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Contents

Turning Homeward:
Art, Technology, and Dwelling in Later Heidegger[1]

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Although homelessness is one of Heidegger's preoccupations throughout his career, it assumes a specifically technological character in his later writings. According to Heidegger, our unique homelessness is an aftermath of technological disclosure and takes the form of a forced familiarity that disables us from inhabiting our world attentively. In this paper I argue that Heidegger sees the work of art as a disturbance to our familiarity, permitting a free relationship to technology, which Heidegger calls dwelling. In drawing the connections between technology, art, and dwelling, I show that they constitute a dialectic structure in which dwelling is a kind of freedom. My central claim is that, despite its dangers, technology itself prepares us for dwelling in a new way, and that for this reason Heidegger's vision of dwelling should not be reduced to a reactionary call for a retreat from the technological world.

Key words: Heidegger, technology, art, dwelling, freedom

I.

Martin Heidegger concludes his essay "Building Dwelling Thinking" with the following remark: "[As] soon as man gives thought to his homelessness, it is a misery no longer. Rightly considered and kept well in mind, it is the sole summons that calls mortals into their

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[1] This article is a revision of a paper first presented at the Humanities and Technology Association Conference, held at the Borough of Manhattan Community College of the City University of New York, October 5th - 8th, 2006.

dwelling" (Heidegger, 1954/2001a, p. 159). In a sense Heidegger's central concerns with homelessness and dwelling converge in this remark, for it expresses the link between them. If we were not homeless, we would be unable to dwell. But dwelling requires the additional task of giving thought to one's homelessness, of keeping it in mind. In his later writings, Heidegger becomes especially worried about our ability to perform this task under technological conditions. His focus shifts from the homelessness that is a fact of our fundamental human condition to the homelessness that is unique to the technological age. But despite the obstacles to dwelling that technology erects, its form of homelessness is as inseparable from our possibility for dwelling as the above remark suggests.

Before I can begin to untangle the relationship between dwelling and technology, I must give a provisional account of what Heidegger means by dwelling. First and foremost dwelling is a sense of home and a familiarity with one's surroundings. When someone is at home, she adopts a relaxed posture because she is intimately familiar with the things around her and because she sees that both she and these things belong together. But it's important to note that dwelling is never only a sense of familiarity, for it demands her awareness that she is a visitor whose time is limited. In Heidegger's account, to dwell and to sojourn are intimately connected. As long as she keeps in mind that her visit is unavoidably finite, she will not grow too accustomed to her home and so take it for granted. Instead, this awareness will make her attentive to her surroundings, and without such attentiveness, she could not genuinely dwell.

In his writings about technology, Heidegger implicitly targets technology's unique denial of dwelling. Because technology produces technological thinking, it ensures that we remain oblivious of the world we inhabit, and so disables us from attending to our surroundings. While in the grip of technological thinking, the world is too familiar to us, which means that we are no longer granted a perspective from which we can see this world as our world. Such a perspective requires a distance from what surrounds us, for only such a distance can bring about the essential features of dwelling: a sense of belonging, relaxation, and attentiveness. So a remarkable aspect of technology is that the very familiarity it produces prevents us from experiencing its world as our home.

TURNING HOMEWARD

Although Heidegger wants to maintain that dwelling is a timeless and enduring task, the condition of homelessness in the technological age presents a unique challenge. Once we see how securely we are in technology's grip, it becomes clear that the path from technological thinking to dwelling in the technological world requires a transformative disorientation or disruption. Heidegger suggests that it is through the artwork's blow (*Stoß*) to our seamless familiarity that we wake up to the technological world and see it as our world. In doing so, the work of art not only shows us to what extent we have become homeless, but at the same time invites us to be at home anew. Thus, the work of art simultaneously disorients and reorients us. But this reorientation could likewise open ways of dwelling which were closed off to our predecessors. I do not want to deny that Heidegger's description of dwelling includes many features which he ascribes to the pre-modern age, and in fact Heidegger himself mourns our inability to retreat into rural life and sprout roots like trees. But despite Heidegger's own preference for pre-modern, pre-technological, and rural dwelling, I want to examine the ways in which the world we inhabit transforms what sense of home we can hope for and what kind of dwelling we can practice. In doing so, we come to see that technology is not merely our disadvantage, but can bring us to our own nature as visitors in a new way.

There have been several efforts to delineate the aspects of technology that Heidegger considers worth preserving, and Gianni Vattimo has argued that it is the ceaseless provocation of the technological world – in addition to the disorientation produced by the work of art – that sustains the homelessness essential for dwelling (Vattimo, 1992, p. 52). I want to argue that Heidegger's vision of dwelling requires the preservation of technological mobility, rather than its provocation and disorientation. Both provocation and disorientation are inimical to the task of dwelling because they disable us from adopting a relaxed posture towards our world, a posture which Heidegger considers constitutive of dwelling. But the openness to movement which technology effects can be preserved even once we are freed from the confines of technological thinking. Thus dwelling can be distinctly technological while simultaneously requiring a genuine reorientation.

In this paper I will describe the relationship between technology, art, and dwelling as a dialectic one, in which technology is an extreme

positivity, art the determinate negation, and dwelling the synthesis that overcomes the initial conflict by preserving the virtues of both art and technology. In promoting this reading, I am aware of Heidegger's obvious departure from the dialectic tradition, since he considers dwelling to be neither a final resting point nor an achievement of our mental or practical activity. My reason for interpreting dwelling dialectically is to show that Heidegger considers dwelling to be a kind of freedom, and in this respect he is continuing the tradition he rejects in other respects. Dwelling provides an important clue for how to conceive of what he calls a free relationship to technology. Once we understand what this freedom is and how it is possible, we can reject the two extreme positions towards technology that we might be tempted to ascribe to Heidegger: on the one hand that he is a closeted Luddite, on the other hand that he is advocating a passive endorsement of our technological fate.

II.

I will begin by laying out the central elements of Heidegger's notion of technology in order to locate the target of his question. It is tempting to read Heidegger's use of the term *technology* as referring either to machines or to science, but Heidegger is careful to differentiate technology from both. Technological machines are merely one of technology's many effects, and they stand in no essential relation to it. In the technological world, all things are technological, and not only the narrow domain of things we call "machines." But technology is also unlike science, because science maintains a conception of the human being as master of the earth, whereas technology treats the human being as just another element to be mastered. Heidegger develops an idiosyncratic conception of technology as a special mode of disclosure, in other words, as a particular way in which things appear to us. And it is important to note that this disclosure is not the product of any human effort.

Like all modes of disclosure, technology erects a world in which things show up in one way rather than another, and thus it involves concealing other possible views. Such concealment is an essential side-effect of any disclosure. But technology, unlike other modes of disclosure, has the essence of self-concealment. Heidegger describes the technological world as one that was set up with the sole aim of

challenging the earth to reveal its resources, and he calls this particular form of "setting up" *enframing*. Enframing is peculiar not only because it flattens everything into resource material that is standing reserve and ready to be used up, but because it blocks our ability to see that enframing is happening in the first place. We cannot imagine things showing up in any other way, and this failure is not suggestive of our epistemic limits, but is the result of technological disclosure. Technology essentially conceals not only various features of the world, but it conceal itself and hides behind an obviousness. Thus, technology's *danger* is precisely the blind spot it creates, producing an oblivious manner of inhabiting its world.

This blind spot or oblivion is what Heidegger calls *technological thinking*. A fruitful way to understand technological thinking is to see it as an extreme familiarity, the kind of familiarity that makes someone oblivious of her surroundings because she takes them for granted. It is a form of familiarity expressed as indifference. Technology accomplishes this familiarity by forcefully familiarizing what was once remote in an effort to diminish all distances and to compel everything to the status of standing reserve. Heidegger invokes vivid examples of what he calls the "abolition of every possible remoteness:"

> All distances in time and space are shrinking. Man now reaches overnight, by plane, places which formerly took weeks and months of travel. He now receives instant information, by radio, of events which he formerly learned about only years later, if at all… Distant sites of the most ancient cultures are shown on film as if they stood this very moment amidst today's street traffic. (Heidegger, 1951/2001c, p. 163)

These examples illustrate that we consider location to be essentially negotiable and arbitrary, and that things are moved from one place to another without consideration that they may not belong there. Technology no longer permits an understanding that certain things cannot be relocated and remain meaningful, as for example ancient sites become unintelligible in the midst of today's traffic. Technological space is essentially homogenous, and because we understand space as undifferentiated, every corner of the world comes to appear so thoroughly familiar to us that we grow indifferent to it. Due to this indifferent familiarity, things in technological space cannot

belong together, since distance is required in order to experience things as near to and belonging with each other, and as near to and belonging with us.

It is not only the displacement of things, but also our flexibility and limitless movement in space that expresses technology's refusal to let us belong to its world. Our mobility suggests that we have become homeless, that we no longer belong to the world we inhabit. In Heidegger's words:

> Man puts the longest distances behind him in the shortest time. He puts the greatest distances behind himself and thus puts everything before himself at the shortest range… Yet the frantic abolition of all distances brings no nearness; for nearness does not consist in shortness of distance. (Heidegger, 1951/2001c, p. 163)

Heidegger is noticing that our thorough familiarity with the technological world renders us homeless, not only because we see any location we occupy as essentially temporary and contingent, but also because we are in a sense too close to our surroundings. We have drawn things so near that we become unable to see that this technological world is ours, that both we and the things around us belong to this world. Heidegger describes this world-blindness – which is a clear consequence of the oblivion of technological thinking – as an uncanniness or homelessness (*Unheimlichkeit*), expressed in indifference and boredom with our world. In the face of our attempts to familiarize everything remote, "an uncanny change in the world moves upon us" (Heidegger, 1959/1969, p. 52).

Heidegger resists lamenting our mobility per se, but targets rather the indifference it accompanies. Technological mobility produces uncanniness only insofar as it is tied to technological thinking, an indifferent and oblivious form of familiarity. When Heidegger asks the question concerning technology's essence, this question aims to bring technology out of its self-concealment and thus break the spell of technological thinking. Once we see the essence of technology, we could no longer be oblivious of our world and indifferent to it. We would see that the technological world is our world, the world to which we belong. Heidegger's question thus imagines a new invitation to

belong to the technological world without technology having extended such an invitation to us.

III.

Since the question concerning technology has not been invited by technology, its source must lie elsewhere. Heidegger suggests that this question can be evoked by the work of art. When we find ourselves in the midst of technological danger, art is the realm in which "reflection upon technology and decisive confrontation with it must happen" (Heidegger, 1982, p. 35). Heidegger suggests that art's saving power rests precisely on its kinship with technology, since both are modes of disclosure. Paraphrasing Nietzsche, Heidegger claims: "The closer we come to the danger, the more brightly do the ways into the saving power begin to shine and the more questioning we become" (Heidegger, 1982, p. 35). But, since we cannot come close to technology's danger by remaining under its spell, art can become a saving power only by breaking the seamlessness of our familiarity and making technology visible to us. Once we are freed from technological thinking, we can recollect ourselves and attain insight into the world we have taken for granted.

Although artworks in the technological world suffer a fate not unlike that of both things and human beings, Heidegger is interested in the mode of disclosure specific to art which rivals that of technology, and yet discloses in a fundamentally different manner. Whereas technology discloses a world obliviously, art essentially makes the world visible as a world. For Heidegger, the Greek temple is exemplary of this relationship between art and world:

> It is the temple-work that first fits together and at the same time gathers around itself the unity of those paths and relations in which birth and death, disaster and blessing, victory and disgrace, endurance and decline acquire the shape of destiny for human beings. (Heidegger, 1950/2001b, p. 41)

The temple structured a world by providing a space in which all domains of life could converge, and by setting up a world, it shaped the Greek destiny. But the setting up and a shaping of a destiny are accomplished not by imposing an alien framework in which the Greeks

could not recognize themselves. Rather the work of art articulated a world and a destiny by showing what was already at stake for the Greeks. Similarly, the work of art in the age of technology has the task of pulling the hidden world into daylight, showing us the world we already inhabit.

Because we find ourselves in a condition of oblivion, the work of art must shock us, redirect our gaze, and make our world visible for the first time. Art's uncanny and extraordinary nature emerges through two features of its work: the work of art defamiliarizes the familiar in order to permit us a view of the world we have taken for granted, but it also defamiliarizes in order to reveal how uncanny our world has meanwhile become. When we gain the latter insight, it turns out that the world made visible by the artwork is not one to which we can simply return and continue to inhabit in the same manner. Rather, the work of art shows that technological familiarity denies the perspective required to see our world as the world to which we belong. Our very ability to belong to this world requires a reorientation toward it, and so the work of art provokes a transformation that does not leave technology intact. But instead of provoking us to reject technology as such, the artwork invites a readjusted comportment toward our technological world. In other words, the work of art undermines technological thinking, and Heidegger considers such thinking to be the gravest of all of technology's dangers.

From the way I described the defamiliarizing role of art, Heidegger's view could begin to resemble those of an aesthetic tradition that considers art's task to be a mirroring of our world. According to this tradition, the work of art illuminates exclusively the world it structures. An example would be Brechtian theater of alienation, in which the members of the audience are confronted with a defamiliarized version of their own capitalistic society that awakens them to various features of this society of which they have grown oblivious. But Heidegger suggests that the work of art has the possibility of genuine resistance to technological thinking only because its role cannot be reduced to such a mirroring of our world. What Heidegger means by *world* is the sphere of intelligibility in which we already have a particular understanding of everything we encounter. The technological world is then the unique sphere in which we see everything we encounter as resource material. A work of art with the purpose of holding a mirror to our world would display to us that

enframing which constitutes the technological world's structure. But Heidegger insists that the task of art exceeds this function. When revealing what is at stake for us, the work of art gestures towards "that on which and in which man bases his dwelling," (Heidegger, 1950/2001b, p. 41) which Heidegger calls *earth*. Unlike world, earth is opaque to us and resists our efforts to master it and make it intelligible. According to Heidegger, the work of art reveals that earth is also at stake in the task of dwelling. Dwelling requires our ability to rely on earth, to rest upon it as our ground without demanding that it expose itself exhaustively.

Heidegger describes the work of art as standing at the nexus in the battle between world and earth in which both tug at each other, earth pulling toward opaqueness and world toward exposure. Because the work of art is not enlisted in the service of either, its position at the crossroad between earth and world makes visible that earth and world belong to one another. By revealing this relationship, the artwork returns our world to earth. Furthermore, the artwork's disruption of our technological plans permits a point of view from which we can let go, release, and attain a relaxed posture towards our world and towards earth. Heidegger calls this comportment *meditative thinking*, or *Gelassenheit,* which is a thinking that attends to things by letting them be. This meditative thinking then enables a new sense of belonging to our world which was denied by the essence of technology. The relationship between meditative thinking and belonging becomes explicit in the following words of Heidegger's Memorial Address:

> Thus we ask now: even if the old rootedness is being lost in this age, may not a new ground and foundation be granted again to man, a foundation and ground out of which man's nature and all his works can flourish in a new way even in the atomic age? What could the ground and foundation be for the new autochthony? Perhaps the answer we are looking for lies at hand; so near that we all too easily overlook it. For the way to what is near is always the longest and thus the hardest for us humans. This way is the way of meditative thinking. (Heidegger, 1959/1969, p. 53)

It is the artwork's invitation to meditative thinking that resists most explicitly the essence of technology and its danger of

technological thinking. Meditative thinking thus reveals the contrast between our technological habits and dwelling.

IV.

In order to understand how art invites dwelling, we must note that the work of art serves as the site of a new constellation, because it brings together not only earth and world, but also mortals and divinities. Because we stand in this constellation – which Heidegger calls the *fourfold* – as mortals, we come to recognize that we belong to both earth and world as those capable of death. So our belonging to the world and earth is conditional, which means that our experience of home will be dependent on our mortality. As Heidegger suggests when he underlines the interdependence between dwelling and homelessness, our form of dwelling is that of creatures who are essentially sojourners. The work of art, in serving as the site of this constellation, reveals that we belong to our world and earth as mortal creatures. But Heidegger stresses that "to initiate mortals into the nature of death in no way means to make death…the goal. Nor does it mean to darken dwelling by blindly staring toward the end" (Heidegger, 1954/2001a, p. 149). Although it is the inevitability of death that enables us to dwell, we do not dwell frantically. Rather, we dwell by remaining with things, to which we are simultaneously saying our farewell. This double-task – staying and parting – provokes us to be attentive to our world, and such attentiveness enables the experience of nearness. When we are attentive to our surroundings, we don't experience space as homogenous and populated with arbitrarily positioned things, since we are no longer indifferent to the things that surround us.

According to Heidegger, technological thinking produces obliviousness and indifference precisely because it is forceful, because it makes the world familiar by forcing everything into one's vicinity. Since any forceful form of thinking would only perpetuate technological oblivion – and Heidegger considers Enlightenment reflection and critique to fall in this category – meditative thinking provides the sole path toward a new sense of belonging. In "The Question Concerning Technology," Heidegger announces that he is interested in the free relationship towards technology, and suggests that this freedom involves an acknowledgement of our technological destiny. As we have already seen, technological thinking prevents such

acknowledgment since it produces oblivion, while meditative thinking grants us the perspective from which we can recognize our world and our destiny as our own. But because meditative thinking requires that we accept our destiny, and doesn't involve rejection or critique of it, it looks as if meditative thinking were essentially passive toward technology. The question then becomes how we can understand such passivity as a form of freedom.

