, he never questions the status of his own presence in the communities he visits — and equally, one may find it

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185 Ibid., p. 255.

186 Ibid., p. 258.

difficult to sort out his particular moral outrage from that of his informants, but somehow this seems to pale in the face of the significance of what he attempts to do.[187] To sustain the question of what happens to the psychic and somatic integrity of humans in communities that undergo either acute or chronic limit events is one way to allow the question of ecological threat to be posed.

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187 A particularly provocative area of research (which to my knowledge has not been published) would be to consider the recent development of television programs which focus on "disasters." These programs, which seems to be coterminous with programs such as Cops, and LAPD, at least insofar as they position the viewer as *witness*, strike me as far more extreme. On one hand, they are scripted as a variant of the nature program; that is, they are constructed around a narrative of a vengeful, hostile, and just plain untrustworthy "nature." But on the other hand, the images themselves, are of death. In an hour-long program one will *see* death by airline accident, fire, flood, suicide, sporting misadventure, murder, and so on. What strikes me a fascinating is the simple fact of the viewer as witness to repetitive scenes of death and disaster. The images are not in the least homeopathic. These are hard core, grainy video, hand-held scenes. This is snuff TV.

Disasters of the Social

The move I would like to make at this point it to take this idea of trauma and point it outward from the individual, toward the collective, the social, and simultaneously, to assume the viability of Erikson's notion of chronic as well as acute conditions of trauma.

To say that trauma is an unmediated event in which an aspect non-symbolized real that passes to the inside, there is, on the face of it, no reason why it would be problematic to speak of groups rather than individuals. Obviously this is not an invention of my own, although in the chronology of this particular work, a collective notion of trauma struck me as a bit of a revelation. Some writers, for example Robert J. Lifton, and Robert Kaplan, have been developing profiles of individuals and communities in the wake of disasters of various sorts. Kaplan, in *The Ends of the Earth*, has taken travel writing to its limit in the form of a disaster travelogue — truly an *atlas calamitas* — of Third World social, political, ecological, and historical breakdown.[188] Lifton's work spans decades and

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188 Robert D. Kaplan, *The Ends of the Earth: A Journey at the Dawn of the 21st Century*, (New York: Random House, 1996). Kaplan, an American journalist and travel writer, wrote *Ends of the Earth*, based on his travels through Western and Northern Africa, the Middle East, Eurasia, and China. On the one hand, one can read

has been concerned not only with extreme traumas, but with the manner in which the encounter (therapeutic or otherwise) with survivors creates a secondary traumatic subject position of the *proxy survivor*.[189]

Holocaust writing contains probably the most concerted attempt to understand the social dimensions of trauma. From, for example, Saul Friedlander, Art Spiegelman, Primo Levi, Claude Lanzmann and Jean-François Lyotard there have been highly diverse strategies used to confront the collective and historical condition of Jews in the wake of the holocaust. And without seeming to use the holocaust as *an example*, one must nonetheless say that there are others. Indeed, there are countless examples throughout history of groups of various sorts undergoing unspeakable circumstances. The short list would include: Hiroshima, Nagasaki, Dresden, Vietnam, Cambodia, Bosnia, Uganda, Rwanda, Zaire, Guatemala, Chile. And what unites this disparate geography is a disaster suffered upon a community. But these examples constitute some of the most powerful features of our time. Too powerful, really; that is in the sense that one easily becomes caught up in the profound and overpowering tragedy and suffering of these places, peoples, and events.

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this work as a documentary of how eco-social disaster constitutes the *umwelt* of the regions in which he traveled. And on the other hand, one can read this as a documentary account of how one American's neo-Malthusian expectations are rendered absurd in the face of the complexity he confronts. This book warrants itself a lengthy discussion that I will not offer here.

189 Lifton discusses this feature of inquiry into trauma in relation to his work on Nazi doctors in the interview cited above.

The *atlas calamitas* of the last century (and one needn't stop there) is just about as large as we allow it to be. And just about every imaginable psychological, social, and political defense mechanism has been employed against this understanding. In a sense this supports what I'm trying to get at here; the magnitude of these events exceeds one's capacity to comprehend. The dose needs to be titrated. As LaCapra says, we need to find a homeopathic dose — a homeopathic repetition — in order to work with such things. This poses a powerful question about the understanding of traumatic experience. As Lanzmann puts it in relation to the holocaust,

> It is enough to formulate the question in simplistic terms — Why have the Jews been killed? — for the question to reveal right away its obscenity. There is an absolute obscenity in the project of understanding.[190]

I take him to mean that the obscenity consists in the expectation that there is an answer to such a question, that the answer precedes its transmission. In LaCapra's analysis, the prohibition against Why? is in part that it "involves the expectation of a totally satisfying answer on the level of representation," and in part that it is a call for a "harmonizing, normalizing account ... in which the past is seen to lead continuously up to a present."

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190 Claude Lanzmann, "The Obscenity of Understanding: An Evening with Claude Lanzmann," *Trauma: Explorations in Memory*, ed. Cathy Caruth, (Baltimore: Johns Hopkins University Press, 1995), p. 204.

On LaCapra's account, with which I agree, Lanzmann's approach to the holocaust is precisely to refuse understanding.