Although meditative thinking does suggest a kind of passivity with respect to technology, our passivity is in a way precisely what frees us from blind obedience. It is clear that Heidegger's notion of freedom is not a freedom of choice, but it would be a distortion to describe it as sheer abandonment to our fate, and Heidegger is careful to distinguish the technological thinker who is constrained to obey and the meditative thinker who listens and hears. Heidegger provides the following picture of what he has in mind when he speaks of this free relationship toward technology:

> Still we can act otherwise. We can use technical devices, and yet with proper use also keep ourselves so free of them, that we may let go of them any time…Our relation to technology will become wonderfully simple and relaxed. We let technical devices enter our daily life, and at the same time leave them outside, that is, let them alone, as things which are nothing absolute but remain dependent upon something higher. I would call this comportment toward technology which expresses 'yes' and at the same time 'no,' by an old word, *Gelassenheit.* (Heidegger, 1959/1969, p. 54)

The simultaneous affirmation and rejection is perhaps the most distinct trait of meditative thinking and it exhibits the link between dwelling and freedom that Heidegger envisions. Heidegger is pointing out that an affirmation of our destiny demands a rejection of technological thinking, since such thinking hinders our acknowledgment that this destiny is ours, that we belong to it. Moreover, this simultaneous affirmation and rejection does not result in paralysis or contradiction, but makes possible the kind of relaxed posture that Heidegger describes as the practice of dwelling. When we think meditatively, we leave room in our lives to recollect ourselves from the frantic movements of the technological world, and even when

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we use technological devices, we do not do so technologically. Consequently, those who dwell in the technological world meditatively or attentively are able to genuinely and freely belong to this world, whereas before they were its obedient functionaries.

But dwelling demands the acknowledgment of our technological destiny not only because it happens to be ours. I want to argue that technology holds the possibility for a journey through the world which was closed off to our predecessors, but which is essential for dwelling. This is a feature of the relationship between technology and dwelling that Heidegger himself does not explore, although it is implicit in his thinking. My claim is that we can dwell not *in spite* of technology, but in a specific sense *because of* technology. Technology makes dwelling possible in a manner in which the pre-technological age did not, despite its abundance of nearness and farness, and thus we are presented with a new mode of dwelling which departs from a provincial and potentially stagnant one. Although technology hides much from us, it does foreground our status as visitors in the world. It puts us in motion and allows us to pass through the world rather than carve out a static domain whose stringent boundaries may compel us to forget that this dwelling place is not our final destination. In our technological habits we rush from the new to the ever new, but this movement is at the same time our new advantage: because we inhabit our world as beings in transit, technology has already challenged our assumption that we are ultimately at home in the world, that we will belong to it forever. We need to recollect ourselves in order to become aware of this feature of technology, since the mere activity of rushing crowds out such awareness. After all, it is not technological thinking that enables this awareness. Nevertheless, meditative thinking can make visible the truly revelatory features of technological disclosure, those that show the world also as a passageway and not merely a destination. So dwelling is possible in the technological world not merely because it is our world – although we might regret that this is the case – but because technology itself positively contributes to the task of dwelling. Once we see this relationship between technology and dwelling, we can recognize that dwelling for us cannot be a return to some provincial roots.

V.

Although Heidegger exclaims: "the rootedness, the autochthony, of man is threatened today at its core!" (Heidegger, 1959/1969, p. 49) it is misleading to take this as an expression of nostalgia for those same roots which once fixed the boundaries of our homes. Heidegger's worry about our contemporary disorientation and indifference to our surroundings is not a wholesale rejection of the technological world, but is concerned specifically with technological thinking, since it is this thinking that bars dwelling and prevents us from freely belonging to our world. Heidegger leaves open the possibility for a free relationship to technology, a relationship in which we discover not only that the technological world is our world, but also that technology is able to reveal that we belong to our world as its visitors.

In this paper I hope to have shown which aspects of technology Heidegger targets as hostile to dwelling, and which he leaves open as potentially positive contributions to dwelling's essential task. Although there have been other efforts to emphasize Heidegger's positive picture of technology and its role in dwelling, they face the threat of depicting dwelling as indistinguishable from technological thinking. For example, Gianni Vattimo has proposed a controversial interpretation of Heidegger's views, claiming that Heidegger wishes that both technology and the artwork preserve their uncanny "oscillation." Vattimo writes, "Precisely in the Gestell [enframing], that is, in the society of technology and total manipulation, Heidegger sees an opportunity of overcoming the oblivion and metaphysical alienation in which Western man has lived until now" (Vattimo, 1992, p. 56). Even if Heidegger does suggest that we must see the danger to the end in order to find a saving power, he does not thereby commit himself to the view that technological thinking – as a ceaseless and frantic confrontation with the world – liberates us from oblivion. On the contrary, such thinking is incompatible with freedom, because it ensures that we remain in the blind service of technology. Vattimo is right to point out that Heidegger considers a feature of technology to be liberating, but this feature is technology's flexible, nomadic, and transitory relationship to the world, and not its attitude of restlessness and disorientation.

According to Heidegger, the task of dwelling cannot be fulfilled by simply redrawing borders along our patch of homeland. The reason

why reinstituting the distinction between the remote and near cannot achieve dwelling is that such reinstitution would just be one more expression of technological thinking, a thinking that forcefully establishes and abolishes boundaries. Since a return to groundedness cannot be forced, Heidegger's question concerning technology is far from a reactionary call. Nor is his notion of dwelling a nostalgic fantasy that is unavoidably at odds with our world. Heidegger is articulating a new vision of freedom, as a form dwelling, which is a simultaneous rejection and affirmation of technology. Such free dwelling integrates technological mobility, but it demands that we be mobile in a relaxed, attentive, and careful manner.

Throughout his later writings, it seems like Heidegger is sketching a picture in which we are technologically homeless, then reoriented by art, and finally returned home through meditative thinking. But, as I have shown, this picture is more complicated. In dwelling, we are turning homeward, but a turning is not a proper return, whether to a new home or a bygone one. The possibility for a transitory dwelling distinguishes Heidegger's thinking from nostalgia for a time when borders were not negotiable. In contrast to nationalists who frequently express such nostalgia by condemning urban habits, Heidegger refrains from simply rejecting the cosmopolitanism associated with the technological age. Although he himself may have preferred the rural life, his thinking about our technological destiny suggests the possibility of a worldly form of dwelling.

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Subject or Fourfold? On the Politics of Turning Homeward[1]

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The later Heidegger replaces the concept of the subject with the notion of the fourfold, a horizon of meaning framed by earth and sky, mortals and divinities. In this horizon, based on Heidegger's re-interpretation of spatiality, Being is said to be truly at home, allowing mankind to dwell in less alienated fashion than during the era of the Subject (modernity). By contrast, this article argues that espousing the fourfold represents a proto-religious turn that modernity should not take. The concept of the subject therefore needs to be maintained, albeit one that can demonstrate a greater response-ability to the dimensions of contemporary life.

Key words: Heidegger, space, modernity, subject, fourfold, response, homelessness, autochthony

Heidegger's essay "Building Dwelling Thinking" is fascinating for a number of reasons (1971). The one that attracted me is his unorthodox approach to spatiality, and the important role this notion of space plays with regard to a non-exploitative attitude towards the world. As we will see, Heidegger's alternative delineation of space is decisive for mankind's genuine dwelling—a way of being that is

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[1] This paper is a revised version of my presentation at the 30th annual Humanities and Technology Association meeting in Manhattan in October 2006.

respectful and protective of the world and its things. Ideally, genuine dwelling should be the preferred way for mankind to provide shelter.

I like Heidegger's critique of the traditional notion of abstract space very much. The question I want to explore in this context surfaces only when Heidegger provides the "details" as to how genuine dwelling occurs. It is here that mankind as caretaker is called upon to be mindful of the *fourfold* of my title; a term which, in Hölderlin's mythical language, refers to man's embeddedness in the dimensions of earth, sky, gods, and mortals. Part of the fourfold, mankind is called upon to contribute to its realization which manifests itself in genuine dwelling.

My question is this: Can Heidegger's notion of the fourfold really be considered an alternative to the modern notion of the subject? Does the fourfold as a manner of revealing provide the framework for Being to show itself—unlike in modern technology—in a non-antagonistic manner? Can this approach to space/dwelling/conservation serve as a postmodern solution to the ills of modernity?

In my discussion, I will be touching upon a number of issues familiar to the philosophical discourse of modernity—such as spatiality, subject philosophy, and the politics of metaphysical homelessness—that would each warrant an in-depth review of the secondary literature. All I can provide here, however, are a few of the signposts for my work. In terms of the connection between homelessness and spatiality I have profited from the essay by Zaborowski (2005), although I hold a position diametrically opposed to his on the issue of metaphysical homelessness. In terms of the political dimension of Heidegger's writings, I have found most helpful the works of Michael E. Zimmerman (1990), Jean-Francois Lyotard (1990), and Alain Renaut (1997). What distinguishes my contribution from all these works is my primary focus on Heidegger's critique of subjectivity in terms of spatiality and the fourfold.

I.

As is well known, Martin Heidegger pursued the "destruction" of *metaphysics*, by which he meant the Western philosophical tradition, his entire career. He never tired of pointing out that the *abstract* nature of post-Socratic Greek philosophy had led the entire Western tradition astray by interpreting Being in terms of presence. The true focus of his

account, however, must be seen in the "modern" moment of this historical development of the errant history of Being, namely when epistemology rises to the pinnacle of philosophical thought. In post-Cartesian thought the world is turned into *an effect—the representation*—of the self-conscious Subject. In Heidegger's language: with Descartes the "world" turned into a picture, a *Weltbild*, constituted in the mind of the abstract subject (Heidegger, 1977).

The consequence is that, in modernity, a self-conscious Subject treats things as objects (i.e., as entities to be known and used) with little or no regard for the way in which these things reveal themselves. Heidegger describes this modern attitude in different ways, yet at the heart is the Faustian desire for power and control. Mankind takes charge, subduing the earth, with science and technology as its tools of preference. Towards the end of his life, in the famous interview with the German magazine *DER SPIEGEL*, Heidegger maintained that the forces of technology held Being in a vise grip, and that only a "God can save us now" (Heidegger, 1976).

Yet, the modern subject is only a late stage in mankind's forgetfulness of the true essence of Being. The Western tradition forgot that Being gives itself as an event, as a present, as history, as fate, and that the essence of mankind ought to consist in taking note of this event as it gives itself. Thus, according to Heidegger, the entire history of Western philosophy is a history of a downfall, with the essence of mankind set adrift in an inauthentic, alienated (*Unheimische*) way of being (1971, p. 146). To counter this trend, Heidegger found ever new formulations to rearticulate the abstract approach of subject philosophy. One of these is concerned with the notions of space/dwelling/building.

II.

In his address "Building Dwelling Thinking" given in the 1950s at a conference in Darmstadt dedicated to the theme "Man and Space," Heidegger begins by advancing a decisively new approach to spatiality. The premise for his revision is that mankind finds itself always already in the world, embedded within a pre-existent reality which is part of itself and of which it is a part. In this view mankind, unlike the Subject in modern philosophy, is not set up against the world but makes sense of itself from within its world.

From this vantage point, Heidegger rejects the abstract view of spatiality as a three-dimensional container of human experiences in general. Meaningful human experience constitutes itself not in an abstract world of uniform dimensions and distances but rather in a concrete world of things—not objects qua representations in the Cartesian mind—as long as they are *genuine* ("if it is a true bridge," 1971, p. 153)—an important qualifier to which I will return. Before delving deeper into the nature of things and the notion of the fourfold, we will have to consider the relationship between spatiality and dwelling.

Heidegger's account of spatiality occurs in an essay whose primary focus is on *genuine* dwelling (*wohnen*) on this earth which, as we will see, represents a first step towards addressing the forgetfulness of Being. Since "Building Dwelling Thinking" originated as a presentation in a lecture series on "Man and Space," where dwelling was not directly fore-grounded, we would do well to inquire into the connection between space and dwelling. As it turns out, dwelling is crucial to Heidegger's conception of mankind's interaction with things which in turn is the foundation for his redefinition of spatiality.

In order to explain the connection between spatiality, dwelling, and things, Heidegger uses the example of the bridge: the bridge belongs to a particular subgroup of things, i.e., things that in order to come about need to be built (buildings, constructions of any kind). Things belonging to this group create, once they are built, sites, which in turn provide room for the fourfold to gather.

Gathering the fourfold—the dimensions of sky, earth, divinities and mortals—the bridge first creates a location. As a location, the bridge is also a focal point of the fourfold, and thus of meaningful human space; the location did not exist before the bridge was there. To be sure, from the point of view of abstract space, the river may have had many potential locations on the expanse of its banks but "the location comes into existence only by virtue of the bridge" (Heidegger, 1971, p. 159). This means that the abstract notion of space (in German: *Raum*) comes about only once it has been instantiated as specific location, as place, once room (*Raum*) has been made for it. Thus, the abstract notion of space is derivative of the concrete making of a place; put differently, the *origin* of the abstract notion (container) of space must be sought in the dwelling of things.

Let me comment on the crucial relation between space and location a bit more. Abstract thought makes near and far the result of the rational measuring of distance. The pejorative "mere" in the following quote shows Heidegger's intentions: in conceptual thought "nearness and remoteness […] become mere distance, mere intervals of intervening space" (1971, p. 155). For such a conception of space the bridge is nothing but a certain something defined by abstract coordinates. On a second level, these coordinates can be used to abstract height, length, and depth, from which we derive the notion of space as three-dimensional extension, which—in a third moment—leads to space as a store house of pure possibilities in the mathematical calculation of many-dimensional spaces. This geometrical and mathematical notion of absolute *space* does not have locations and places. Once having been abstracted from the dwelling of things, however, geometrical space can be applied indifferently to an infinite number of things in space. Location, on the other hand, provides a concrete site by making room for the fourfold, in two ways:

> It *admits* the fourfold and it *installs* the fourfold. The two—making room in the sense of admitting and in the sense of installing—belong together. As a double space-making the location is a shelter for the fourfold or, by the same token, a house. Things like such locations shelter or house men's lives. Things of this sort are housings, though not necessarily dwelling-houses in the narrower sense. (p. 158)

Mankind's building of things that shelter is performed as an activity that makes room for them by bringing locations into being. If mankind does it right (i.e., builds "dwelling houses in the narrower sense"), this activity occurs as a summons by the fourfold. In Heidegger's view, then, mankind is summoned to "save" the fourfold of sky, earth, divinities, and mortals into things that shelter, protect, and preserve the world. It seems that in terms of mankind's everyday existence, only the understanding of spatiality as concrete location can heed the summons of the fourfold and lead to the preservation of the world.

Seen from this vantage point, the philosophical concept of space had to be rearticulated because, as we saw, it is derivative of the concrete activity of making room for things. It is unable to account for

the way in which human beings dwell, much less how they ought to dwell, which is alluded to in the notion of the summons. Abstract space allows any and all kind of dwelling since it only conceives it in terms of three-dimensional arrangements in space. Heidegger's notion of dwelling, however, makes it possible to speak of how particular arrangements of space—locations of genuine building—respond more adequately to the summons of the fourfold than others.

In abstract space, it is impossible to imagine the dwelling of the fourfold. Abstract thought answers to one bottom line, and one bottom line only, namely the abstractions of the manifold of geometric space. The fourfold, on the other hand, has four bottom lines that need to be satisfied all at once. Alluding to the warm, mythical—at the very least metaphorical—realms of earth, gods, and divinities, rather than to cold, abstract reason, the fourfold allows us to build buildings that, as things themselves, let harmony and a sense of communion with the world around us occur. At the end of his essay, Heidegger refers to the traditional black forest farmhouse where dwelling occurs in spiritual harmony with nature, the seasons, and man's destiny, i.e. his mortality.

III.

As much as I value Heidegger's critique of the philosophical tradition in general and of abstract (absolute) space in particular for the insights it produces about the historicity of our conceptual vocabulary, I do part ways with him when it comes to the autochthonous alternatives to the Western philosophical tradition he recommends. The fourfold, in my view, represents such an alternative, and I will try to show why it is a problematic term for me.

I understand the fourfold as Heidegger's alternative to the philosophical concept of the Subject as described above. The fourfold replaces the hubris of human agency with mankind's realization that it always already participates in life's unfolding which—if supported by mankind—is able to treat the world and things within it with more respect. In the terms of Heidegger's essays on art and technology, the fourfold does not challenge things forth but rather lets things be. Heidegger here counters the idea of human agency with a more cosmic agency, human will with human responsiveness.

We are dealing here with a subject-less gathering of the fourfold as exemplified above in terms of the bridge. "The bridge *gathers* to

itself in *its own* way earth and sky, divinities and mortals" (Heidegger, 1971, p. 153). It is endowed with an agency all its own, or rather, it takes its directive from the fourfold, and human agency is minimal. Mankind participates in the advent of the fourfold by building the bridge, but it receives its inspiration from the fourfold.

> From the simple oneness in which earth and sky, divinities and mortals belong together, building *receives the directive* for its erecting of locations. Building *takes over* from the fourfold the standard for all the traversing and measuring of the spaces that in each case are provided for by the locations that have been founded. (p. 153)

As good as this may potentially sound, we must ask, I believe, a number of questions here. What does this approach enable? What does it mean to receive directives? What is occluded by this approach to human agency? In short, what kind of thinking animates this approach?