> One may maintain that anyone severely traumatized cannot fully transcend trauma but must to some extent act it out or relive it. Moreover, one may insist that any attentive secondary witness to, or acceptable account of, traumatic experiences must in some significant way be marked by trauma or allow trauma to register in its own procedures. This is a crucial reason why certain conventional, harmonizing histories or works of art may indeed be unacceptable. But one may differ in how one believes trauma should be addressed in life, in history, and in art. Freud argued that the perhaps inevitable tendency to act out the past by reliving it compulsively should be countered by the effort to work it through in a manner that would, to some viable extent, convert the past into memory and provide a measure of responsible control over one's behavior with respect to it and to the current demands of life. For example, the isolation and despair of melancholy and depression, bound up with the compulsively repeated reliving of trauma, may be engaged and to some extent countered by mourning in which there is a reinvestment in life, as some critical distance is achieved on the past and the lost other is no longer an object of unmediated identification. It would

> be presumptuous ... to pass judgment on the lives of Holocaust victims. But one may argue that, at least with respect to secondary witnesses in art and in historiography, there should be interrelated but differentiated attempts to supplement acting-out with modes of working-through.[191]

Lanzmann's film *Shoah is* certainly a film about life and about death and about memory. What makes this film work has little to do with history and much to do with memory. Indeed, Lanzmann himself says that "Shoah is not a documentary ... [T]he film is not at all representational." Interestingly, Lanzmann has also said that Shoah is "a fiction of the real."[192]

> Positivism and objectivism, which Lanzmann clearly rejects, deny or repress a transferential relation to the object whereby crucial aspects of it are repeated in the discourse or experience of the observer. In acting out, on the contrary, one reincarnates or relives the past in an unmediated transferential process that subjects one to possession by haunting objects and to compulsively repeated incursions of traumatic residues (hallucinations, flashbacks, nightmares).

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191 Dominick LaCapra. *Lanzmann's Shoah : 'Here There Is No Why'*. 1996. Online. Available: http://www.ruf.rice.edu/~culture/papers/lacapra.html.

192 Lanzmann, "The Obscenity of Understanding."

> Here the quest for full presence becomes phantasmatic and entirely uncontrolled.[193]

One could say that what Lanzmann does with this film is to close, perhaps only briefly, what has become the irreducible gap that separates the cultural imaginary and the unspeakable, unrepresentable real of the events of the holocaust. Events, which as we know, were aimed at eradicating all witnesses. The events, we could say, of a second death; first, the death of the witnesses, then, of the events themselves. But the events of the holocaust are suspended between the two deaths. The witnesses, the survivors, occupy this zone in an attempt to grant a symbolic death to the events.

Lanzmann seems to have attempted to give a gift of death back to these events, allowing them to die in life, and he does so through a principle mode of living — memory. What *Shoah* starts to say about the problem of the monument is that without the practices of memory, events can cease to have happened. We recall Benjamin: "for every image of the past that is not recognized by the present as one of its own concerns threatens to disappear irretrievably." The point is well taken, and could be seen as a warning beacon that looms over this entire work, but it still begs the question of what the image is, and where it comes from.

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193 LaCapra, "Lanzmann's Shoah."

Outing Threat, Mind the Gap

What kind of relationship might we choose to have with the traumatic reality of nuclear waste, and nuclear and ecological threats generally? The approach taken to the waste aspect of this problem has been equally frightening and fascinating. In one sense it has been grasped as a problem of projecting meaning; a problem of historical transmission. Building a sign that would retain its distinctive features *qua* sign for 10000 years. But even with diverse inputs into the development of the sign, it has remained essentially a *technical* question. A question of design. A question of building a better sign. Better meaning. And it strikes me that in exactly the same way as the physical materials are seen to be technical questions — the materials that must be developed to withstand a certain average wind pressure, and temperature, a certain average particulate load, etc., — so it is that the sign has been seen as a question of assembling *better* semiotic units. All of this amounts to building a sign that can *shout* louder in order that it can *mean* longer. There is an interesting equivocation going on in relation to the idea of distance; the clarity of the sign in a spatial proximity is taken to be a guarantor of the sign's clarity in temporal proximity. And then there is the double movement of the burial in which the whole question of the monument is sealed. On the one hand, the waste

is to be interred, buried and thus concealed, made *safe*. And on the other hand, the very danger is to be made manifest again through signification. The presumption is an intimate bond (signifier = signified) between the signified and the signifier, the danger and the sign, burial and signification. The wager is that the *proper* signifier will retain this integrity and not engage in a kind of nuclear-mimetic deterioration with its signified (signifier < signified). The proper sign is presumed to possess a perpetual, and veridical iconicity. Signification is and must be the only game in town (even after the town is long gone). With the monument as an anchor dropped hopefully in the real, tenuously attached to the present with the anxiety of a profound uncertainty, the problem has found the solution it deserved. Somehow though, perhaps through over-commitment to the episteme of "risk," together with an unstated wish for a redemption, those charged with responsibility for this problem have opted to dispense with memory, and focus instead on the unprecedented expenditure of the burial and the monument.

Through the use of a monument, the task of memory is symbolically deposited within a sign that is then given the task of organizing this meaning through time. The presence of threat is shifted away from the concreteness of human practice, to monumentality. Through repression, denial, and disavowal the problem is made to reach closure. Yet this closure is entirely premature — if it is even closure that is called for — since no one has been able to come to terms with what has taken place.

The gravestone has become the only real issue. Yet the question of the burial has never been posed. Why bury? It is an odd fascination with a certain function of death, with making these materials die. Threat, though, cannot be provoked into death in this fashion. And the whole problem with these nuclear materials is that they — and the threat they pose — refuse to die to begin with. Yet somehow we are driven to perform the last rites well in advance — it is one thing to mark our wish for their hasty demise, but building the coffin and cutting the stone borders on a nearly unimaginable disavowal.

What really needs to happen, apart from some serious and sophisticated analysis of the question itself, is to think in completely different terms. One could imagine a kind of thinking where only life was thought when thinking about the threat of waste. What does thinking about what makes life different from death do to transform thinking about threat? An interesting question. To begin with, it might bring death into life. It might well pull death back from the desert and allow it a full dimension as part *of* life.

Threat, thought of in the way I am attempting, forces us to confront the question of the monument, of death, of semiosis, and of a cultural otherness that confronts us when we are drawn to think of the future in this manner. But, from the point of view of the marker, such considerations might also reverse the manner in which the monument is to be thought. That is, rather than the double movement of the burial, it might allow us to talk precisely about signs that hurt. Reliance upon a

foggy likeness of danger amounts to a hope for an eternal Firstness, for an eternal expression of the possible, *regardless of aught else*. Instead, the project might be drawn to consider that the materials should be made, not "safe," but as dangerous as they really are. Not signification, but knowledge and memory and practice in relation to dangerous material.

In chapter four I made a parenthetical claim that the guardianship approach to the threat of waste represented the *best, the worst, and really the only option*. What this loosely aligned group of academics, professionals and activists are advocating is a global realignment of thinking about nuclear threat.[194] The position they have advanced — the Nuclear Guardianship Ethic — is reproduced below:

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194 See, for example, Ulrike Fink. "The Nuclear Guardianship: Concept for a Radioactive Future." *Sacred Earth: Testimonies Poison Fire, Lectures, Conclusions, The World Uranium Hearings, Salzburg, 1992* (1992). Available: http://www.ratical.com/radiation/WorldUraniumHearing/UlrikeFink.html, The World Uranium Hearing. "The Declaration of Salzburg (Draft)." *Sacred Earth: Testimonies Poison Fire, Lectures, Conclusions, The World Uranium Hearings, Salzburg, 1992* (1992). Online. Available: http://www.ratical.com/radiation/WorldUraniumHearing/Declaration.html, Joanna Macy. "Nuclear Guardianship: The Search for New Perspectives." *Sacred Earth: Testimonies Poison Fire, Lectures, Conclusions, The World Uranium Hearings, Salzburg* (1992). Online. Available: http://www.ratical.com/radiation/WorldUraniumHearing/JoannaMacy.html, Martin Kalinowski. "No Final Solution: No Burial — Technical & Ethical Testimonies at Konrad Mine Radioactive Waste Disposal Hearings." *Nuclear Guardianship Forum* 2 (1993). Online. Available: http://www.ratical.com/radiation/NGP/NoFinalSolu.html.

1. Each generation shall endeavor to preserve the foundations of life and well-being for those who come after. To produce and abandon substances that damage following generations is morally unacceptable;

2. Given the extreme toxicity and longevity of radioactive materials, their production must cease. The development of safe, renewable energy sources and non-violent means of conflict resolution is essential to the health and survival of life on Earth. Radioactive materials are not to be regarded as an economic or military resource;

3. We accept responsibility for the nuclear materials produced in our lifetimes and those left in our safekeeping;

4. Future generations have the right to know about the nuclear legacy bequeathed to them and to protect themselves from it;

5. Future generations have the right to monitor and repair containers, and to apply such technologies as may be developed to protect the biosphere more effectively. Deep burial of radioactive materials precludes these possibilities and risks uncontrollable contamination to life support systems;

6. Transport of radioactive materials, with its inevitable risks of accidents and spills, should be undertaken only when conditions at the current site pose a greater ecological hazard than transportation;

7. Research and development of technologies for the least hazardous long-term treatment and placement of nuclear materials should receive high priority in funding and public attention;

8. Education of the public about the character, source, and containment of radioactive materials is essential for the health of present and future generations. This education should promote understanding of our relationship to the Earth and to time;

9. The formation of policies governing the management of radioactive materials requires full participation of the public. Free circulation of information and open communication are indispensable for the self-protection of present and future generations;

10. The vigilance necessary for ongoing containment of radioactive materials requires a moral commitment. This commitment is within our capacity, and can be developed and sustained by drawing on the cultural and spiritual resources of our human heritage.

The Nuclear Guardianship Ethic is proposed as an evolving expression of values to guide decision-making on the management of radioactive materials.[195] What impresses me the most about this is that it is an entirely ethical expression. It is based upon an act of faith that it is better to remain aware of presence of nuclear materials than it is to engage in a ceremonial burial. It allows that nuclear waste must become part of memory and practice. We must ensure the presence of witnesses, and the only way to do this is to become witnesses ourselves. And this must become a very important thing to do, because it is, in my estimation, the only way to confront the real of ecological threat, to guard ourselves against it, and not to deny the future the right to do the same. It cannot be dealt with by a sign to danger. It *is* dangerous and it must be allowed this dimension of itself.