In my view, the proto-religious dimension here is all too obvious. The fourfold holds the structural place of an all-powerful agency that is in possession of the key to the beneficial progress of human history. Mankind's role, here, is an essentially passive one, active only to the extent that it may respond (or not) to the directives from beyond.

As we have seen, the framework for genuine human responsiveness is presented here in terms of earth, sky, divinities, and mortals. While these metaphorical signposts guaranteeing the integrity of the fourfold are fairly broad and can probably accommodate the majority of human aspirations, one does get the sense that a univocal, uncontested way to the improvement of human affairs is possible, even necessary. To wit: a way of letting things be, of living in harmony with the way things give themselves to us. While this attitude is no doubt beneficial as antidote to the subjective hubris of Faustian man, it harbors its own problems.

For one, it runs the danger of all revealed religion: to the extent that its narrative of the downfall of Faustian man is not viewed as interpretation but as universal History, there is no contest of opinions possible. In Heidegger's account of History, mankind is carried along by a supra-historical fate which, in late Heidegger, reveals its essence through language. Only through listening to the way in which fate speaks to us can mankind live up to the level of fate and accept it. Like

revealed religion, fate comes with the promise of salvation only if we heed its call.

This approach leaves little room for forms of dissent that might influence the direction of fate in positive terms. Contestation and dissent can only be viewed here as willful distortion of the fundamentally beneficial directives given by fate. In "Building Dwelling Thinking" the fourfold provides the beneficial framework within which mankind responds to fate. And this is as Heidegger wanted it: for in his view it was precisely the willful subject, erecting the world as object in its own image that lay at the root of the downfall of mankind.

Can we go so far in our critique of Faustian man as to assume, with Heidegger, a meditative stance that, assured of its beneficial effects, does away with contestation and dissent in the here and now? Can we overcome what Heidegger diagnosed as the modern malaise, the homelessness of mankind, by recommending his approach as a postmodern panacea?

I believe the answer is no. The notion of a beneficial fourfold giving directives to mankind that can be universally decoded does not represent a viable alternative to our modern predicaments which surely exist. One need look no further than to the issue of global warming, or to the depletion of the world's natural resources such as oil or water to appreciate the urgency of Heidegger's reflections. And yet, the proto-religious dimension of his thought is fraught with as many challenges for a secular society as any other religious system. This is not to dismiss Heidegger's critique of the philosophical tradition and of the hubris of the subject. As I suggested above, I believe on the contrary that there is much to be learned from his philosophical deconstruction. I would even go so far as to say that there is indeed a History taking shape beyond what mankind wants and intends, yet the shape of that History is not to be intuited in the here and now but only in hindsight, and both meditative listening and challenging action need to come together to run the affairs of this world.

Subject, then, or fourfold? I believe mankind cannot give up its world-making will to power. At the same time, there is no reason why the meditative listening (*Gelassenheit*) advocated by Heidegger cannot become an integral part of such world-making. But it will have to occur as the "listening" act of a subject, even if it is performed in a Heideggerian spirit of response. That is to say it will have to happen in

the subject's space of negotiation and dissent, of interpretation and compromise.

In reference to my title, I believe this analysis does not include the idea of a homeward turn—however it may be conceived. At the end of his essay, Heidegger picks up the linguistic and conceptual root word *heim* from the beginning of his essay (*das Unheimische* = the inauthentic) in the notion of man's homelessness (*Heimatlosigkeit*):

> The real dwelling plight lies in this, that mortals ever search anew for the nature of dwelling, that they *must ever learn to dwell.* What if man's homelessness consisted in this, that man still does not even think of the *real* plight of dwelling as *the* plight? Yet as soon as man *gives thought* to this homelessness, it is a misery no longer. Rightly considered and kept well in mind, it is the sole summons that *calls* mortals into their dwelling. (Heidegger, 1971, p. 161)

IV.

It is certainly true that one can extricate Heidegger from an autochthonous reading here, a reading that would put him in a corner with those advocating a return to the land of the fathers. But there is no denying that Heidegger insists here on the root metaphor *heim* and mankind's distance from such a state of at-home-ness. This thought of home represents the proto-religious dimension which, in my view, is problematic in the contemporary world for the reasons outlined above.

On the other hand, we can hear—we probably ought to hear—the summons of which Heidegger is speaking. Yet this summons does not call us *home* because we were never really *homeless*. The response demanded by the summons is thus not a turn towards home but rather a call to activate other dimensions of our human response-ability, more respectful ways of dwelling. In this sense, the multiple bottom lines of the fourfold can act as a metaphor of the meditative tasks of mankind in the future.

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Making the City Inhabitable: London's Sewer System[1]

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In the middle of the nineteenth century London was the world's most populous city and the capital of the great British Empire. It also was a metropolis beset by critical problems, wherein millions of residents wallowed in the city's own sewage and tens of thousands died of cholera. Finally, the nauseating experience of the Great Stink incited certain persons to cleanse the city of its deadly filth. This article tells the story of how London became mired in its own excrement and how Sir Joseph Bazalgette and Dr. John Snow saved the city from choking on it.

Introduction

In June 1858 London was a very prominent city with an illustrious history and in many ways the world's center. As the capital of Britain, it was also the center of the world's largest empire that spread across five continents. It was in 1858 that the Indian mutineers surrendered to British forces, with much of the rebellion suppressed by June, so that Britain was able to establish its Raj in India (James, 1997, pp. 268-274). Moreover, as the capital of Britain, London was part of the country's phenomenal industrial power and, as recently as 1851, had

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[1] I made a conference presentation of this topic, entitled "Making the City Inhabitable: the London under London," at the Humanities and Technology Association Conference in New York City on 8 October 2006.

hosted the Great Exhibition which had showcased British leadership in manufacturing. It was during the 1850s that Britain became "the workshop of the world" (Thomson, 1950/1975, p. 138), and in 1861 the country produced 19.9% of the world's goods (Blanning, 2000, p.122). At mid century, Britain was still the world's shipper and thousands of ships each year still docked in London. London was also the financial center of the world and its banks provided capital for numerous projects, whether it was railroad building in the United States or the construction of a rail line across India. At Westminster stood the majestic Houses of Parliament, only recently rebuilt on the Thames River, and, since 1832, these Gothic edifices housed the reformed parliament that increasingly served as the model of constitutional governance in the world.

In many of the aforementioned conditions Britons, especially those in London, could take pride. However, there was one matter that Britons, especially those in London, found no pride but only disgust and that was the condition of the Thames River which flowed through London just before it emptied into the North Sea. In the middle of June 1858, after weeks of hot and oppressively heavy weather, the metropolitan area of London was overwhelmed by a stifling stench that wafted from the vile waters of the Thames. The middle of June 1858, when Londoners nearly choked on their own excrement, has become known in history books as *The Great Stink*. But, what caused the Thames River to become a flowing cesspool, when, at the beginning of the nineteenth century, it was a relatively clean river about which some Londoners rejoiced. This article, which was originally presented as a conference paper at the Humanities and Technology Conference in October 2006, answers that question and discusses the sewer system that provided the solution to Londoners' nauseating problem. In the narrative of this story two men stand out prominently: Sir Joseph Bazalgette and Dr. John Snow. These men spared the residents of the metropolis from the scourge of cholera as well as contributed significantly to public sanitation. The story of the Herculean effort that cleaned the city and saved Londoners from wallowing in their own excrement is, not only exciting, but may even contain a moral triumph whereby the public welfare was served by dedicated and determined heroes. The account begins in June 1858.

The Great Stink

June opened with a succession of stifling hot days. Typical midday temperatures, as reported in *The Times*, were eighty-nine or ninety degrees Fahrenheit in the shade. The noon temperature in the shade for June 15, as recorded by the Meteorological Report at the High Field-House Observatory, was 91.2 degrees (*The Times,* 1858, June 18, p. 9). During the many days of oppressively hot weather *The Times* regularly printed letters about the weather. Some would merely consist of a list of temperatures in the shade at four or six hour intervals during a given day. Others, such as the one submitted by William Odling, made a connection between a heavy summer atmosphere and the river stench. Quoting himself from a report he had written in March, Odling, a British chemist, made the following observation: "It must be admitted that the condition of the Thames during hot weather is most objectionable and that some means for remedying this condition are imperatively called for. The ensuing summer will probably convince the most skeptical of doing something" (*The Times,* 1858, June 16, p. 7). In a letter printed the previous day, W.J. Hall claimed to have seen passengers on paddle steamers cruising on the river and dockworkers along the Thames bent over and "vomiting." Hall believed that the river's "poisonous liquid" was foul enough "to shorten the lives of those who inhale it" (*The Times,* 1858, June 15, p. 5).

During the third week of June *The Times* published articles by its correspondents making the same connection between a heavy summer atmosphere and the river stench while also developing the topic further. On June 17 the river is affectionately referred to by *The Times* as "Old Father Tames" and is dubbed "the uncleanest, foulest river in the known world." After the name-calling, the correspondent provides an explanation for the sickening stench. Nearly anywhere on the river, according to the correspondent, one can find at low tide "a hundred sewers disgorging solid filth, a hundred chimneys vomiting smoke, and strange, indescribable, sickening vapours; a hundred broad acres of unnatural, slimy, chymical compost, a hundred paddlewheels stirring up mud (*The Times,* 1858, June 17, p. 8). Since London is situated on the Thames so close to the sea, the river experiences high tides and low tides. Instead of the sewage, especially that dumped at low tide, flowing out to the sea, during the first half of the nineteenth century,

the liquid sludge was continuously "oscillating up and down the river" (Halladay, 1999/2003, p. 5). During the long, hot days of June 1858 solid deposits were left to bake under the sun as the water receded during low tide. The stink became so overpowering on June 17, according to *The Times* correspondent, that MPs "were instantaneously driven to retreat, each man with a handkerchief to his nose (*The Times,* 1858, June 18, p. 9). Regarding the odorous assault at Westminster, the article's tone is one of glee because the people's national representatives had dithered too long as the crisis worsened. The writer asks the newspaper's readers to "suppose cholera…should come upon us during the heats of summer or autumn" (*The Times,* 1858, June 18, p. 9). In closing, the correspondent wishes the people's representatives in Parliament to "be confined in a river steamer and compelled to ply, without intermission, between London and Vauxhall bridges until they have agreed upon a plan" (*The Times,* 1858, June 18, p. 9). The plan to which the article refers was a sewer system that had been under discussion by Parliament, as well as by the Board of Health and the Metropolitan Commissioners, for nearly a decade. The Great Stink of June 1858 had followed three outbreaks of cholera during the previous twenty-five years, and some astute persons had connected the epidemics to the state of the water in the river. By mid century, then, the Thames had created a crisis for Londoners that could no longer be avoided.

The Growth of London

This crisis had been building during the first half of the nineteenth century as London expanded from a large city to an even larger metropolitan area of many districts set on both sides of the Thames River. Strictly speaking, London—often phrased as The City or The City of London—referred and still refers to the area once set within the walls of a moderately sized medieval town. Already by the Tudor-Stuart Period the urban environment had extended beyond the walls and was now on both sides of the river. During the seventeenth century of the late Stuart Period, the administrative center of Westminster had become incorporated as a western suburb of a greater London as residences expanded westward around the bend of the Thames on the north side of the river. Less than a hundred years later London with its many suburbs was the most populous city in Europe and at the opening

of the nineteenth century it was the largest city in the world. Between 1801 and 1861 the population of London and the metropolitan area tripled. (Officially, the term *Metropolitan* is used to refer to old medieval London and its many suburbs, and officially the term *The City* refers only to what was once old medieval London within the town walls. In this article I will use the following terms to refer to the entire urban area set on the Thames' estuary in the nineteenth century: London, metropolitan, metropolis, and the city.) In 1801 the census recorded 958,863 persons in London, but by 1861 the number had risen to 3,222,717 (Inwood, 1998, p. 411 and "Water Supply," 1866, p. 397). During the twenty-year period of 1841 to 1861, the time of the Great Stink, London's population had increased by 614,000 (Inwood, 1998, p. 412).

A series of maps in *London: The Biography of a City* illustrate the city's growth, especially the rapid and tremendous expansion during the nineteenth century (Hibbert, 1969/1987, pp. 32, 53, and 198). By the middle of the nineteenth century London already encompassed, or was in the process of incorporating, the following distant suburbs: Islington, West Ham, and Kensington on the north side of the river and Tooting, Herne Hill, and Deptford on the south. The distance from the Tower of London, which is on the northern banks of the Thames, to Islington is almost four miles, and across the river from the Tower to Herne Hill the distance is another four miles. Before the century ended, London extended far beyond these places; clearly, London was no longer a walking city. By 1861 the metropolitan area comprised 224.5 square miles ("The Water-Supply of London," 1869, p. 449). Areas that had been countryside with ponds and farms at the beginning of the nineteenth century, like Hampstead to the north and Norwood to the south, became paved-over parishes within London by the middle of that century. Hampstead became a middle class suburb with some of the country preserved in parks, but Norwood became an industrial district (Inwood, 1998, pp. 507, 579, and 580). By the time of the Great Stink the vast metropolitan area had become a city divorced from the countryside of fresh air, farming, and clean-running streams where men could leisurely fish and women would dip their pails.

Increased Water Use in an Expanding London

As London increased both in size and in numbers so did the use of water by the residents. Two articles on London's water supply, published during the 1860s, state that at least 100,000,000 gallons were consumed daily ("The Water-Supply of London," 1869, p. 449 and "Water Supply," 1866, p. 389). During the 1850s the city's water consumption increased dramatically, from 43.3 million gallons in 1850 to 80.8 million in 1856 (Halladay, 1999/2003, p. 43). Increased water usage was due to a reason other than the ever-expanding population. Since the late eighteenth century the flushed toilet, especially the one manufactured by Thomas Crapper with the S-bend to trap gases and prevent them pervading the house, became very popular with well-to-do Londoners (Trench and Hillman, 1984/1993, pp. 64 – 65). Prosperous middle class persons abandoned the seat in the outhouse for the convenience of the toilet in the home. In 1815 municipal laws allowed households to connect directly to the sewers. For those who could afford it, the pipeline to some sewer in the city replaced the cesspit in the backyard. So then, while the toilets kept one's house and property clean, the flushed contents from the toilets that the sewers dropped into the Thames polluted the river (Halladay, 1999/2003, p. 46).

Before London had swelled into Dickens' city-- the brick-filled one consisting of smoke, soot, slime, and sewage--the residents were able to interact more directly and often beneficially with the surrounding natural environment. First, instead of flushing their own waste into the Thames along with the increasingly larger quantities of industrial and slaughterhouse wastes dumped into the river, people would sell the contents of the cesspits to small-scale entrepreneurs called "night soil men" (Halladay, 1999/2003, p. 29; see also Trench and Hillman, 1984/1993, p. 65). As late as 1800, men could push cartloads of human dung to the outskirts of the city's nearby rural regions to be sold as fertilizer to farmers. As London became larger and the countryside receded, this enterprise disappeared. Moreover, the sale of guano, which is dry bird and bat dung, as fertilizer depressed the "night soil" business. As a result, many London cesspits were left unshoveled and overflowed. Secondly, the many fewer persons living in the Thames River valley could easily and safely take water from the many smaller rivers that flowed into the larger Thames before it flowed

to the sea. A map in *The Great Stink of London: Sir Joseph Bazalgette and the Cleansing of the Victorian Metropolis* shows the many streams, such as the Lea and the Fleet on the north side and the Ravensbourne and the Falcon on the south side, which flow into the Thames (Halladay, 1999/2003, p. 27).   Still, during the first part of the nineteenth century these brooks and streams were open and fairly clean, but, as the metropolitan area mushroomed, these smaller rivers became covered over sewers because more and more persons dumped their refuse into them. Two and three story lodgings would be built over the hidden stream that had become a sewer for the overcrowded occupants, such as the one at Fish Lane in Holborn (Trench and Hillman, 1984/1993, p. 67).

Cholera Epidemics

During the years that London continuously expanded into a mammoth megalopolis, the city was attacked four times by cholera. The number of recorded deaths in London for the given years are as follows: 6536 in 1831 – 32; 14,137 in 1848 – 49; 10,738 in 1853 – 54; and 5596 in 1866 (Halladay, 1999/2003, p. 124). Before the nineteenth century cholera was an unknown disease in Europe and, since it seemed to be confined to India, Europeans, except for the British who governed much of the subcontinent, knew little about it. Then, in 1817, an epidemic, which had begun in India and had for a time been transported by a British army, began its march westward across central Asia and into Europe. When the disease had reached the major cities of Russia in 1830, shock waves of alarm rolled across Europe. In a year's time cholera appeared along the Baltic coast, in central Europe, and in Germany. By 1832 cholera had hit the western states in Europe and had even crossed the Atlantic Ocean to the United States (Hays, 1998/2003, pp. 135 – 136). It was in late 1831 that cholera reached Britain, first in Newcastle and shortly thereafter in London. When cholera struck the city in 1831 and then again three more times during subsequent years, the horrifying record of the disease's death toll became part of London's story of uncontrolled swelling sewage.