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195 Nuclear Guardianship Ethic, *Poison Fire, Sacred Earth: Testimonies, Lectures, Conclusions, The World Uranium Hearings, Salzburg*, Online, Available: http://www.ratical.com/radiation/NGP/NGethic.html.

Experimentum mentis, redux

I began this work with a game of twenty questions, modified to show something not about games, but about questioning, about inquiry. This record of my inquiry will now draw to a close, but not for a lack of questions. Indeed this seems to be the principle economy of this work: the accumulation of questions.

Our task, if we are to become better able to deal with the paradox of threat involves two things: the first is to know that our impulses toward an objective picture are necessarily fraught with projections, and the second is that we must reflexively attempt to locate and understand these transferences when they take place. We need to know when our motives and our behavior are determined through acting-out — i.e., an unthinking repetition. That said, there *is* agency left in all of this. And it consists in the choice that can be made between living within pathological elements of the trauma of the virtual — essentially living patterns of acting-out for evermore — or we can guide our actions with attempts to come to terms with the fundamentally non-objective status of threat precisely by measuring our responses always in terms of what it is that we value, and desire. In Freudian parlance, a working-through — that is, a modified

repetition that is supplemented by interpretive attempts to understand the repetitive formations (and the resistances that found them).[196]

In other words, the collective trauma posed by ecological threat may become the site of a *traumatic transvaluation*.[197] A transvaluation that would in a sense capture what Ewald sought in his example of the survivalists. But rather than communities founded solely upon survival, we are free to imagine new identities, strategically claimed to account for the presence of threat in a way that neither bypasses it through psychological mechanisms of defense, nor consigns us to an infinity of traumatic repetitions. Obviously one must be careful here. It is not a matter of *equating* threat and trauma — logically speaking this would leave the middle (the real) undistributed. The point is that nuclear and ecological threats partake of a traumatic relation with the real. And in doing so, such threats disclose a gap between a symbolic umwelt and an unrepresentable outside. And to return to Žižek in order to agree with him, the task must be to come to understand the senseless real of nuclear threat.

Culturally and socially there has been little opportunity to work-through the advent of nuclear threat. The modern history of the nuclear was

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196 Laplanche and Pontalis. *The Language of Psychoanalysis*, pp. 488-9.

197 This term, traumatic transvaluation, was suggest by Dominic LaCapra in a private conversation in 1996. I am not sure if he has used it elsewhere.

inaugurated by a stunningly inconceivable mass murder, and now we wish to commence with its ending with a quiet burial. Much as we may wish to avoid having to deal with the situation, its threat, and threats like it, cannot be granted closure.

The claim so central to environmentalisms of all stripes is that everything is connected. This is clearly seen in the notion of an organicist Gaia, in the more popular ecological slogans such as *there is no such thing as a free lunch*, and the more theoretically oriented, communication-based ecological treatments such as that of Tony Wilden's *causes cause causes to cause causes.*[198] One could go so far as to say that without this fundamental commitment to interconnectedness, ecological and environmental thought would be evacuated of most (if not all) of its radical potential.[199]

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198 See James Lovelock, *Gaia: A New look at Life on Earth*, (New York: Oxford University Press, 1979), Barry Commoner, *The Closing Circle*, (New York: Bantam Books, 1972), and Anthony Wilden, *System and Structure: Essays in Communication and Exchange*, (New York: Tavistock, 1980).

199 The promise of ecological theory is well summarized in the following quote from Rozak: "Ecology has been called the "subversive science" — and with good reason. Its sensibility — wholistic, receptive, trustful, largely non-tampering, deeply grounded in aesthetic tradition — is a radical deviation from traditional science. Ecology does not systematize by mathematical generalization or materialist reduction, but by the most sensuous intuiting of natural harmonies on the largest scale. Its patterns are not those of numbers, but of unity in process; its psychology borrows from Gestalt and is an awakening awareness of wholes greater than the sum of their parts" Theodore Rozak, *Where the Wasteland Ends*, (Garden City: Doubleday, 1972), p. 400.

The very notion of an ecosystem presupposes a dynamic interaction of correlates as an organizing feature. One could say that from the point of view of ecological theory (proper) interconnectedness is indeed less of a transcendental principle than it is something empirically given. But this would be to miss the point of what I am attempting to get at here. The *way* that environmentalism and ecological thought have become discursively organized *requires* the interconnectedness of everything — apart from what an ecologist might have to say. This foundation has been the very possibility of contesting practices that are geographically remote and causally (in a linear sense) unrelated. Interconnectedness in this sense facilitates the constitution of a complex causal picture of interactions, and allows this picture to be superimposed upon technical and industrial practices that are otherwise construed as benign. It allows the possibility of unintended effects to be adduced from ecological arguments. Interconnectedness qua concept facilitates a form of discourse that allows one to say that what happens *over there* makes a difference *over here.* And it does so frequently with potent results. For example, it fostered the development of a model whereby phosphates in laundry detergents became causally linked to formerly disparate phenomena such as fish production, and employment in the trucking industry. Or indeed, ecology became a legal framework through which accidents such as Love Canal could be contested on behalf of dead, living and future victims. Indicator organisms, the introduction of exotic species, fisheries decline, global warming — such things are palpable evidence of how the epistemology of

interconnectedness has fostered forms of knowledge that have and continue to challenge dominant modes of thinking.