Like the Black Death of the fourteenth century, nineteenth century cholera caused pandemonium as well as death wherever it struck. While the total number of victims is much less than that caused by the medieval bubonic plague, cholera struck fear because of the horrifying

manner in which it killed and the inexplicable abruptness of its attack. A person who was alive and even healthy in the morning would be suddenly dead by nightfall after having undergone excruciating distress. Characteristic of the attacks were constant excretions of "a liquid like rice-water" from the mouth and the anus. After a time of cramps and convulsions the person soon approached a horrifying unconsciousness wherein "the eyes sink" and the whole body became "a leaden blue, purple, black or deep brown." Further, "the fingers and toes are reduced at least a third in thickness." During hours of agony the victim "struggles for breath, asks only for water." If blood were taken from the patient by a doctor, it would appear very thick and black. Finally, "towards the close of this scene, the respiration becomes very slow…and [the victim] dies quietly after a long convulsive sob or two (Hempel, 2007, p. 33). During cholera's first visitation in London, as well as throughout the rest of Britain, there seemed to be nothing effective that anyone, including doctors, could do. Cholera victims were bled with leeches; administered enemas; fed pills, sometimes containing mercury; and burned with hot plasters in the stomach area, none of which cured but all of which did add to the agony of the suffering person (Hempel, 2007 pp. 42 – 47). Sometimes quarantines were set up, especially in ports, in order to prevent the disease from entering the city by a ship's crew or cargo that had sailed from an infected locale or within the city to protect persons unaffected by cholera from those who were already dying of the disease.

As abruptly as the disease had appeared in Britain in late autumn 1831, it just as suddenly disappeared in autumn 1832. Cholera had only devastated London during the late winter and spring of 1832. During this time little progress seemed to have been made because, according to the writer in the *Quarterly Review*, "one-half of the inhabitants of London [did] not know how the other half live. With equal truth it may be said they know not how they die" ("Sanitary Reform in the Metropolis," 1865, p. 255). During the 1830s and the 1840s doctors, governmental administrators, and volunteers struggling against the epidemics discovered the filthy lives and the gruesome deaths of London's lower classes. Continuing with his opening in the article, the writer asserts: "The appearance of cholera in this country in 1831 gave probably the first impetus of any consequence to sanitary researches. Scared by the appearance of the pestilence, persons of ordinary education began to think that after all there might be some

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worse effect from an overflowing cesspool than an undesirable odour" ("Sanitary Reform in the Metropolis," 1865, p. 255). Starting in the 1840s, a public health movement began in London and this campaign peaked during the 1850s and 1860s.

The Discovery of Cholera in Polluted Water

Foremost among the advocates of sanitation during this time was Edwin Chadwick who began his public career prominently as the secretary of the Poor Law Commission. During the 1830s and 1840s he gathered evidence from London's lower class districts that he published in reports to demonstrate the connection among pauperism, filth, and disease. Chadwick's most famous report and the one that became the most influential in the campaign against filth is *Inquiry into the Sanitary Condition of the Labouring Population of Great Britain,* which was published in 1842. The report's circulation in London and elsewhere in Britain was widespread and at the time it outsold popular novels (Hays, 1998/2003, pp. 144 – 145 and Inwood, 1998, pp. 422 – 424). As a strong advocate of the miasma theory, which hypothesizes that disease is spread by breathing the foul odors that waft from filth, Chadwick was dismayed that so much squalor was allowed to exist in the poorer districts. Believing that "the evil of sending refuse down into the Thames was utterly inconsiderable compared with the evil of keeping accumulations of noxious matter in densely inhabited localities," Chadwick wanted the city cleaned up (Hempel, 2007, p. 160). The cleansing process would include the closing of overflowing cesspits and the forced flushing of the clogged sewers into the river. In 1848, as the key member of the newly formed Metropolitan Commission of Sewers, he got his chance. During cholera's second visitation in London, Chadwick flushed the sewers. "From March to May then, 29,000 cubic yards of filth were deposited in the river, followed by a further 80,000 cubic yards from September to the following February" (Hempel, 2007, p. 160). The effect of Chadwick's well-meaning action to terminate the squalor wherein the city's lower classes were "floundering in their own excrement" was to transform the Thames rapidly into an open sewer (Hempel, 2007, p. 160). Even though Chadwick was removed from the commission, the sewage dumping continued year after year until by the middle of the 1850s complaints about the Thames in *The Times,* especially during hot

weather, were constant. In 1855 the famous English scientist, Michael Faraday, wrote to the newspaper because he believed he had a "duty to record these facts." Faraday's facts consisted of the key parts of his trip upriver on the Thames. At each dock along the way he dropped a piece of white paper into the water and, "when the pieces fell edgeways the lower part was hidden from sight before the upper part was under water (*The Times*, 1855, July 9, p. 8). Ominously, it was from this black water that a few of London's eight water companies still pumped for their customers' personal use.

At the same time that Edwin Chadwick sought to use the Thames to save London from its own excrement, Dr. John Snow began the systematic investigation of befouled water as the source of certain diseases, in particular, cholera. Snow conducted two significant investigations of cholera in London during the summer of 1854, which was part of the third epidemic in Britain. A year later his report was published as the medically and historically important *On the Mode of Communication of Cholera.*

Snow was not born in London but in York, which is considerably north of London and is the county where cholera first entered Britain in 1831. During that epidemic Snow had his first encounter with cholera while he was a young medical apprentice. Years later, after he had established himself as a successful anesthesiologist in London, he would encounter the dread disease again. The terrible outbreaks of cholera in the city provided the occasions for the quiet and unassuming doctor to study the course of the disease and to postulate its cause.

The third outbreak of cholera in London, which occurred in 1853 and in 1854, hit both sides of the Thames River. The epidemic struck first on the south side of the river in July 1854 from Battersea in the west to Rotherhithe in the east. For those residences and businesses that received pumped water in this part of London during the mid nineteenth century, the source was either the Lambeth Water Company or the Southwark & Vauxhall Water Company. In certain parishes of this part of London the two companies serviced many of the same streets with pipes from each company running side by side along a thoroughfare. So then, since it would be by the owner's preference which company's pipes entered a given residence, pumped water from Lambeth could be next door to that from Southwark & Vauxhall. During the second epidemic in 1848 – 49 both companies drew their water from a tidal area of the Thames near Battersea Bridge so that

much of the sewage dumped into the river at low tide did not flow downstream. Since those years and before the outbreak of the third epidemic in 1853 – 54, Lambeth had moved its operation upriver to Ditton where the river was neither tidal nor polluted. However, Southwark & Vauxhall remained at Battersea and continued to pump "perhaps the filthiest stuff ever drunk by a civilized community" ("Water Supply," 1866, p. 406 and see Inwood, 1998, p. 431).

Soon after cholera struck the south side of the Thames in July 1854, Snow began his own personal investigation--what is now called the Grand Experiment--by going house to house to determine who received water from which company. In the areas affected by cholera were 300,000 persons "of every rank and station, from gentlefolk down to the very poor" with the key difference for his study being their source of pumped water. Strongly believing that the miasma theory was wrong, Snow wanted to show the consequences of "one group being supplied with water containing the sewage of London, and amongst it, whatever might have come from the cholera patients" and of "the other group having water quite free from impurity" (Snow, 1936, p. 75). The data that Snow compiled were convincingly strong in support of his hypothesis that cholera is primarily spread by drinking feces-contaminated water. According to Snow's tabulations, during the first four weeks of the epidemic "cholera was therefore fourteen times as fatal…amongst persons having the impure water of the Southwark & Vauxhall Company, as amongst those having the purer water from Thames Ditton" (Snow, 1936, p. 80). During the second epidemic, when both companies had pumped their water from the same polluted stretch of the river at Battersea, he found no significant difference in the statistics of the two groups of cholera victims in this infected area of the city.

Even before he had time to write his report for publication, another outbreak of the disease hit London. This time it struck north of the river in Saint James' Parish, near to Snow's residence in Soho Square. So, the doctor temporarily abandoned work on his report of the cholera outbreak south of the river in order to investigate the one north of it. On the hot night of August 31 cholera began to devastate an area consisting of just a few blocks near Golden Square. A few days later Snow arrived to track the locations of the victims. As he located the victims' residences, he drew a detailed map, which quickly showed him that the overwhelming majority of victims resided within

the vicinity of the Broad Street pump. As early as September 3, "I suspected some contamination of the water of the much-frequented street-pump in Broad Street" (Snow, 1936, p. 39). Next, Snow made a check of the victims who had died on August 31 and during the few days thereafter as to whether or not they had imbibed water from the suspected pump. Again and again, his inquiries produced an affirmative. On September 7 at a meeting of the parish board of Saint James' Parish Snow convinced the members to turn off the Broad Street pump (Snow, 1936, p. 40). Further examinations seemed to confirm his hypothesis that contaminated water pumped from Broad Street was the source of cholera. An excavation of the ground showed that some of the sewer line from the house at 40 Broad Street had crumbled. At this residence, which was adjacent to the pump, a man and a girl had died of cholera. A subsequent inquiry made by the parish priest discovered that Sarah Lewis had washed the soiled clothes of her husband and her daughter in water that had drained into the damaged sewer, which most likely was the source of cholera in the pump's water (Hempel, 2007, pp. 232 – 234). After Snow's death in 1858, the satirical journal *Fun* published a drawing in 1860 that commemorated the doctor's work. The drawing shows the skeletal figure of Death holding the handle and pumping the deadly water to people, including many children who often were the water carriers for families (Halladay, 1999/2003, p. 131).

Time for Reform in London Sanitation

Snow's work did not immediately convince many during his lifetime that his hypothesis was correct and many devout advocates of the miasma theory still resolutely propounded that filth causes disease. Edwin Chadwick and Florence Nightingale adhered to miasmatism until they expired: Chadwick died in 1890 and Nightingale in 1910 (Hempel, 2007, p, 278). However, by the late 1850s enough Londoners had become strongly convinced that, whether the Thames killed because of its stink or because of its contaminated water, the river must be cleansed. A lengthy article, printed in the *Quarterly Review* in 1865, provides a history of the reforms in London sanitation that had been accomplished since the mid 1840s ("Sanitary Reform in the Metropolis," 1865). Of particular note in the article is the work of the Metropolitan Board of Works that Parliament had authorized with

the Metropolis Local Management Act of 1855. The Board shut down numerous cesspits and cleared out clogged drainage in the city. Both, especially the sewers, had been places where persons called "Toshers" had gained a living by sifting through sludge for something of value ("Sanitary Reform in the Metropolis," 1865, pp. 268 – 268 and Trench and Hillman, 1984/1993, p. 66). Of course, their work and their place of work contributed to the spread of disease. Despite the writer's optimistic tone, it is still apparent in the article's content that not much had been accomplished during these years to cleanse the river because at the time of the publication the sewer system was still under construction. Part of the problem was that the Metropolitan Board of Works was only one department among many that made claims to some kind of authority in the metropolitan area. The Board's authority was circumscribed by the claims of authority made by vestry officials at the local level and MPs at the national level. For example, the Board had to make special appeals to Parliament for expenditures over £50,000. The many different authorities, each acting as if it were absolute in its small area of jurisdiction, made the accomplishment of a large task for the whole metropolitan area very difficult. *The Times* expressed the nature of the problem with the following pungent words: "There is no such place as London, at all, the huge city passing under this title being rent into an infinity of divisions, districts, and areas, each with its own jurisdictions, its own officers, and its own proper rates." As an example, *The Times* cited two lighting companies and two water companies operating on the same street (*The Times,* 1855, March 18, p. 9).

In the middle of July 1858, one month after the Great Stink and three years after *The Times'* criticism that multiple authorities hindered the work of public sanitation, the government acted. On July 15 Chancellor of the Exchequer Benjamin Disraeli introduced legislation in the House of Commons whereby Parliament would amend the Metropolis Local Management Act, thereby, giving the Metropolitan Board of Works the authority and the funding to carry out the project that the Board's own engineer had already devised. In Commons Disraeli asserted that "the purification of the river Thames" was necessary "to terminate a state of affairs so unsatisfactory and fraught with so much danger to the public health." While the Chancellor agreed that the Board had, thus far, failed to carry out "great and important duties," he added that the government had not delegated it

the appropriate authority. He insisted that the amending legislation would compensate for that shortcoming by repealing all vetoes of the Board's authority held by local government and by parliamentary government. To finance the project the amendment assigned "a special rate on the inhabitants of the Metropolis" that would be collected over forty years (*Parliamentary Debates,* 13 June – 2 August 1858, col. 1508 – 1515). On August 2 Parliament passed the Metropolis Local Management Amendment Act, which was only six weeks after the Great Stink.

Sir Joseph Bazalgette was the engineer in charge of the project that would cleanse the Thames River. One of his biographers, John Doxat, asserts that, although Bazalgette is not as well remembered today as Edwin Chadwick or Florence Nightingale, the sanitation engineer "probably did more good, and saved more lives, than any single Victorian public official" (Halladay, 1999/2003, p.5). Born in Enfield, a market town north of London, in 1819, Bazalgette received a private education and, at the age of seventeen, he began to work in John MacNeill's engineering firm. Under MacNeill's tutelage, he worked on land drainage and reclamation projects; these would later prepare him for his work on the Thames River. By working in London, he had become familiar with the great engineers of the day like Robert Stephenson, who sat in Parliament, and with the city's sanitation problems. During the next decade, after the government had set up the Metropolitan Board of Works in 1855, such knowledge became useful in the furtherance of his career (Halladay, 1999/2003, pp. 9 – 10). With the support of London's prominent engineers, Bazalgette received the Board's appointment as chief engineer in 1856. During the first two years of Bazalgette's appointment as chief engineer, Board members fought amongst themselves, individually, as well as, collectively, against the vestry authorities regarding what the solution to London's sanitary problem should be, who would pay for the project, and who should be in control of the project. During this time of wrangling, Bazalgette developed his plan (Halladay, 1999/2003, pp. 65 – 67). Once Parliament's amending legislation had empowered the Board of Metropolitan Works with money and authority, the chief engineer commenced work early in 1859.

The Great London Drainage Project

Bazalgette's plan for the drainage of London and the purification of the city's river involved a system of intersecting sewers. The purpose of these sewers was to intersect—hence, the use of the term—all other existing sewers in the metropolitan area so that no sewer could slip its filth into the Thames as it flowed through the city. Rather, the five intersecting sewer lines would take all discharges from all other sewers and carry the contents along the river in order to dump the sludge into the Thames south of the city. Such dumping places would be beyond residential districts. Three of the intersecting lines would be constructed north of the river and the other two would be built on the south side. The lines north of Thames would link together at Barking, which is below the city limits, where an immense outfall would be constructed to hold the sewage for dumping as the tide turned to flow out to the sea. Bazalgette proposed a similar arrangement for the two intersecting sewer lines south of the Thames that would link at the Crossness outfall, which is even further below London than Barking is. Across two pages of *The Great Stink of London: Sir Joseph Bazalgette and the Cleansing of the Victorian Metropolis*, the author provides a detailed map that clearly shows how the intersecting sewer system would work (Halladay, 1999/2003, pp. 80 – 81).

Among the amazing engineering feats of the project were the two pumping stations, located on each side of the river. Since the metropolis is set in a river valley located in southeast England just before the Thames empties into the sea, London's terrain is at varying elevations. The effect of the city's contour meant that the sewer lines would be built at different levels. The lines closest to the river would be much lower than those further away, especially the third one running along the outskirts of London's most recent urban expansion on the north side. In order for the sewage in the lines on each side of the Thames to be collected *enmasse* for deposit at each outfall, the sewage from the lower lines would have to be pumped up to the more elevated lines prior to reaching Barking and Crossness. To solve this problem, Bazalgette's plan proposed a pumping station at Abbey Mills on the north side of the river and another at Deptford on the south side. Inside each station huge steam engines—eight of them at Abbey Mills and four at Deptford—labored to raise the city's excrement about twenty feet from the lower level lines to the higher ones. Unless he

had been informed, a visitor to the pumping stations, especially the one at Abbey Mills with its "Venetian Gothic" exterior, would not know that the magnificent edifices had been built as part of a sanitation project (Trench and Hillman, 1984/1993, pp. 74 – 75).

The construction of the intersecting sewer system was big news in the metropolis. During the six years of the project, from 1859 to 1865, the *Illustrated London News* reported many times on the job's progress. Already in November 1861, before the work had even reached the halfway point, the newspaper printed a story with eleven illustrations highlighting the developments along both sides of the river ("London Main Drainage," 1861, November 30, pp. 551 – 556). The article recalls nostalgically "when forty years ago good salmon were taken in the upper reaches of the Thames" and "a thriving community of fishermen resided there in those picturesque old streets about the Archbishop's Palace." The correspondent concludes this introduction with the hope that "in the course of two years or thereabout" the river may "assume its original character." If salmon cannot once again be caught in the river, the correspondent expects London's main drainage project to restore the Thames as "a clear, wholesome stream, attractive for its natural beauties and adding to the healthiness of the metropolis generally" ("London Main Drainage," 1861, November 30, p. 551).

After describing Bazalgette's plan, the correspondent relates certain feats of the project. The construction of the outfalls was impressive and the correspondent devotes seven paragraphs in the article to depicting the work at Barking and explaining how this outfall would operate. Since the gigantic outfall was designed to hold seven million cubic feet of sewage daily, the excavated area had to be securely lined so none of the filth seeped into the ground because such seepage might work its way into local streams or underground springs used as the sources of wells. The excavations were in the form of five tunnels, twenty feet deep and a hundred feet wide and five miles in length, and the contours of these tunnels were lined with Portland cement. The inverts to hold the sewage were then set on top of the cemented half tunnels that had been built into the excavated earth. To prevent noxious gases from escaping the sewage as it oozes at the outfall before the daily dumping, the top of the u-shaped tunnels would be bricked over and covered with soil. Discharge of sewage into the river would occur through pipelines that extended from the outfall to the bottom of the Thames nearly at the center point of the river's

breadth. The outlets into the river would only be opened at high tide, and "it is expected that the sewage water so discharged will be swept away into salt water before the tide has entirely ebbed" ("London Main Drainage," 1861, November 30, p. 556).

Another impressive feature of the project is the embankments that Bazalgette built along the Thames in the central part of the London. The three embankments—Victoria, Albert, and Chelsea—are imposing and visually pleasing to the onlooker's eye, but, besides providing for beauty at the river's edge through parks and gardens, Basalgette's proposed embankments would serve a function. By reclaiming land beyond the river's edge, the embankments would narrow the river and, thus, speed up the flow of the Thames as it passed through central London. A faster flowing river, the Board hoped, would produce a "scouring" effect that would keep the water clean (Halladay, 1999/2003, p. 148). Further, a Thames with high wall embankments would prevent the tidal overflowing of riverbanks that left behind deposits of mud and, at mid century, stinking sludge.

The effects of the embankments transformed the appearance of the Thames River in central London from the city of Dickens, which had daily mud baths at low tide, to the city of Bazalgette with attractive gardens along high wall embankments, which can be seen in nearly any contemporary photograph of downtown London along the Thames as well as be viewed in the river scene of the 1948 British production of *Oliver Twist*. The Victoria Embankment, which is on the north side of the river with the three intercepting sewer lines, would provide the additional function of serving as the landfill for the lowest level sewer that would be built within the embankment and run parallel to the river (*The Times,* 1891, March 16, p. 4). Eventually, this very large embankment would house London's first underground railway; would provide five landings for river steamers; and would hold pipes to carry gas, water, and electricity (Halladay, 1999/2003, p. 160).

The final project, including the embankments, all of which were completed by 1874, cost more than what had been anticipated in 1858. To complete the embankments an additional £1,284,000 was added to the original £3,000,000 that Disraeli had proposed for the project during the summer of the Great Stink (Inwood, 1998, p. 554). When completed, the drainage system contained "100 miles of Bazalgette's interceptory sewers, built between 1859 and 1865, carrying off the contents of some 450 miles of main sewers, which are themselves fed

by some 13,000 miles of smaller local sewers" (Trench and Hillman, 1984/1993, p. 72). Many miles of the local sewers reach back in time to the Tudor Period when the monarchs commanded that open streams carrying sewage should be covered over, repaired, and cleaned out (Trench and Hillman, 1984/1993, p. 60). From the sixteenth century to the nineteenth century the people, often without reference to local governance or to Parliament, had made their own local sewers or turned streams into sewers. Often, parts of, or even entire, streams that fed into the Thames had been covered over to become more mileage in a complex and confusing maze of sewage disposal in the ever expanding London.

Bazalgette's accomplishment was to ensure that the local sewers, without clogging, led to the main sewers. These sewers were prevented from dumping directly into the Thames, as they had been during the first half of the nineteenth century, and were diverted to the newly constructed one hundred miles of intercepting sewers. To ensure that the intercepting sewers could carry all the sludge from the main ones, the intercepting lines expanded from approximately four feet in diameter to approximately nine feet in diameter. Also, to ensure that the lines would not clog so that London's sludge would daily reach the outfalls, the sewers dropped, sometimes, as much as four feet per mile (Halladay, 1999/2003, pp. 79 and 87). While between 1890 and 1913 three more intercepting lines were built along the Thames, the system that Bazalgette had constructed between 1859 and 1865 is still essentially the same today as it was at the middle of the nineteenth century.

Such a stupendous undertaking required massive amounts of materials. According to Bazalgette's report to the Metropolitan Board of Works in 1861, the project would require that 3,500,000 cubic yards of earth be excavated. To construct the 100 miles of sewers as well as the embankments, the workmen would use 880,000 cubic yards of concrete, much of it the top quality Portland cement, and 318,000,000 bricks (Halladay, 1999/2003, p. 84 and Trench and Hillman, 1984/1993, pp. 72 and 76). As duly noted in the *Illustrated London News,* the hundreds of millions of bricks had to be "laid with the greatest of care and accuracy" because problems located as deep as twenty feet below ground level could not be as easily fixed as making a repair on a brick building located on a street ("London Main Drainage," 1861, p. 555). Moreover, knowledge of a problem below

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the surface might not be discovered until it had become a major disaster. Finally, the brickwork had to be carefully done because the interior of the intercepting sewers was to ensure the free flow of liquid sludge. Bazalgette designed egg-shaped sewers with the narrow end pointing down so that during low levels of water the flow of sludge would be tight and fast moving and during high levels, as in a storm, the shape of the sewer opened to accept a greater volume of sludge.

Despite the admirable work performed by Joseph Bazalgette, for which he was awarded a knighthood in 1874, justifiable criticisms surfaced regarding the metropolitan main drainage system. Bazalgette's system of intercepting sewers had merely shifted London's daily excretion of 180,000,000 gallons of filth from the central districts to a stretch of the river slightly below the city (*The Times,* 1891, March 16, p. 4). First, concerns and, later, complaints were made that the Thames in the area of the outfalls had become dangerously polluted. *The Times* recorded a tragic incident that had occurred on 3 September 1878 when a collision between a freighter and a pleasure steamer caused the latter ship to sink. Since the accident happened near the outfalls during the time of discharge, some critics believed that the many fatalities were because of the filthy water. A chemist, who made a report for the Woolwich Board of Health, was quoted in *The Times* as stating, "It would not be right to say that [the passengers] were absolutely poisoned by the water they imbibed, but the intolerable nauseous smell, accompanied by an equally nauseous taste, may have produced sudden vomiting" (*The Times,* 1878, October 24, p. 7). During the mid 1880s *The Times* ran articles asserting a new great stink and this one, according to the newspaper, existed at Barking and Crossness, the two sewage outfalls below the city. In 1884 a parliamentary commission investigated the matter and concluded, "It is neither necessary nor justifiable to discharge the sewage of the Metropolis in its crude state into any part of the Thames." Moreover, the commission members added that dumping untreated sewage into the river contravenes the original intentions of Parliament when it had passed the Metropolis Local Management Act in 1858 (Halladay, 1999/2003, p. 104).

From Diversion to Treatment and Utilization

By the late 1880s the Metropolitan Board of Works had accepted that it could not dump raw sewage into the Thames (*The Times,* 1885, November 30, p. 9). Although the tidal wash did not bring the liquid sludge back to central London, it still caused problems elsewhere. While the problems were still located beyond the borders of the city in the 1880s, the rate of London's expansion would soon have brought the sewage problem back into the metropolitan area. So then, beginning in the late 1880s, treatment centers were set up at the two outfalls to separate the solid from the liquids. From 1888 until 1998, ships, one of which was named the *Bazalgette*, carried the solid sludge and dumped it at sea. Since 1998, the solid sludge has been incinerated in "a sand bed at a temperature of 850 degrees centigrade" and the heat generated from burning the sludge is used to drive a turbine that produces electricity. As for the liquid waste, first, it was treated with chemicals like "lime and protosulphate" (*The Times*, 1891, March 16, p. 4); then, an "aerobic process" was used to purify the liquid before releasing it into the river (Halladay, 1999/2003, pp. 106 – 107). Even with the necessary addition of the purification process, the sewage removal system is still essentially what Bazalgette had built.

When Sir Joseph Bazalgette died in March 1891, *The Times* published an obituary that provides a brief account of improvement in London's sanitation and also notes the accomplishments brought about by Bazalgette in making London a better place in which to live. Some of these accomplishments, along with certain key ones made by Dr. John Snow, have already been discussed in this article's narrative. In regards to the story of London's sanitation, the obituary refers to the water companies that still pumped their water from the Thames near the Battersea Bridge, which prior to Bazalgette's intersecting sewers, was foully polluted with filth. The writer adds, "One of [the water companies], though its directors were confident that the supply was of excellent quality, was responsible for 6,000 deaths from cholera in consequence" (*The Times,* 1891, March 16, p. 4). The obituary does not give details so the charge may be leveled against the conduct of the Southwark & Vauxhall Water Company during the third cholera epidemic, (discussed above) or against the East London Waterworks Company during the fourth epidemic (not discussed in this article). To whichever one the obituary refers, the writer is correct to note that

Bazalgette's intersecting sewer system "has added some 20 years to their chance of life" by having removed filth from the river where water companies pumped *(The Times,* 1891, March 16, p. 4). Another contributor to the improvement of London life is Dr. John Snow, who did not live long enough to see either Dr. Robert Koch confirm his hypothesis that drinking feces-laden water causes cholera or to witness the completion of Bazalgette's sewers which swept the cholera problem away from Londoners.

Neither Victorian lived long enough to see the return of marine life to the Thames River, which has recently happened. The writer of the *Illustrated London News* story on the metropolitan main drainage project who, at the middle of the nineteenth century, wished for the return of salmon has had his wish realized at the end of the twentieth. According to Dot Hart, "in 1974 salmon returned to the Thames—the first for 150 years" and 1993 witnessed "a record return of 338 Salmon" (Hart, 2007, par. 17 and 20). Measures not anticipated by Victorians, such as Dr. John Snow and Sir Joseph Bazalgette, have been primarily responsible for the revitalization of the Thames River in the second half of the twentieth century. However, actions, taken by both of these men a century earlier, did significantly contribute to the correction of major problems that had begun during their youth. It is not surprising, then, that quite a few books, which positively recall their work, have been published at the beginning of the twentieth-first century.

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Ethics Online: A Plea for Open Source[1]

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Our ability to shape online learning communities in the humanities is, I argue, needlessly constrained by commercial course management systems. I explain how using alternative Open Source Software to create an online environment for actively learning the principles of moral deliberation afforded novel opportunities to unobtrusively manipulate the environment and thereby improve community members' interactions. Given the effectiveness of these changes, I conclude that the Humanities must be careful to observe an important distinction between the relatively inferior autonomy gained from *using* technology and the vastly greater autonomy of *controlling* technology, a distinction which can be acknowledged by embracing Open Source Software.

Key words: Ethics, moral deliberation, asynchronous discussion, Open Source Software, course management system, online learning community.

Introduction

Despite impressive improvements in functionality, the proprietary nature of popular course management systems like WebCT and Blackboard requires that their underlying formula be kept a closely guarded secret. The result is something of a cookie-cutter approach to

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using pedagogic technology: Creative use of the technology is confined to just the set of functions imagined and implemented by Blackboard's corporate programmers.

To be sure, Blackboard's programmers are not deaf to users' suggestions. The full complement of resources provided by a standard course management system is at least rich enough to make the system useful for most of its users most of the time. Yet, if we respect human autonomy and creativity as, presumably, the humanities require, then we should not be satisfied with any cookie-cutter approach. The autonomy one gains from *using* technology is arguably inferior to the autonomy one gains from *controlling* the technology itself. An example of such control consists of our use and non-trivial manipulation of an alternative technology to solve the problem of teaching the principles of moral deliberation to large groups of students.

In the next section I describe an optimal environment for learning moral deliberation and set the problem of scaling that environment up to large classes of students enrolled in philosophical ethics. I then extract the essential features of the optimal environment and describe a novel technical solution to the problem of scale. Examining alternative solutions, I proceed by explaining the distinction between Open and Closed Source Software and describe how using Open Source Software gave us crucial flexibility to improve core functionality. I conclude by considering how the new learning environment impacts learning moral deliberation and thereby make the case for Open Source Software.

An Optimal Learning Environment

In the Spring of 2001 my school surprised larger and better-known institutions like Indiana University, Villanova, and the University of Washington by winning the U.S. National Ethics Bowl Championship. Unlike other college bowls, the Ethics Bowl is not designed to be a debate so much as a deliberative exploration of the moral dimensions of actual cases and ethical dilemmas by teams of students and judges (Borrego, 2004, p. A31). Since the cases are published a mere six to eight weeks prior to the Bowl, preparation is intense. Two faculty coaches put together a team of between five and eight students and meet with them two to three times each week for up to three hours at a time. The meetings are intense exercises in moral deliberation. Each

case is carefully analyzed by the group. Arguments are carefully examined in light of student-led research. Moral analogies are drawn, refined, and, gradually, the process of serious moral deliberation leads to the discovery of morally defensible courses of action.

Through no fault of their own, students generally begin the process by appeal to their emotional reactions to a case. Unreflective moral judgment—which, in hard cases at least, is almost always mistaken—is all most students have ever known to apply. Students are apt to be as certain of their moral judgments as they are quick to make them. Yet moral certainty cannot long withstand the atmosphere of rigorous moral deliberation in an Ethics Bowl meeting. Students (and coaches) almost always end up repudiating formerly-held positions in favor of more sophisticated and ethically nuanced positions; a clear sense develops on the team that they are gradually uncovering the moral truth of the matter.

I take it that a large part of the value of moral deliberation in moral education, and one of the greatest challenges for professional ethics, is teaching students the value of reflective moral judgment. The process of moral deliberation so successfully employed in preparation for the Ethics Bowl teaches students the ability to withhold judgment, to *examine* a position without either *endorsing* or *condemning* it, and to humbly search for moral truth instead of declaring it.

The Ethics Bowl program is an extracurricular off-shoot of the Texas A&M University-Corpus Christi's Professional Ethics course, a first course on applied ethics that is an institutional course requirement. The course is organized around a large lecture with small discussion sections. Each lecture enrolls approximately 200 students—there are typically three lecture times each semester—and each discussion section has between thirty and fifty students. The idea is that students attend lecture for instruction on ethical theory which they then apply in discussion sections roughly organized according to their professional disciplines.

The success of the Ethics Bowl meetings in teaching students moral deliberation does not presently translate to the Professional Ethics course. The problem is scale. Learning the shape of moral deliberation by reasoning about particular ethical dilemmas requires that each student actively engage in moral deliberations, yet this is only possible if a class is sufficiently small to allow every student the opportunity to contribute to discussion. The number of students in

each discussion section makes it almost impossible to engage every student in serious moral deliberation. The most discussion section leaders can usually hope to achieve is to summarize and explain key points from lecture to help students better grasp the material. Students rarely have the opportunity to test their skill at wrestling with complex moral dilemmas and real-world moral issues. Creating a learning environment that manages to capitalize on the virtues of the Ethics Bowl preparation could arguably provide just such an opportunity.

Learning Moral Deliberation

What is it about the Ethics Bowl meetings that make learning moral deliberation so successful? There are at least three answers to this question.

1. The Ethics Bowl meeting has an extremely favorable time per student ratio. There is sufficient time for each student to develop and offer his or her insights and arguments.

2. Students who would otherwise dominate discussion are more easily restrained by the faculty coaches and, importantly, fellow teammates: Ethics Bowl meetings are better at self-regulation.

3. Teammates get to know one another and the faculty coaches very well. They enjoy a greater comfort level with one another, trust one another, and, in general, feel safer in discussion. It is not unusual to see teammates become fast friends.

I submit that the third answer is the most important, for it is only when students feel safe from the condemnation or scorn of their peers and the professor that they will freely explore new positions and, most importantly, learn how to stand back from their initial positions to critically assess their own arguments. This is particularly true in applied ethics, where topics are often of a highly sensitive nature--e.g., abortion rights, euthanasia, and homosexual rights.

Students tend to feel safer in preparing for the Ethics Bowl precisely because they get to know each other so well. There is safety

in an environment of friendship and mutual respect, yet friendship and mutual respect are much more easily fostered in a small group. A class of 200 students poses a formidable obstacle to a student's gaining a sense of safety in the class; some students report experiencing anxiety at the mere thought of being called-upon in lecture.

To be sure, my point is not to disparage large lectures—they can be invaluable if done well. Yet as a comedian quipped about surveys which show that people fear public speaking more than death, it appears we would rather be in the casket than giving the eulogy. This fear is a significant obstacle for students who are being asked to do the sensitive and challenging work of developing a sophisticated understanding of controversial and often polarizing moral issues.

As long as I focused on the process of gaining a sense of safety by learning *more* about one another, however, I could not see a way to meet the challenge. In the short time we have each semester, there is no practical way to get 200 or more students to the level of familiarity and trust an Ethics Bowl team enjoys. If a sense of safety in discussion is essential to useful discussion, and a sense of safety is gained by having greater knowledge of one another, then the possibility of teaching more than a superficial applied ethics course on our scale is called into question.

Yet if it is impractical to have more knowledge of one another, then perhaps having *less* knowledge would help meet the challenge. There is, after all, a sense of safety in anonymity, and anonymity is frequently employed by professor and student alike. Thus, for example, professors do not generally require that students sign their course evaluations. Instead, anonymity is used to encourage the student to comment openly and honestly.