Thus there are, from an operational point of view, good practical and political reasons for advancing claims based upon interconnectedness. But, if we reflect for a moment on what I've been developing here in terms of nuclear threats, this position becomes somewhat different.

The problem is this: nuclear threats come to make ecological thought look like an advanced form of cultural paranoia. I mean this in the sense that once we say that everything is connected, we already mean that everything is, if not already, then at least potentially captured symbolically. It is an exercise in (some form of) refusal to acknowledge the gap. And it creates an expectation for a world of *too much* necessity (a sickness, one could say, of finitude).[200]

To make everything connected is to see the fissures and cracks rendered by nuclear threats — whether the threats posed by wastes, or threats performed by accidents — as a kind of recompense for a failure to properly understand the connections. *The real punishing the epistemic for its sins of omission*. But the virtuality of threat is precisely indifferent to this.

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200 The reference here is to Becker's description of Kierkegaard's "sickness of infinitude." Becker aligns this with the world of the schizophrenic — a world of insufficient necessity. The world of depressive psychosis, on the other hand, is a world of too much necessity. See Ernest Becker, *The Denial of Death*, (New York: Free Press, 1973).

Nuclear threats are not a call to understanding — at least not a boundless understanding of connections. Rather, the kind of understanding that is called for is that we can come to know such threats only through our responses to them. (Again, my paraphrase of Ewald: the greater the potential of an ecological "risk," the more its reality is dependent upon a system of values.[201]) And such responses are, or ought to be, a function of what it is we value. It is as though the modifications made to the game of Twenty Questions with which we began (that is, to choose no word at all) were disavowed by ecology. The word *was* there waiting, and the task is therefore to discover its coordinates. And yet thinking this will get us no distance toward resolving the rift between threats on the one hand, and the concerns of life on the other. Perhaps this is what Guattari was getting at when he spoke of an ecology of the virtual. Toward the end of *Chaosmosis* he wrote:

> The contemporary world — tied up in its ecological, demographic and urban impasses — is incapable of absorbing, in a way that is compatible with the interests of humanity, the extraordinary techno-scientific mutations which shake it. It is locked in a vertiginous race towards ruin or radical renewal. All the bearings — economic, social, political, moral, traditional — break down one after the other. It has become imperative to recast the axes of values,

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201 See above, Chapter IV, for the context of Ewald's claim.

> the fundamental finalities of human relations and productive activity. An ecology of the virtual is thus just as pressing as ecologies of the visible world.[202]

Such an ecology would seem to amount to an ecology of the strange. At least it would from the point of view of an episteme of full understanding, an episteme of interconnectedness. Yet from another perspective, an ecology of the virtual would be nothing of the sort. For the strange is something actual that seems unreal or out of place. The strange is like the Freudian *unheimlich*, something familiar but foreign ("the *unheimlich* is what was once *heimisch*, home-like, familiar"[203]). But the strange requires the home, the oikos, as a reference, as an index to its strangeness. The virtual however is always in its place, it's just never actual. That is, its relationship, its interconnection with the oikos remains obscure. An

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202 Félix Guattari, *Chaosmosis: An Ethico-aesthetic Paradigm*, (Bloomington: Indiana University Press, 1995), p. 91. In Félix Guattari, "The Three Ecologies," *New Formations* 8 (1989): 131-147, he called for a slightly different sense of ecology: The generalized ecology I am arguing for here has in my view barely begun to be prefigured by environmental ecology in its contemporary form... Existing ecological movements certainly have many virtues; but the wider ecological question seems to me too important to be abandoned to the archaizing, folkloristic tendencies which choose determinedly to reject large-scale political involvement... for the ecology I propose here questions the whole of subjectivity and capitalist power formations." p. 140.

203 Sigmund Freud, "The Uncanny (1919)," *Collected Papers, Volume 4.* trans. Joan Riviere, (New York: Basic Books, 1959), p. 399.

ecology that could attend to the threats of the nuclear would have to make peace with the incomprehensible (and deadly) creativity of the virtual.

I cannot begin here to trace an outline of such an ecology. I can only point towards it as a problem that must be engaged. It must, I think, be the outcome of a process that is yet to take place. To truly measure responses to nuclear threats requires a far more detailed consideration of the play between the subjective and the social and cultural. It is a kind of consideration where my own response to all of this would be a far larger dimension. Clearly, the project in the desert frightens me in the extreme. And this is important because it must color my response. Burroughs once said something like "writing about music is like dancing about architecture." This seems odd to me though I can't remember why Burroughs thought it wasn't.[204] But in any case, I wonder how we could revise this formulation to say that writing about threat is like... What? Perhaps it is that writing about threat really is a bit like dancing about architecture; but only on the condition that we agree that there is nothing unusual about dance expressing something about architecture. In other words, where Burroughs was pointing to an incompatibility between expressive modes, I would like to urge precisely the opposite. Only when we have an expectation that writing about threat (or dancing about architecture) should have as its object the bringing to full presence of

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204 Sadly, it will not be possible to put this question to him. On August 2, 1997, as I was editing this final section, William S. Burroughs died (as a result of a heart attack).

threat (or architecture), could we begin to have the sense that one cannot express the other. It is precisely because threat is displaced in relation to the symbolic that other expressive modes are required for us to generate representations that are adequate to our needs. And this is why the only measure we are left with in relation to such threats is our response to them. Perhaps another way to express this would be to say that the ontology of threat is irreducibly social.