Anonymity is a useful pedagogic tool. Wrapping student discussions in a cloak of anonymity is technically as simple as having them contribute to online discussions under pseudonyms. To maximize student engagement, new topics for discussion would have to be continuously added and the discussions themselves would have to be asynchronous so that students could reply to one another at any time they chose. To ensure rigor and improve sophistication, student contributions to discussions would have to be scored and critiqued by faculty and teaching assistants. Adding an online discussion component to the course, in short, could bring the three features crucial to the ethics bowl team preparation to the class at large, but the

resulting online learning environment would have to be carefully constructed in such a way as to meet the special requirements of teaching moral deliberation. For as a skeptic of teaching moral deliberation online points out,

Certain features in the teaching situation that are present in the classroom are not available online. A classroom which manages to develop into a community of learners is most likely to support learning, including collaborative learning. For that to happen, a certain level of trust needs to develop, so that people feel free to explore and play with ideas, especially if the subject is somewhat new and intimidating. It is easier for that to happen if the participants are meeting face-to-face or have done so for part of the course. Thus it is easier, I believe, to develop a collaborative atmosphere in a face-to-face situation than with a set of disembodied learners. The kind of teaching for identifying action steps, for example, is best learned in a collaborative atmosphere, particularly the process of identifying ethical issues and imagining alternative action steps. (Schrag, 2005, p. 363)

Nevertheless there have been attempts to construct online learning environments for teaching ethics. Painter-Morland et al (2003, pp. 75-88) evaluate the use of synchronous or real-time online discussions to teach business ethics using theories of moral development and conclude that such discussions are effective tools for teaching ethics. Closer to our case, Ellenchild Pinch and Graves describe and assess the use of asynchronous online discussions to teach bioethics, concluding that

On-line conferencing through a WebBoard succeeded in stimulating valuable bioethical discussion and debate among class members. Both reticent speakers and distance learners were on equal footing with the more outspoken and on-site attendees. Limitations, especially that of time, were present but not insurmountable. The WebBoard success encourages even further initiation and development of on-line strategies to link students with each other while meeting their educational goals. (2000, pp. 710-711)

To be sure, there are pitfalls. Frankel (1999, p. 395) points out that anonymity can encourage students to engage in unprofessional and abusive behavior. Miller (1999, pp. 22-25) argues that the analytical skills students can gain in asynchronous online discussions are inferior to those possible in traditional classroom environments. Schrag (2005, p. 363) suggests that online discussions alone are insufficient to teach students how ethical theory applies to practical situations. Nevertheless, Kalichman argues that a well-designed and closely supervised online environment may meet some of these challenges.

> ...It is now widely recognized that active learning is essential to achieve many educational goals. In the case of research ethics, this means that students are engaged in discussion about contrived or real cases, challenging thought questions, relevant fictional or non-fictional selections from print or video, or surveys about topics in research ethics. With appropriate guidelines and monitoring of such discussion, the result can be an active learning experience that will reinforce the learning of information, develop improved skills for ethical reasoning, and foster a positive attitude toward research ethics. (2005, p. 343)

It is important to bear in mind that my goal was not merely to hold online discussions about moral issues. Unguided moral discussion, whether in person or online, tends to quickly devolve into emotive reports and bickering that masquerades as debate. Rather, I wanted to create an online learning environment that would approximate team preparations for the Ethics Bowl in terms of learning about the complexity of moral deliberation by engaging in serious moral deliberation about real-world problems under careful supervision. Thus I anticipated from the outset that, unlike other attempts, we would need to figure out how to employ global anonymity without in the least bit sacrificing individual accountability to the learning community. Combining anonymity with accountability in just the right measure proved to be the key to success.

A Technical Solution

Texas A&M University-Corpus Christi adopted WebCT as its sole, officially supported system for nearly all course-related

information technology needs. Yet our principal aim of building a learning environment that incorporated global anonymity with public accountability by using pseudonyms and public scoring could not be met with the resources provided by WebCT. WebCT's asynchronous discussion resources provided for anonymous but not *pseudonymous* contributions. Indeed, none of the standard course management systems offered the right mix of functions for our purposes. Researching alternatives led us to Open Source Software.

Since humans cannot usually read the strings of 1's and 0's that make up a computer program, human readable and writable computer programming languages are used to write the program's *source code*. Source code is like a recipe for making, or compiling, the program that actually runs the computer. Corporations that write programs for profit jealously guard their source code so as not to aid competitors in writing their own software.

The Open Source development model eschews the corporate "Closed Source" development model for a community approach wherein anyone can read, comment upon, and make changes to a program's source code (see Raymond, 2001). The resulting Open Source development model is richly academic in the sense that it emphasizes peer review and collaboration. Open Source advocates like to say that buying a piece of closed-source software is like buying a car with the hood welded shut (Stephenson, 1999, pp. 4-8). They are the shade-tree mechanics who like to pop the hood and make adjustments. Indeed, the ability to make changes to the software turned out to be crucial for us, as I will explain shortly. Better, Open Source software is often, though not always, provided free of charge.

SLASH, the Slashdot Like Automated Storytelling Homepage, is the Open Source software that runs the popular news and discussion website slashdot.org (Chromatic, 2002). SLASH provides a number of tools that make it ideal for creating an online learning community and, indeed, a course portal.

- Continuously Updated Homepage
- Polls with Attached Discussions
- Lecture Notes and Discussion
- Threaded Discussions on Articles and Essays
- Student Essay Publication

- Announcements and Student Questions
- Student Submissions for Discussion
- Student Journals
- Scoring of Discussion Contributions

SLASH and all of the software upon which it depends is Open Source and free for use and modification. Most of all, SLASH does one thing—pseudonymous asynchronous discussion boards with public scoring—very, very well. I believe that SLASH's functionality in that regard far outstrips anything other software can provide.

Installing SLASH is non-trivial, in part because SLASH is just a single component of a much larger array of necessary software:

1. The Linux Operating System in a standard web-server configuration.
2. Perl, which is usually installed when Linux installs.
3. The MySQL Database Server.
4. The Apache Web Server compiled with mod_perl.
5. Perl modules required by SLASH, which are provided by CPAN (the Comprehensive Perl Archive Network).
6. SLASH modules and applets supplied in the SLASH package.

Chapter 2 of "Running Weblogs with Slash" (Chromatic, 2002) has a detailed description of the steps and specific commands necessary for steps 2-6, but it assumes familiarity with the Linux Operating System and the Linux command line interface. Fortunately nearly every campus enjoys an Open Source subculture of faculty, Information Technology staff, and, especially, students who are eager to help. For example, many of the servers we use at Texas A&M University-Corpus Christi employ the Linux operating system. Our server administrator was more than willing to help install SLASH and provide support.

In order to use SLASH, students register for an account by entering a nickname and their email address. The student's nickname becomes her *nom de plume*--or, for the more argumentative student, her *nom de guerre*--under which she contributes to new discussions on the website. Since no one except site administrators have access to her email address, her anonymity is assured.

Contributions are scored on a scale of -1 to 5; each contribution's

score is publicly displayed in the contributions title bar. Although faculty do the lion's share of scoring and always have the final say on scoring disputes, the scoring system also randomly selects active and high-scoring students and awards them a fixed number of points they can use to help score contributions. Thus contribution scoring is at least partly a function of the entire learning community.

A student's scores on discussion contributions are summed to give a total, called 'Karma', which roughly represents the student's overall contribution to the learning community. Karma is then used as part of the student's grade for the course: It typically counts for 30-50% of the grade for the course, with the usual examinations and other assignments making up the rest. Given the relationship between individual discussion contribution scores, Karma, and course grades, the scoring serves to reinforce good behavior and extinguish, or at least minimize, bad behavior. Students who are vicious to one another, for instance, are likely to lose Karma and see disapproving comments from their peers. Students who write clearly, rigorously, and respectfully receive higher scores on their contributions. Since contribution scores are available for all to see, the higher scoring contributions become a model for others to follow.

Modifying SLASH: An Argument for Open Source

After several semesters using SLASH it became apparent, however, that we had not achieved the right balance of anonymity and accountability. To be sure, instructors could score a given contribution and attach a comment to the contribution from a menu of pre-selected comments. Examples include "Well Argued", "Deserves Replies", and "Grammar and/or Spelling Errors. The combination of score and comment provides some feedback to the student and, since they are public, to the community at large, but accountability was still lacking. Discussions rarely tended to elevate from mere emoting to the level of sophisticated and informed moral deliberation we had hoped to achieve.

Instructors always have the option of making their own contribution to a discussion, but such meta-contributions were too intrusive on the student discussions. Students tended to "shut-down" when they saw instructors posting comments and criticisms, although they were eager to see comments and criticisms from fellow students.

A PLEA FOR OPEN SOURCE

We needed a way to privately communicate with students that wouldn't sacrifice anonymity or interfere with ongoing discussions.

Fortunately, the Open Source development model permits changes and improvements in basic functionality on an as-needed/as-wanted basis. SLASH in particular is designed to accommodate further development. A few of the more superficial changes I had already made included:

- Assigning discussion section leaders to be principal scorers of discussions so as to more fairly distribute the workload of scoring discussion contributions;

- Providing color cues on discussions for principal scorers to visually distinguish between contributions which have been scored and those which have not;

- Manual locking and unlocking of discussions to permit principal scorers to close discussions to further contributions and changes in scoring;

- Reporting student activity and scores to discussion section leaders for purposes of tracking student development and retrieving grades; and,

- Changing the kinds of comments scorers may make about discussion contributions that get reported back to the student-contributor.

These were all technically somewhat trivial changes to make, although in some cases I had to take time studying Perl scripts to try to understand how SLASH manages its variables and the flow of information.

Improving the level of discourse by the community proved to be a challenge. Instructors needed to be able to better guide student efforts without directly intruding on their deliberative efforts. The solution I hit upon was to provide a text field beneath each contribution which only appears for an instructor. The instructor can enter comments of any sort and length into the text field and, upon scoring the discussion,

SLASH emails the instructor's comments to the author of the contribution. SLASH also emails a copy of the instructor's comments to the instructor for record-keeping purposes. Since SLASH handles the email messages, anonymity is preserved at all times. The instructor's comments are privately available to the student by email—private, at least, as any email exchange can be. The instructor can now hold the student accountable for his or her contributions without knowing exactly which student is the author of a given contribution.

A New Environment

By opening a back-channel of communication to the student, the instructor is able to comment on the student's efforts without in any way intruding on the ongoing discussions. The ability to comment at length about a student's contribution and provide those comments directly to the student has proven to be an extremely useful tool for improving our students' efforts. We can quickly catch problems, extinguish bad habits, and offer guidance and direction on difficult arguments. We can also applaud and encourage students who discover a novel argument or propose an especially defensible solution. The result is a unique online learning environment which seems to provide just the right balance of anonymity and accountability so as to elevate discussions to the level of rigorous moral deliberations.

To be sure, the resulting environment is almost nothing like the standard classroom environment, and it bears only the most superficial resemblance to the kind of learning environment possible with WebCT or Blackboard. Imagine teaching a class where each student is known only by a nickname she chooses. Imagine further that *all* you know about the students is what they write and what they may happen to say about themselves in their writings. The student is in complete control of what you know about her: There is a cloak of anonymity between students and between you and the students. You don't know any more about the student than what she chooses to disclose in what she writes. (Indeed, at the end of the semester when I remove the cloak of anonymity to assign grades I am often astonished to discover that some of the most reserved students in class turned out to be some of the most vigorous contributors in the online environment.)

You interact with your students, of course, but your interaction is limited to what you write in response to their contributions. It's as if

you had the capacity to send tips, suggestions, hints, and criticisms on private notes to each student during a class discussion, thereby unobtrusively guiding the students' efforts. You quickly recognize that economy and clarity of expression are key virtues. A single turn of phrase may illuminate, mislead, or confound. The usual process of learning more about one's own topic by explaining it to others in the classroom is thus vastly sharpened.

There are, in effect, two levels of discourse happening simultaneously: The students are engaged in moral deliberations while you engage them by your comments in thinking *about* those deliberations--meta-moral deliberations, if you will. Such meta-moral deliberations are invaluable in getting students to understand, on the most fundamental level, the importance of writing well; sparking the student's moral imagination by prompting them to think of alternative strategies and solutions; and strengthening the student's own moral autonomy by encouraging them to think critically about their own moral deliberations.

In the end students are much more confident in joining discussions from the safety of their individual anonymity, yet, by receiving comments directly from the instructor, they pursue moral deliberations responsibly and with increasing sophistication. In particular, I discover that students are

- Much more likely to critically assess the arguments given to them;
- Eager to respond to each other in constructive argument;
- Happy to help each other out by answering questions and providing additional explanations;
- More confident in exploring new positions and playing devil's advocate;
- Better at assessing their own contributions relative to their peers' efforts;
- More honest and forthcoming in reflecting on and describing their own experiences and ideas.

Now imagine being a student in this environment. You are struggling to understand complex and abstract ideas. You find that the ideas often challenge your own long-held convictions. You interact

with your peers and your professor by writing. In reading what others have written, you discover that there is an enormous diversity of positions and arguments. It's clear that your fellow classmates often think very differently than you. At first it seems raucous and chaotic, yet underlying everything is a sense of probing, questioning, and discovering. You find yourself reading what your peers have written with great interest. Always shy yourself, you find the honesty of what your peers write refreshing. Since no one knows who you are, you reply to their comments in kind. In an important sense, your contributions and theirs are *authentic*: Your anonymity provides you with the opportunity to be forthcoming and sincere.

Granted, some of your peers are brilliant. What they write is always instructive and sometimes fascinating. They are the stars of the class, and it's great fun to see them arguing back and forth. You don't feel like you can do as well as they, but you take a chance and join in one of their debates. Suddenly you find you are engaged in a sophisticated discussion about topics and issues you never previously would have considered. You take time to respond carefully, and you find yourself conceding the points made about your arguments just as your interlocutors sometimes reject their own positions in light of the arguments you give. Your confidence grows.

During all of this you receive scores on your contributions along with notes from the professor. The notes are annoying at first. The professor goes on and on about proper grammar, spelling, and formatting. But you try your best and refrain from writing your contributions as if they were comments to friends on their MySpace pages. Your scores begin improving. The professor notes the improvement, but goes on to encourage you to try arguing for positions and solutions you hadn't considered or had rejected out of hand. You see that there is a lot more to this stuff than you had originally thought.

You begin to understand how the abstract theories you've been learning about in class connect with the issues you're debating online. You find moral principles like beneficence, nonmaleficence, autonomy, and paternalism become increasingly useful in constructing your arguments. More importantly, the professor's commentary about your work keeps you from giving your knee-jerk reaction to a case. Instead, you spend time thinking about how someone who didn't have your reaction might think about the case. You think about how their reasons compare with yours, and you start to see how comparing reasons can

lead you in entirely new directions.

Conclusion

It is important to emphasize that the new functionality I describe above and the online learning environment that resulted from its use was only possible because I could study, analyze, and modify the SLASH source code. That is, it was only possible to tailor the software to my pedagogical needs because it was Open Source software. No such modifications could have been made to Closed Source software without going through the software's corporate programmers, and unless there is overwhelming demand for some new function, corporations will not spend the money to customize their software: The user, who generally knows best what she needs, cannot directly make changes to the basic functionality of the software.

Companies welcome suggestions, of course, but one then has to wait until the next upgrade to see whether or how a suggestion has been implemented. Improvements and changes cannot be made in a timely manner according to student feedback and instructor suggestions. The Closed Source development model suffocates experimentation and innovation because it is necessary for commercial reasons to protect the source code by restricting access. It makes customization to meet the specific needs of its users all but impossible.

It bears emphasis, on the other hand, that those in the Humanities should not find the use and modification of Open Source software daunting. The virtue of Open Source software is that the work of previous programmers is available for viewing to serve as a model for making changes. One need not be an expert programmer to read and understand how a particular function has been implemented. All one requires is a clear understanding of the problem that needs to be solved and an idea of how the technology can be harnessed to solve the problem.

In closing I submit that there is an important lesson for the humanities in our example of the advantages of Open Source Software. Those in the humanities--philosophy, the languages, psychology, social science, history, and the fine arts all included--happily use technology as it becomes available to improve their creative and teaching efforts. After all, technology at its best permits greater autonomy because it gives one the freedom to explore and utilize otherwise unavailable

alternatives. Yet, as those in technical fields like engineering and computer science would presumably attest, this freedom is insignificant in comparison to the freedom one gains from being able to manipulate the technology itself.

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"Secure, anonymous, unregulated:" *Cryptonomicon* and the Transnational Data Haven

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This essay considers how Neal Stephenson's 1999 epic novel *Cryptonomicon* engages with the long-standing and complex relationship between cryptology and national/transnational identity. *Cryptonomicon's* layered and disjointed structure allows it to explore the impact of cryptography and cryptanalysis in the Second World War (as well as their impact on the consequent rewriting of the international political stage), to reflect on the place of technology in the recent history of cryptology, and to consider how emergent (and supposedly secure) data storage technologies not only open up planetary-wide communication traffic but also unsettle the protocols of national and international law. The essay is informed by recent work on cryptology, data havens, globalization, transnationalism, and postcoloniality, as well as Derrida's work on archives and technology.

Key words: **c**ryptology, *Cryptonomicon,* data havens, Derrida, nationality, Stephenson, technology

Introduction

Credited by some as a more compelling and engaged response to the information age than the other heavyweights that tend to dominate postmodernity's novelistic horizons (Garner, 1999), Neal Stephenson's 1999 novel *Cryptonomicon* works on an epic scale that resists easy synopsis. Its geographical landscape is a global one, with characters ranging across China, Japan, the Philippines, Sweden, the UK, and the USA. Its sense of history is elaborately bifurcated;shuttling between the Second World War and the 1990s, it traces the roots of the dotcom era to the information war of the 1940s. Its cast of dramatis personae is a lengthy one, although much of the narrative moves (with a logic that

sometimes stretches credulity) between three central figures: Lawrence Waterhouse, a PhD student in mathematics at Princeton who enters the Second World War and soon becomes one of the Allies' key figures in the intelligence war; Randy Waterhouse (grandson of Lawrence), erstwhile librarian and UNIX autodidact, who becomes the chief software engineer in a telecoms venture for migrant Filipino workers, and who finally – incredibly - discovers Japan's lost war gold; and Bobby Shaftoe, a gung-ho marine and grandfather to rogue marine services contractor America (Amy) Shaftoe, who later becomes Randy's girlfriend. Gathered around this central cast is a large company of extras; the presence of many of these supplementary characters – such as Alan Turing, General MacArthur, Admiral Yamamoto, Albert Einstein, Winston Churchill, and Ronald Reagan – could easily seduce Stephenson's readers into treating this text as historical fiction.