As I have been conceptually ricocheting back and forth between the monument and burial in the desert, and the security of my study, the question of my own response has perhaps remained too far beneath the surface. One could be inclined to read this work as a performance of my own anxiety. What this project in the desert represents frightens me in the extreme. And as I write these final words, I also wonder if I am not engaged in a kind of repetitive behavior. Stealing a glance under the curtain at the terrifying scene, then retreating safely back indoors. Perhaps this is the case. And if so, the question I might answer for myself is where my inquiry exists within a nexus of acting-out and working-through. It seems certain that mastery is out of the question. I haven't solved anything. But I feel that I have raised some questions that are meaningful to me, and in doing so I have conveyed some of its thickness to the reader.

I am aware that theoretical activities can become a distancing operation; that is, theory can become too removed from the scene of its concern, too abstract. It is my hope that I have in some way shown that to touch at a

distance with theory is also a way to enter into a different proximity with its object. And this is a problem that supports, in a way, the urgency of my project. The problem is in part that the so-called New Humanities — as a multi-perspectival set of critical and interpretive positions — are too often concerned (implicitly and otherwise) with the post-foundational anxiety that corresponds to this particular period in time.

The very critical and intellectual upheavals that have revolutionized the relationship between the academy and history, between the practices of thought and Enlightenment modes of knowing, have presented a decidedly *janus*-like situation. On the one hand, the transhistorical support structures have been rendered radically suspect, laying bare the pretension of a map-able — and therefore navigable — royal road to truth; and the cartographers in this case are the (royal) scientists. But on the other, the very condition of suspicion that verified the emperor's nakedness can fold back on itself in a debilitating relativism. The result of which can turn out to be a rather profound degree of political paralysis.

It can become difficult (and not merely unfashionable) to tread both sides of this embattled zone. The "environment" is not something that gets a great deal of attention in the Humanities today. Perhaps it is too impassioned, or not sufficiently abstract, or too infused with discourses of science and humanism. Or, from the opposite perspective, perhaps it is that the Humanities, still reverberating from the renunciation of *les grandes*

recites, must resist any renewed tendency toward homogenization (of value, of resistance, of identity).[205]

Whatever the case, a great deal of that which might otherwise be relevant to confronting a decidedly global, and utterly complex set of environmental and ecological questions, remains unuttered. Even in the wake of the realization that nature is not simply the obverse of culture — a reworking of this particular binarism that comes largely (and ironically) from the intellectual labour of the Humanities — ecological questions (and questions concerning ecology) are not frequently posed. Yet this is precisely what needs to be done.

The "revolution" that has bequeathed us the power of critical theories, it seems, has gone largely unnoticed in the world of Big Science, and governmental decision-making. Indeed, the year 1968 may just as well be better remembered as the year in which the U.S. House of Representative declared Lake Erie to be "dead," and the residents of

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205 This is not to suggest that "environmentalism" itself is conspicuously open to thought from the outside. Indeed, the last decade has witnessed a profound decline in public interest in the "environment." Within the field itself, the polarity of on the one hand the fundamentalist deep ecologists, and the scientific ecologists on the other, is as divided as it has ever been. Two recent books which deal with the foundations and implications of the environmental movement are Luc Ferry, *The New Ecological Order*, (Chicago: University of Chicago Press, 1995) and my *Primitives in the Wilderness: Deep Ecology and the Missing Human Subject*, (Albany: State University of New York Press, 1997).

Bikini Island were finally sent home with instructions not to drink the water.

All of the critical calisthenics in the world won't make the slightest bit of difference without the realization that, at the routine level of policy, Newton, Descartes, and Adam Smith have a lot more currency than Nietzsche, Marx, and Freud. This is certainly not to say that these latter should defer to a *real world*, quite the opposite. This is precisely the world, in my opinion, that must be the object of our critical endeavors. We cannot allow a disdain for scientific discourses to act as a selective frame for the objects of our study. Nor can we allow widely held interest in — or, less politely, blind fetishization of — the politics of micro-practices to divert attention from the need for large-scale, democratic projects. Ecological threats must become an object of our concern if only because such threats threaten the very possibility of political, democratic and social aspirations.

It has not been my intention here to sort out this political conundrum. Yet a conundrum it is. My purpose however has been to attempt to perform the kind of work that is consistent with this position. I will leave it to the reader to determine if I have been successful in doing so. In any case, I have endeavored to remain aware that the real pleasure of theory (for me) is when it does engage — in an affirmative and non-ironic mode — with the world. The crazed bucket-brigade to engage the solution of permanent burial, fueled in equal measure by historical inertia, disavowal, and a particular form of (instrumental) rationality that persistently conflates the

possible with the desirable, is edging humanity toward a point at which any thought of the future will be considered utopian.