Stephenson's text is fascinated by technology and much of it is devoted to situating technoculture not in the closing years of the twentieth century, but in a longer history that has been largely unwritten. However, as much as *Cryptonomicon* seeks to explain the shaping of the present by technologies of the recent past, and as much as it finds programmers, computer scientists, and hackers (such as Turing and Lawrence Waterhouse) to be the unacknowledged heroes of the twentieth century, this text cannot be placed firmly in the category of documentary revisionism. Often – almost invisibly – *Cryptonomicon* refuses the accepted protocols of historical fiction, to the extent that recognition of technology's cultural centrality here takes place in a narrative that works against the secure transmission of information and becomes conceptually vertiginous. Indeed, *Cryptonomicon* encourages readers to treat its claims to accuracy with suspicion by including, in its seemingly reliable history of the information wars, a fictional work that is itself entitled *Cryptonomicon*.

This essay will consider *Cryptonomicon's* documenting of technology's unwritten history, focusing in particular on the ways in which this novel charts the emergence of the data haven at the end of the twentieth century and traces the roots of this apparently new technology both to earlier archival technologies and to cryptographic attempts to secure information. What *Cryptonomicon* reveals, in its *almost* encyclopedic treatment of data havens' dependence on cryptology, is a strange reshaping of both communication and the

nation-state. Language here functions simultaneously as a reliable and insecure medium of information exchange, and the nation-state is seen to be a territorial location that is at once essential to and threatened by new technological systems.

Unbreakable encryption?

Cryptonomicon's narrative constantly gravitates towards the manipulation of information, especially the interfacing of the human intellect with the computer in both the encryption and decryption of individual, corporate, and state secrets. Long sequences of the novel are often given over to disquisitions on the encoding and decoding of personal, commercial, political, and military information. Early in the novel, for example, readers are introduced to Novus Ordo Seclorum (abbreviated to Ordo), Randy's preferred software for encrypting emails to Avi, his business partner in Epiphyte Corp.[1] One of Ordo's strengths, we are told, lies in its ability to generate encryption keys that are of unlimited length:

> Randy pulls down a menu and picks an item labeled: "New key…"
> A box pops up giving him several KEY LENGTH options: 768 bits, 1024, 1536, 2048, 3072, or Custom. Randy picks the latter option and then, wearily, types in 4096.
> Even a 768-bit key requires vast resources to break. Add one bit, to make it 769 bits long, and the number of possible keys doubles, the problem becomes much more difficult. A 770-bit key is that much more difficult yet, and so on. By using 768-bit keys, Randy and Avi could keep their communications secret from nearly every entity in the world for at least the next several years. A 1024-bit key would be vastly, astronomically more difficult to break.
> Some people go so far as to use keys 2048 or even 3072 bits in length. These will stop the very best codebreakers on the face of the earth for astronomical periods of time, barring the invention of otherworldly technologies such as quantum computers. Most encryption software – even stuff written by extremely security-conscious cryptography experts – can't even handle keys larger than that. But Avi insists on using Ordo,

generally considered the best encryption software in the world, because it can handle keys of unlimited length—as long as you don't mind waiting for it to crunch all the numbers.

>Randy is trying to generate one that is ridiculously long. He has pointed out to Avi, in an encrypted e-mail message, that if every particle of matter in the universe could be used to construct one single cosmic supercomputer, and this computer was put to work trying to break a 4096-bit encryption key, it would take longer than the lifespan of the universe. (Stephenson, 2000, pp. 53-4)

What Ordo brings to the history of code-making, then, is a mode of encryption that is more virtual and mechanical than it is human: all that Ordo requires from Randy is an arbitrary sequence of key strikes, from which it generates the random numbers that then constitute the encryption algorithm. Randy is, in other words, effectively removed from the process of translation that makes his emails incomprehensible to anyone other than their intended recipients; instead he becomes simply an instrument which allows Ordo to carry out the more rigorous work of thinking.

Perhaps more important than the question of Randy's relegation to technology's appurtenance is the question of perfectible communication that Ordo raises, since this mode of encryption seems finally to realize the idea that an unbreakable code is effectively possible. Robert Churchhouse (2002) opens his *Codes and Ciphers* with the observation that "For at least two thousand years there have been people who wanted to send messages that could only be read by the people for whom they were intended" (1); from Caesar's simple substitution cipher (which replaces each letter in a message with one that is three places after it in the alphabet) to PGP (Pretty Good Privacy – highly secure freeware for data encryption and verification), various modes of concealment and encipherment developed during this period, frequently based upon the assumption that they could resist decipherment and disclosure.[2] This history of cryptography has, however, been a history of secrets deciphered, since the most complex codes of the past now appear elementary and even the most secure codes of today (such as PGP) are thought by some to have been broken by the US Government. One reading of *Cryptonomicon* might find in Ordo a method of encoding that finally overcomes cryptography's

difficult history: Ordo remains apparently secure throughout the novel, and it is this secure exchange of information that allows Randy's hacker nonconformism (as well as Avi's entrepreneurial flair) to flourish in a business environment left arid by governmental surveillance and corporate espionage. *Cryptonomicon* suggests, in other words, that communication between two parties has, in the past, been corruptible by an intrusive third party; what new technologies now allow is an unprecedented level of confidence in language as a private medium which can guarantee the legitimacy of expression.

A new history of technology

Importantly, *Cryptonomicon's* sense of history is neither a straightforwardly linear nor an epochal one, since it refuses either to reaffirm the idea that the technological present smoothly builds on technologies of the recent past or to endorse the notion that we now inhabit a technologized "end of history" which overcomes the failures of the pre-technological past. As much as this novel often constructs Randy and his associates as the beneficiaries of a newly technologized and global order, it sees this order as one which has neither shaken off the limitations of antecedent technologies nor entered an unprecedented age of technologized - posthuman – enlightenment. In this respect, the novel echoes Siegfried Zielinski's claim that "media worlds" are not distributed sequentially, but "combine at particular moments in time, collide with each other, provoke one another, and, in this way, maintain tension and movement within developing processes" (2006, p. 258). Three examples from the novel demonstrate this departure from both evolutionary and epochal historiography. The first example concerns software. Ordo certainly functions mostly by removing human involvement and by operating with almost complete autonomy in its encryption of data. But this novel does not, unlike some recent accounts of the machinic reconstruction of consciousness and the body, suggest that the human is, in its greater association with technology, entering its terminal phase. Although advanced encipherment might well depend upon tools such as Ordo, these tools are also seen to require human collaboration, with cryptology being possible only as the result of a complex interfacing of machines, software, and human intelligence. For instance, when Randy is working on the Arethusa

cipher – the code which, when broken, leads him to the mine housing Japan's war gold – we read:

> Unlike human codebreakers, computers can't read English. They can't even recognize it. They can crank out possible decrypts of a message at tremendous speed but given two character strings like
>
> SEND HELP IMMEDIATELY
>
> and
>
> XUEBP TOAFF NMQPT
>
> they have no inherent ability to recognize the first as a successful decryption of a message and the second as a failure. (Stephenson, 2000, p. 824)

Cryptonomicon, in other words, finds both the past (Lawrence Waterhouse's information war) and the present (Randy Waterhouse's information economy) to be simultaneously machinic and human, since even the most advanced software does not fully supplant the human.

The second example concerns hardware. As much as *Cryptonomicon* seems to find an unparalleled authenticity in new modes of cryptographic deception, it does not seek wholly to detach new encryption technologies from earlier efforts to secure the exchange of messages. Indeed, *Cryptonomicon's* sense of emergent communications must be seen as one that interlaces the technologies of the present with those of the recent past. Perhaps the most telling examples of this genealogy occur when it seeks to establish code-breaking machines of the Second World War as computing technology, rather than simply as electromechanical precursors to the devices that we now conceive as computers. The Turing Bombe at Bletchley Park (which performed the calculations that allowed the Enigma cipher finally to be broken) is seen as an early attempt at mechanized thought, but it is Waterhouse's use of a room-sized device in Manila to crack Japanese codes that provides *Cryptonomicon* with the clearest image of an embryonic computing intelligence:

> The Basement is filled with ETC card machines and with several racks of equipment devoid of corporate logos, inasmuch as they were designed and largely built by Lawrence Pritchard Waterhouse in Brisbane. When all of these things are hooked

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together in just the right way, they constitute a Digital Computer. Like a pipe organ, a Digital Computer is not so much a machine as a meta-machine that can be made into any of a number of different machines by changing its internal configuration. At the moment, Lawrence Pritchard Waterhouse is the only guy in the world who understands the Digital Computer well enough to actually do this, though he's training a couple of Comstock's ETC men to do it themselves. On the day in question, he is turning the Digital Computer into a machine for calculating the zeta function that he thinks is at the core of the cryptosystem called Azure or Pufferfish. (Stephenson, 2000, p. 830)

The third example of this text's departure from conventional historiographies can be found in its treatment of knowledge. What underlies the emergence of the computer during this period – and its eventual status as the apparent guarantor of private and authentic communication – is a scientific (mathematical, physical, and cryptological) reasoning that endures across history. Lawrence Waterhouse's successes as a cryptanalyst (and, as a consequence, the Allied successes against Germany and Japan) are attributed in *Cryptonomicon* to a theoretical grasp of universal principles that allow a purer, more precise, and better functioning knowledge than the sort of thinking that is limited by the praxis of the moment:

The basic problem for Lawrence was that he was lazy. He had figured out that everything was much simpler if, like Superman with his X-ray vision, you just stared through the cosmetic distractions and saw the underlying mathematical skeleton. Once you found the math in a thing, you knew everything about it, and you could manipulate it to your heart's content with nothing more than a pencil and a napkin. He saw it in the bell curve of the silver bars on his glockenspiel, saw it in the catenary arch of a bridge and in the capacitor-studded drum of Atanasoff and Berry's computing machine. Actually pounding on the glockenspiel, riveting the bridge together, or trying to figure out why the computing machine wasn't working were not as interesting to him. (Stephenson, 2000, p. 8)

Cryptonomicon constantly attributes the Allied victory more to a nerdish facility for pattern recognition than to combat heroism or battlefield strategy, and it reveals the debt that today's technologists owe to figures like Alan Turing and Lawrence Waterhouse. However, when read primarily as text which locates the informational age in the past as much as the present, *Cryptonomicon* could be seen to offer little more than a revisionist account of technology, one which is concerned only to establish a new history of technology and a new history of the twentieth century. Stephenson's novel goes further than such a revisionist rewriting, troubling straightforward assumptions about narrative, time, and historicity by drawing attention to a bond between software, hardware, and knowledge that cannot simply be attached to modernity. *Cryptonomicon* might well point to a new order of the ages, but this order is one marked neither by an epochal shift towards an informational age nor a progressive maturation of incipient technologies. Rather, the novelty of this moment is to be found in the emerging sense that information technologies occupy a profound, intimate, and *enduring* place in culture and consciousness.

"The wreckage of cryptosystems"

If Stephenson's novel provides a more complex sense of history than the one that it seemingly promotes, then it also challenges the technotopian positivism that is attached to the notion of secure encryption. The hubris that is attached to the notion of an unbreakable cipher is revealed in much of the literature on cryptology. Fred Piper and Sean Murphy observe that "Being unbreakable is a claim that many designers have made for their algorithms, usually with disastrous consequences" (2002, p. 52), and *Cryptonomicon* echoes this sentiment in an email exchange between Randy and Enoch Root (a former military priest and colleague of Bobby Shaftoe who eventually helps to disinter Japanese war gold):

> You and I both know, Randy, that the history of crypto is strewn with the wreckage of cryptosystems invented by arrogant dilettantes and soon demolished by clever codebreakers. You probably suspect that I don't know this – that I'm just another arrogant dilettante. (Stephenson, 2000, p. 432)

Cryptonomicon repeatedly bears witness to the disasters that have befallen those "arrogant dilettantes" who remain confident in the security of their ciphers. The interception and deciphering of messages that allowed the US air force to locate and assassinate Admiral Yamamoto in 1943, as well as Germany's catastrophic reliance on the Enigma cipher, appear in Stephenson's text as evidence of cryptographers' ill-conceived certainty about their media.

Cryptography's history is shown to be a difficult (and often disastrous) one here, but this novel also suggests that current encryption technology offers a level of security that can finally resist unsolicited decryption. And yet, Ordo, introduced as an encryption software which allows information "to remain secret for as long as men are capable of evil" (Stephenson, 2000, p. 55), too fails fully to secure Randy's messages. While Ordo is seen to produce encryption algorithms that defend against current code-breaking technologies, it is nevertheless susceptible to other forms of attack. For example, some of Randy's emails are archived on his company's server in California; when the information stored here begins to interest the US government Avi fears that a subpoena could force Epiphyte to disclose its decryption keys. A different, and more dramatic, interception of Randy's data occurs when he is imprisoned in the Philippines; falsely charged with drug-smuggling, Randy is given his laptop and encouraged to continue working while incarcerated. At this point he becomes convinced that he is the victim of "Van Eck phreaking," a (fictional) form of electronic surveillance which allows others to "pick up the radiation emanating from the wire that connects screen buffer to video hardware, and translate it back into a sequence of ones and zeroes that can be dumped out onto their own screen" (Stephenson, 2000, p. 354); in other words, what Randy sees on his monitor can also be seen by those surveilling it. Ordo might, then, guarantee email and storage security, but it cannot protect against other forms of interception.

Passages such as these suggest that *Cryptonomicon* is not convinced, as it might appear to be, that communication can be confidential, or that new technologies have allowed cryptology to emerge from its uneasy history of compromised secrets disclosed. While hackers like Alan Turing, Lawrence Waterhouse, and Randy Waterhouse need secure cryptosystems, the underlying hermeneutic of the novel is that there can be no secure cryptosystem. Since it is the

breaking of codes and the confounding of cryptographers' intentions that allows each of them to acquire concealed information and to reform the global economic order, *Cryptonomicon's* less visible concern is to establish language as an uncertain and ultimately ungovernable medium. Here, as in all writing, language is seen to be both functional and dysfunctional since the coded message allows the act of transmission to occur, but only by opening this transmission to interception, hacking, and misappropriation in ways that can be neither controlled nor perceived.

Information and the nation-state

Reading *Cryptonomicon* against the grain of its apparent investment in the reliability of communication and communications technology elicits further questions about this text's ambiguous engagements with the technocultural politics of the twentieth century. In Stephenson's text, not only is language ambiguous and history an equivocating medium of disclosure and concealment, but also, more generally, shifting patterns of information exchange are seen to produce cultural uncertainty. Avi's account of the changing terrain of informational control draws attention to this unsettling transformation:

> "… as we've talked about many times, there are many reasons why different governments might want to control the flow of information. China might want to institute political censorship, whereas the U.S. might want to regulate electronic cash transfers so that they can keep collecting taxes. In the old days they could ultimately do this insofar as they owned the cables."
>
> "But now they can't," Randy says.
>
> "Now they can't, and this change happened very fast, or at least it looked fast to government with its retarded intellectual metabolism, and now they are way behind the curve, and scared and pissed off, and starting to lash out." (Stephenson, 2000, pp. 838-9)

No longer is it the case that national governments regulate and restrict the global distribution of information. Rather, *Cryptonomicon* shows, these governments' unprecedented level of national anxiety

results from a hitherto-invisible class of technologically creative iconoclasts – hackers, maverick programmers, and visionary engineers – who bend and manipulate information, stretch the limits of technology and redefine the systems with which they work, in the process profoundly reshaping the social, political, commercial, and military landscape. The hackerist libertarian ethic that drives *Cryptonomicon's* narrative forward does not, then, simply seek to establish geeks as the emergent priests of a new information age. This text also shows how these characters engage in an often subtle, but sometimes brutal, renegotiation of the rules that particular nation-states (and the international organizations to which they belong) seek to impose upon those who move information, capital, and themselves across the territories of the world.

In this regard, Stephenson's fictional and historical interests in *Crytonomicon* correspond closely with recent theoretical responses to technoculture's increasingly transnational, and often contra-national, trajectories. Gilles Deleuze and Félix Guattari (1988) perhaps stand at the vanguard of those who find social systems, such as the nation-state, constantly encoded, decoded, and recoded by machinic assemblages (pp. 424-73). More recently, the work of such prominent – and divergent – commentators as Manuel Castells (1996-7), Paul Virilio (2002), and Michael Hardt and Antonio Negri (2006) combines to underline the erosion of national frontiers by media, communications, and commercial technologies. Closer to *Cryptonomicon's* thematics, Jacques Derrida's *Politics of Friendship* (1997) places the question of encryption at the heart of the nation-state's current anxieties:

> A debate… is under way today… between the State and citizen associations (all assuredly 'democrats' and 'liberals') concerned over the right to initiative, invention, communication, commerce, and safeguarding privacy…. Today we have a State just as 'liberal' and 'democratic', just as concerned over its responsibilities, as its citizens, but *providing* it can maintain its hold on the means of protecting internal security and national defence. (144)

Here, Derrida points to a conflict that has, in recent years, started to unsettle the democratic state's claims to democratic representation: with the availability of increasingly sophisticated encryption

technologies (such as PGP) ordinary inhabitants of the digital sphere are now able to shield their data from the gaze of law enforcement agencies. This discord is often read as a dispute between the civil liberty of the individual and the sovereignty of the state (see, for example, Lessig, 2004), but for Derrida it exposes the limits of the representative and liberal nation-state, since such a state will tolerate neither the internal nor external negotiation of its national borders.