Men make their own history, but they do not make it just as they please; they do not make it under circumstances chosen by themselves, but under circumstances directly encountered, given, and transmitted from the past. The tradition of all the dead generations weighs like a nightmare on the brain of the living.
Karl Marx — "The Eighteenth Brumaire of Louis Bonaparte"

Peter C. van Wyck

Toronto, Ontario

August, 1997

Twenty Years

1955: The U. S. Atomic Energy Commission asks the National Academy of Sciences to study permanent disposal of radioactive wastes. The following year, the Academy recommends disposal in salt deposits.

1970: A Lyons, Kansas, salt mine is selected as the potential site for a radioactive waste repository.

1972: The Lyons site is judged unacceptable because of the area's geology, hydrology and previously undiscovered drill holes that could lead to extensive dissolution of salt.

1974: A site 30 miles east of Carlsbad, New Mexico, is chosen for exploratory work.

1975: A borehole drilled to 3,000 feet provided enough information to eliminate the original site. Severe structural deformations in the primary

salt bed and pressurized brine hundreds of feet deeper were factors. The U.S. Geologic Survey recommends moving to an area about seven miles southwest of the original borehole.

1978: The Environmental Evaluation Group (EEG) is established to provide the State of New Mexico oversight powers.

1979: Congress authorizes the Waste Isolation Pilot Plant (WIPP) for the research and development of safe methods of disposal of radioactive wastes generated by defense facilities.

1980: The U.S. Department of Energy issues its Final Environmental Impact Statement on the WIPP.

1981: New Mexico sues the DOE and the Interior Department. The suit is resolved by an agreement requiring more studies and guaranteeing the State more information. The first exploratory shaft is drilled.

1982: Underground excavation begins. The DOE and the State of New Mexico sign an agreement committing the DOE to seek money from Congress for upgrading WIPP transportation routes and clarifying that the DOE is liable for accidents at the WIPP or en route.

1983: DOE decides to proceed with full facility construction of the WIPP.

1984: The DOE and the State agree that the WIPP must comply with all State, Federal and Local laws and regulations, including those of Environment Protection Agency.

1985: The EEG notifies DOE that the original container proposed for WIPP shipments is unacceptable. The EPA establishes radioactive waste disposal regulations applicable to the WIPP.

1986: The EPA says the WIPP must comply with the Resource Conservation and Recovery Act (RCRA) of 1976 for disposing of mixed hazardous and radioactive waste.

1987: DOE selects a new design for shipping containers. A federal court invalidates part of the EPA's radioactive-waste disposal rules, leaving no permanent repository regulations applicable to WIPP. A modified agreement between the DOE and New Mexico commits WIPP to original rules until revised regulations may be put in place.

1988: The DOE announces WIPP will not open as scheduled.

1989: The DOE applies to the Interior Department for the withdrawal from public use of 10,240 acres of federal land surrounding the site upon which and under which WIPP is constructed. DOE petitions the EPA for a waiver from RCRA land disposal restrictions. The DOE issues its five-year test plan for WIPP. The Nuclear Regulatory Commission approves new transportation containers. The DOE says July 1, 1990, is the earliest possible WIPP opening date.

1990: The DOE issues its Supplemental Environmental Impact Statement on WIPP. The EPA grants a No Migration Determination, meaning that no hazardous materials would escape from the repository to the environment during the planned test phase. The DOE issues its revised plan for a five-year test phase at WIPP, including gas-generation experiments. The EPA authorizes the New Mexico Environmental Improvement Division (now the Environment Department) to regulate disposal of mixed radioactive and hazardous waste, including WIPP waste.

1991: Jan. 22, Interior Department administratively transfers WIPP land to the DOE; Oct. 3, House Interior and Insular Affairs Committee passes a resolution nullifying the administrative transfer; Oct. 9, New Mexico files suit against the DOE claiming that the land transfer must be made by Congress. The suit is joined by the State of Texas and several members of Congress; Nov. 5, The U.S. Senate passes, by unanimous consent, the interdepartmental transfer of WIPP land as proposed by New Mexico's U.S. Senators, Republican Pete Domenici and Democrat Jeff Bingaman.

1992: Jan. 31, A permanent injunction on the WIPP site is granted (later overturned) and the RCRA permit is invalidated by U.S. District Court Judge John Garrett Penn in Washington, D.C.; Oct. 8, Congress passes the WIPP Land Withdrawal Act; Oct. 30, President Bush signs the Land Withdrawal Act.

1993: Mar. 10, The DOE says tests with radioactive waste at the WIPP site are not necessary to show compliance;[206] May 4-5, The Occupational Safety and Health Administration reviews and approves the WIPP's States Training and Education Program; Aug. 17, Westinghouse's Waste Isolation Division, the DOE's main contractor at the WIPP, declares facility readiness to receive waste for a test phase; Aug. 24, NMED issues a draft RCRA permit, saying a final permit may be issued in 1994 to allow the WIPP to open following public comment and hearings; Sept. 30, The DOE declares readiness to begin receiving waste for a test phase; Oct. 21, The DOE announces it will do radioactive testing at a national laboratory rather than at the WIPP site. Accelerated regulatory compliance became the main focus for employees at the site; Dec. 9, The DOE appoints George E. Dials as manager of a newly created Carlsbad Area Office, linking the WIPP directly with DOE Headquarters in Washington, D.C.