Both the threat that data confidentiality poses to national governments and governments' political, military, and informational attempts to restrict high-level encryption, are, in *Cryptonomicon,* seen to shape the twentieth century's formative moments. Encryption technologies of the recent past are shown to play a critical role in the defence of the nation: the breaking of German and Japanese codes is given a decisive place in the Second World War, since it was decryption that allowed Allied nations to prevail. Encryption technologies are also revealed as one of the most significant threats to both national security and national identity in recent years. No longer the sole preserve of governmental research or the outcome of national defense strategy, encryption is now serving individuals, non-governmental organizations, and corporations; as a consequence, nation-states have recently started both to enhance their decryption capabilities and to restrict the distribution of encryption software. When Epiphyte's server is seized we encounter *Cryptonomicon's* most forthright response to this conflict between data privacy and national governments: "The FBI hates and fears strong crypto" (Stephenson, 2000, p. 689). This seizure, Epiphyte's employees conclude, is one outcome of multilateral efforts to restrict the movement of data:

> "I guess I'm just being paranoid and sort of assuming that the Dentist is somehow collaborating with forces in the U.S. government that are anti-privacy and anti-crypto," Randy says.
>
> "Not just the U.S. government," Cantrell says. "The Black Chamber."
>
> "What the hell do you mean by that?" Doug asks.
>
> "There was a high-level conference a couple of weeks ago in Brussels. Hastily organized we think. Chaired by Attorney General Comstock. Representatives of all the G7 countries and a few others. We know people from the NSA were there. People from Internal Revenue. Treasury people – Secret Service. Their

counterparts in the other countries. And a lot of mathematicians known to have been co-opted by the government. The U.S. vice president was there. Basically we think that they are planning to form some kind of international body to clamp down on crypto and particularly on digital money."

"The International Data Transfer Regulatory Organization," Tom Howard says. (Stephenson, 2000, p. 725)

Derrida's claim that encryption has been central to democratic nations' undemocratic efforts to protect national territoriality is, therefore, dramatized by *Cryptonomicon's* open account of the extreme measures that governments will take in order to police information.

Archive and enigma

Apparently in contrast with Derrida's *Archive Fever*, Stephenson's novel also reflects on certain states' willingness to engage in the technological renegotiation of their status as nations. Epiphyte's participation in the founding of a data haven ("the Crypt… Secure, anonymous, unregulated data storage," Stephenson, 2000, p. 564) in the (fictional) sultanate of Kinakuta provides the clearest example in *Cryptonomicon* of such a renegotiation. Epiphyte's involvement in the Crypt begins as a technological opportunity: its initial role is to install the storage systems and establish the network that will allow the Crypt to provide secure data hosting. When outlining his plans for the development of the Kinakutan data haven, the sultan observes that:

Many Net partisans are convinced that the Net is robust because its lines of communication are spread evenly across the planet. In fact… nearly all intercontinental Web traffic passes through a small number of choke-points. Typically these choke-points are controlled and monitored by local governments. Clearly, then, any Internet application that wants to stand free of governmental interference is undermined, from the very beginning, by a fundamental structure problem…. Bottlenecks are only one of the structural barriers to the creation of a free, sovereign, location-independent cyberspace…. Another is the heterogeneous patchwork of laws, and indeed of legal systems,

that address privacy, free speech, and telecoms policy. (Stephenson, 2000, pp. 317-18)

Kinakuta's particular geographical, economic, and political status, the sultan goes on to argue, means that it is uniquely placed to simplify the relationship between national governments and information by allowing the unrestricted flow of data across its borders and, as a result, finally create a global network that is truly unrestricted:

"Time to start over," he says. "A very difficult thing to do in a large country, where laws are written by legislative bodies, interpreted by judges, bound by ancient precedents. But this is the Sultanate of Kinakuta and I am the sultan and I say that the law here is to be very simple: total freedom of information. I hereby abdicate all government power over the flow of data across and within my borders. Under no circumstances will any part of this government snoop on information flows, or use its power to in any way restrict such flows. That is the new law of Kinakuta. I invite you gentlemen to make the most of it." (Stephenson, 2000, pp. 318-19)

Clearly, the sultan here refers to what *Cryptonomicon* has already established: the movement of secure information can acutely conflict with the interests of the nation-state. The sultan's response to this conflict is not that of the G7/G8 nations, which seek increasingly to restrict the passage of encrypted data (Cybercrime, 2007). The sultan does not propose abandoning Kinakuta's entire legislative apparatus; for him, Kinakuta would benefit economically from a data archive that would simply require the dismantling of its informational borders. The effects of establishing such an archive extend further than the sultan's observations suggest, however, since the deregulation of Kinakuta's virtual limits must result in further, unpredictable, changes in the shape of this nation. On this matter Derrida's work is again instructive.

Archives, Derrida tells us, have not always functioned simply as repositories that hold the records of the past – that is, as a form of prosthetic memory. Their origins lie in the location of the documentary present and in the safeguarding of political power: the etymology of "archive," he observes, points to

a house, a domicile, an address, the residence of the superior magistrates, the *archons*, those who commanded. The citizens who thus held and signified political power were considered to possess the right to make or to represent the law. On account of their publicly recognized authority, it is at their home… that official documents are filed. The archons are first of all the documents' guardians. They do not only ensure the physical security of what is deposited…. They are also accorded the hermeneutic right and competence. They have the power to interpret the archives. (Derrida, 1996, p. 2)

Clearly, this relationship between document storage and legal-political governance no longer operates in the same way. The places that house documents have ceased to be the residences of those in power, and archivists cannot claim exclusive or authoritative interpretation of the material for which they are responsible. As Derrida has more recently argued, "The archive's trustees may find themselves, because of the archive's devious structure, dispossessed of all power and all authority over it" (2006, p. 11).

Repositories of different sorts figure prominently throughout *Cryptonomicon*, and this text reveals that the relationship between information storage and political governance has changed substantially, with new technologies transforming this relationship still further by exposing the departure from the nation-state's regulatory authority in the second half of the twentieth century. Bletchley Park (the location of the UK's cryptanalysis and intelligence activities in the Second World War) and Golgotha (the mine that is constructed to house Japan's gold towards the end of the Second World War) provide two examples of repositories which, in the middle part of the twentieth century, were established to protect the authority of these nations' *archons*. When Lawrence Waterhouse is posted to Bletchley Park, we encounter his first impressions of this estate as one which lost its attachment to the English aristocratic landscape and has instead become an informational hub in the Allied efforts to win the war:

The place has been well looked after, but as Waterhouse draws closer, he can see black lianas climbing up the brickwork. The root system that he glimpsed in the Underground has spread beneath forest and pasture even to this place and has begun to

throw its neoprene creepers upwards. But this organism is not phototropic—it does not grow towards the light, always questing towards the sun. It is infotropic. And it has spread to this place for the same reason that infotropic humans like Lawrence Pritchard Waterhouse and Dr. Alan Mathison Turing have come here, because Bletchley Park has roughly the same situation in the info world as the sun does in the solar system. Armies, nations, prime ministers, presidents and geniuses fall around it…. (Stephenson, 2000, p. 143)

Importantly, *Cryptonomicon* shows that although information – in the form of German and Japanese coded messages – is gathered together and held at Bletchley Park, this process of data collection is, for the British and Allied military, a protected and secure one. Indeed, the very existence of this establishment is described (after the Allies' Ultra Mega code) as "the second best kept secret in the world" (Stephenson, 2000, p. 143). Bletchley Park functions, then, as a shielded and safe repository which will, apparently, ensure the survival of particular nation-states.

Golgotha is elaborately constructed as a subterranean crypt not only to be invisible to those in search of it, but also to be impenetrable to those who seek to disinter Japan's purloined gold. Goto Dengo, Golgotha's chief engineer of this mine, describes the consequences for unauthorized intruders who attempt to enter this vault:

"Anyone who attacks Golgotha will attack from above—to gain horizontal access, the distance is too great. This means they will have to tunnel downwards, either through fresh rock or through the column of rubble with which this ventilation shaft will be filled. In either case, they will discover, when they are about halfway down, a stratum of sand, three to five meters in depth, spread across the whole area… There are a dozen of these," he says. "Each one leads to the Lake Yamamoto shaft – so pressurized water will be behind it. The only thing holding them in place right now is tar – obviously not enough to hold back the pressure of the lake water. But when we have filled these rooms with sand, the sand will hold the manholes in place. But if a thief breaks in and removes the sand, the manhole explodes out of its

seat and millions of gallons of water force their way into his excavation." (Stephenson, 2000, p. 661)

Just as Bletchley Park is built as an informational archive which serves those who command Allied nations, so the physical invulnerability of Golgotha is, then, seen to ensure the economic security of post-war Japan.

Even these most complex attempts build the fortunes of the nation-state around various modes of secure storage are, however, compromised in *Cryptonomicon*. Such repositories, supposedly ordered instruments in the service of the *archons* of the nation-state, are at times seen by this novel to require interpretation by those who do not govern. Bletchley Park, for example, works not as an intelligence archive which is accessed and controlled by Churchill or Roosevelt but as a facility in which interpretation has become the responsibility of the state's functionaries:

It is early in November of 1942 and a simply unbelievable amount of shit is going on, all at once, everywhere. Zeus himself would not be able to sort it all out, not even if he mobilized the caryatids—tell them never mind what we told you, just drop those loads. Temples collapsing everywhere, like spyglasses, he'd send those caryatids—and any naiads and dryads he could scare up—to library school, issue them green visors, dress them in the prim asexual uniforms of the OPAMS, the Olympian Perspective Archive Management Service, put them to work filling out three-by-five cards round the clock. Get them to use some of that vaunted caryatid steadfastness to tend Hollerith machines and ETC card readers. Even then, Zeus would probably still lack a handle on the situation. He'd be so pissed off he would hardly know which hubristical mortals to fling his thunderbolts at, nor which pinup girls and buck privates to molest. Lawrence Pritchard Waterhouse is as Olympian as anyone right now. Roosevelt and Churchill and the few others on the Ultra Mega list have the same access, but they have other cares and distractions. They can't wander around the data flow capital of the planet, snooping over translators' shoulders and reading the decrypts as they come, *chunkity-chunkity whirr*, out

of the Typex machines. They cannot trace individual threads of the global narrative at their whim… (Stephenson, 2000, p. 162)

Stephenson's text attaches a similar loss of political – narrative – authority to Golgotha. In order to protect the integrity of this crypt, Dengo and his fellow engineers (those who know its secrets) are, upon its completion, condemned to death when they are sealed within it. Dengo's escape, and his subsequent disclosure of its location both to an international group of conspirators (including Enoch Root and Lawrence Waterhouse) at the end of the Second World War and, later in the novel, to Avi and Randy, mean that it ceases both to exist covertly and to function securely. Because of this compromised existence, the gold that is housed there fails to protect either Japan's economic interests or its narrative of national identity.

Cryptonomicon also explores the ways in which today's archives, which increasingly take the form of networked storage, are moving regulatory power further from those who manage the social sphere. The sultan of Kinakuta is acutely aware of this transfer of power when he describes his country's data haven as one which requires the abnegation of governmental authority: "Our policies concerning free speech, telecommunications and cryptography have evolved from a series of simple, rational decisions. But they are today so complex that no one can understand them, even in one single country, to say nothing of all countries taken together" (Stephenson, 2000, p. 318). However, the consequences of such policies for Kinakuta's national autonomy are equally complex: although the Crypt brings economic benefits to Kinakuta, it must also result in a corresponding loss of the sultan's political power; or, in a more Derridean idiom, the Crypt might well emerge as an expression of monarchical authority, but this archive at the same time requires the archon to renounce hermeneutic authority.

Derrida does not read this functional transformation of the archive – this transfer of power from one interpretative body to another – as the outcome of a deliberative drive for political justice. For Derrida, archives produce conceptual uncertainty as much as they allow the secure location of information: archives are "at once *institutive* and *conservative*" (Derrida, 2000, p. 7), since the consigning of documents necessarily changes the significance of that material. Archives preserve the status of documents, but they also subject these documents to the modifying effects of storage technologies and open information to

further interpretation. It is because of this ambiguous function, Derrida argues, that the precise and enduring meaning of archived information cannot be guaranteed: "The archive," he writes, "always works… against itself" (1996, p. 12).

The Crypt's relationship to both Kinakuta and Epiphyte exemplifies the ways in which archives both allow preservation and provoke transformation. The data haven is located on Kinakuta because of this nation's particular qualities, and yet this new technology for the storage and distribution of information leaves Kinakuta's future uncertain. Kinakuta embraces the technological opportunities that are offered by a data haven, but it can do so only by modifying itself as a sovereign nation. Since the Crypt will allow transnational groups to further disregard national and international law (and thus further diminish the influence of nations), Kinakuta's national status must eventually suffer from its technological enterprise. Writing for itself an impossible future, Kinakuta demonstrates how even those nations that renounce their powers to regulate data are threatened by advanced encryption.

Compounding this drift from established modes of collective belonging is Epiphyte's discovery of Japan's buried war gold. This gold is discovered not as a result of Epiphyte's normal business interests, but because of Randy's extracurricular research into his grandfather's archive of wartime codes (which, when decrypted, reveal the location of the mine that houses Japan's gold). In other words, it is an unknown and unforeseeable episode in Randy's family history that leads Epiphyte to rethink the Crypt's purpose. Rather than simply taking the gold and retreating into personal wealth, Randy and Avi see in it the opportunity for founding a digital currency that would be securely located in the Crypt, beyond the reach of governmental legislation and not tied to the bullion depository of a particular nation-state. As one reviewer of Stephenson's novel remarks:

> Randy Waterhouse and his cypherpunk business partners are about to do what everyone else has only talked about: open the first true offshore data haven on a remote Pacific atoll. If they can launch a new electronic currency backed by a few hundred metric tons of Nazi gold, well, that's an even more efficient way to wreck those antediluvian nation states. (McCullagh, 1999)

This review's phrasing hyperbolizes *Cryptonomicon's* response to the recoding of the nation-state by both existing and fictional technologies, but it does underline emerging technologies' deleterious impact upon national identity. Crucially, what *Cryptonomicon* further reveals is that these consequences cannot be envisaged, even by those who introduce, promote, and manage them. The Crypt and all that it involves (a transnational digital currency, unrestricted data storage and distribution, secure encryption) is, at the end of *Cryptonomicon*, set to reshape the distribution of political and economic power across the globe. But this archive (like others, Derrida might observe) is one that escapes the *archon's* control, since it is already operating in ways that work against national interests at the very moment that it promotes them.

The Global?

How are we to account for the recent interest in cryptography? Evidence of recent cinematic and literary interest in the technological protection of information is to be found not only in Stephenson's novel, but also in Robert Harris's 1995 novel *Enigma* (and its filming by Michael Apted in 2001), in Dan Brown's 1996 *Digital Fortress*, and in Fox's five seasons of *24*. It is perhaps no accident that this interest developed at the moment when several forms of cultural anxiety merge: fallout from the millennial fear that technology is making humanity's future uncertain, greater demand for secure systems for email and online commerce, and the fear that other regions of the world are becoming unreadable (unreadable in what way?). In order to overcome these anxieties, we persuade ourselves that our secrets are inaccessible to others, and we remain confident that greater intellectual and technological sophistication allows our official representatives to decipher others' secrets. But who is this "we"?

Stephenson's text suggests that these cultural anxieties result from a questionable understanding of technology's history and function. *Cryptonomicon* suggests that both the anxious disavowal and the clamorous embracing of today's technologies fail to perceive the shaping of the past by information (and especially cryptological) technologies. More importantly, it suggests that the concept of "we" is being profoundly reinvented in ways that are now troubling the nation as a system of collective belonging. It does so not by endorsing

globalist pronouncements on the nation-state's terminal decline, nor by suggesting that governments will prevail in the face of the technocultural threat. Instead, this novel shows how technologies are in a process of constant negotiation with the institutions of the nation-state. Data storage and distribution technologies here open up planetary-wide communication traffic but, in a world that is not yet global, they draw upon the economic, material, and intellectual resources of the nation-state at the very moment that they challenge national borders and work to divest nations of their regulatory authority.

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[1] The name of this software – Virgil's 'a new order of the ages' – is, of course, most associated with the reverse side of The Great Seal of the United States. Ironically appropriated here, it names the cryptographic tool used to resist the intrusive gaze of the nation-state.

[2] The description of PGP by William Crowell (Deputy Director of the USA's National Security Agency) suggests similarities between it and Stephenson's fictional Ordo: "If all the personal computers in the world – approximately 260 million computers – were to be put to work on a single PGP encrypted message, it would take on average an estimated 12 million times the age of the universe to break a single message" (cited in Singh, 1999, p. 317).