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206 This, as Jeff Wheelwright points out (in "For our nuclear wastes, there's gridlock on the road to the dump"), was a symbolic, and tactical loss for WIPP. Had on site testing been pursued, they would have arguably surmounted the additional hurdle of actually transporting waste through the State and placing it in the site. The Concerned Citizens for Nuclear Safety (a stakeholder organization in the Southwest) puts a different spin on this decision. They suggest that it was the reticence on the part of DOE to submit the site to actual testing, and the scrutiny of the EPA, that motivated the decision to conduct computer modeling tests only. See Concerned Citizens for Nuclear Safety. *WIPP Fact Sheet*. 1996. Online. Available: http://www.nets.com/ccns/ccns.wipp.fs.html.

1994: Mar. 5, Energy Secretary Hazel O'Leary visits the site, reaffirming her commitment to open the WIPP. She returns on Oct. 6 when she presents the DOE's first Voluntary Protection Plan "Star" Award to the WIPP.

1995: Mar. 31, the DOE-CAO submitted a Draft Compliance Certification Application (DCCA) to the U.S. Environmental Protection Agency; May 26, the CAO submitted a revised Resource Conservation and Recovery Act (RCRA) permit application to the New Mexico Environment Department; May 31, the CAO submitted to the EPA a draft petition for a No-migration Variance Determination; Oct. 6, The WIPP Disposal Decision Plan is revised, accelerating the opening by two months. The Energy Secretary's disposal decision is moved up to October 1997, and the first receipt of waste is scheduled for April 1998.

1996: *Disposal Phase Draft Supplemental Environmental Impact Statement (SEIS–II)* submitted which analyzes the potential impacts of disposing transuranic waste at the WIPP. In this document one proposed, and five alternative scenarios are assessed for the WIPP: the proposed action is to continue as planned; and the alternatives are to use WIPP for the disposal of defense and non-defense waste; to use the WIPP for the disposal of treated (to reduce volume) TRU, as well as other wastes deemed appropriate by the DOE (non-defense related); to use the WIPP dispose of transuranic waste at the WIPP after treating it by a "shred and grout" process (i.e., grinding and mixing waste with material that hardens and immobilizes the contaminants); close the WIPP and deal with wastes by

temporary storage in monitored sites; and, close the WIPP, leave existing waste where it is, and deal only with newly generated TRU. And significantly, the EPA granted an exemption to the "no migration" clause that is specified in the Resource Conservation and Recovery Act. The EPA stated that the requirement "is redundant to the more stringent radioactive waste disposal criteria, and that the exemption will not jeopardize the environment nor the public health and safety."[207] Two other significant features of 1996, were the issuing of the compliance criteria which WIPP must conform to (otherwise known as 40 CFR 194 Criteria for the Certification and Re-certification of the Waste Isolation Pilot Plant's Compliance with the 40 CFR Part 191, Environmental Radiation Protection Standards for the Management and Disposal of Spent Nuclear Fuel, High-Level and Transuranic Radioactive Waste), and the response submitted by WIPP to these criteria: the massive *Compliance Certification Application*. This document, representing the ultimate textual potlatch, is really too vast to read. Spanning 84,000 pages of text, appendices, figures, tables and references, the EPA has said they need a year to evaluate it. From the point of view of the interested party, the document is doubly difficult to read. First of all, paper copies do not exist for circulation (conservatively, the document would occupy about 5.5

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207 WIPP Press Release. *President Signs Opening of the WIPP, Save Taxpayers Money Bill to Speed —09/23/96*. 1996. Online. Available: http://www.wipp.carlsbad.nm.us/.

meters of shelf space), and secondly, CD ROM version exist only in 11 locations in the Southwest United States.

1997: March 31, DOE revises WIPP's opening date to May 1998. The previously projected opening was felt to be too optimistic in light of the vast Compliance Certification Application for WIPP that must be read and approved by the EPA. The EPA informed DOE that it cannot complete the required rule-making on the certification decision until April 1998, at the earliest. The *Albuquerque Journal* reported on April 1, 1997, that the delay was actually due to time needed to verify computer models of the WIPP that show that the site will be able to prevent the waste from reaching the accessible environment for 10,000 years.

In a recently released 10-year plan for the site, two scenarios were given, one in which the WIPP would receive waste from only a small number of sites, and scale operation to a period of 100 years, and the other would have it that the site would operate at full capacity, ceasing operations after 35 years.[208] All of these decisions are yet to be made. Regardless of what gets stored at WIPP (whether defense or commercial), and when it gets put there, and how it is transported there, the site is meant to be prototype. The American government has charged the Department of

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208 U.S. Department of Energy. "Ten-year Plan looks toward the Future." *TRU Progress* 2.2 (1997). Online. Available: http://www.wipp.carlsbad.nm.us/.

Energy with the responsibility to come up with a total design for storage that can be adopted throughout the globe.

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