

The End of Literature: Machine Reading and Amitav Ghosh's *The Calcutta Chromosome*

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Abstract

Digital humanities discussions of distant reading, machine reading or not-reading have often turned on a depiction of the field of literary production in which individual texts and authors recede in importance as units of analysis. At the same time, the question of what is specific to the literary in discussions of electronic textuality, or the digital literary, has been under-analyzed. This article contributes to theorizing the digital literary by way of an analysis (or close reading) of the role of machine reading in a postcolonial science fiction novel by Amitav Ghosh, *The Calcutta Chromosome*. This novel participates in the imagination of electronic textuality and digital forensics at a moment when the imagined possibilities of the digital archive were of intense interest to both cultural critics and literary writers. The figure of the writer of vernacular literature in the novel, I argue, brings together the text's interest in both electronic textuality and the subaltern archive, thus establishing the stakes of the digital precisely on a revamped role for the literary in the context of globalization. As such, Ghosh's novel provides a useful opportunity for re-considering proposals for distant reading in relation to world literary studies and postcolonial criticism.

... the sheer enormity of the task makes it clear that world literature cannot be literature, bigger; what we are already doing, just more of it. It has to be different. The *categories* have to be different. - Franco Moretti, "Conjectures on World Literature" [Moretti 2000]

What does it mean to talk about the end of literature? Literature is built around an impossibility, an impasse internal to it. But this means that the end of literature is, in fact, a condition of its possibility. - Nicholas Brown, "One, Two, Many Ends of Literature" [Brown 2009]

Introduction

Published in 1996, Amitav Ghosh's *The Calcutta Chromosome* figures machine reading as an imaginative device enabling the recovery of subaltern histories and the construction of a posthuman future. The novel dramatizes a series of information recovery operations in which digital traces are retrieved from a seemingly all-encompassing electronic ether. The novel is thus centered around questions of digital archiving and digital forensics — central themes of the digital humanities. Indeed, Ghosh's exploration of topics of machine reading and digital forensics well exemplifies what Matthew Kirschenbaum has referred to as the "forensic imagination" in his study of electronic literature between the early 1980s and the mid-1990s [Kirschenbaum 2008], precisely the context for Ghosh's novel. Ostensibly a medical mystery, *The Calcutta Chromosome's* central question — how a mediocre scientist in the British imperial service in India was able to discover the mechanism of malaria's transmission through mosquitoes — is only solved when the work of a writer of Bengali vernacular literature is recovered alongside deleted emails and other documents retrieved through digital forensics. Acts of information retrieval pervade the novel as the narrative is assembled through the recovery of textual artifacts with the aid of a comprehensive digital archive named Ava. The narrative of the novel is pieced together through a series of increasingly dramatic recovery operations that extract digital textuality out of the electronic ether. The digital archive itself is figured in the novel by the character Ava, both an archive and an artificial intelligence who functions as a Spiritualist medium in order not only to solve the text's medical mystery but also to enable the posthuman

future to which the text gestures in its conclusion.

In this article, I use the depiction of machine reading in *The Calcutta Chromosome* to interrogate the status of the “digital literary,” a volatile concept that has emerged in the context of readings of electronic literature.^[1] The enigma of the writer of vernacular literature in a novel built around the trope of machine reading suggests that the status of the literary is by no means clear-cut in the context of electronic textuality. Recent work in the digital humanities has called for “not-reading” as a means of tackling the surfeit of electronic textuality made accessible through contemporary digital archives. As Franco Moretti has provocatively asserted, “we know how to read texts; now let’s learn how *not* to read them” [Moretti 2000, 57]. Moretti’s proposals have focused on what he has called “distant reading” in his influential *Graphs, Maps, Trees* where he advocates primarily quantitative methods for visualizing the data of literary production [Moretti 2007]. Matthew Kirschenbaum has expanded on the trend towards distant reading by suggesting that “data mining and associated technologies (like visualization) offer the promise of ‘not-reading’ the vast number of electronic texts that are becoming readily available from a variety of online sources” [Kirschenbaum 2007]. Data mining and other quantitative methods provide the promise of mastering large bodies of text through “not-reading,” a kind of extreme abstraction in which individual works of literature disappear in favor of electronic textuality in general. This abstraction depends on discarding precisely the distinctions that made the literary as a category possible to begin with, what Moretti calls in *Graphs, Maps, Trees*, “the old, useless distinctions” such as “high and low; canon and archive; this or that national literature” [Moretti 2007, 91].

But what can we make of the literary itself in light of this development of not-reading? As Nicholas Brown makes clear in his essay on the “end of literature,” the postmodern desire to dissolve the distinctions underlying the category of the literary raises a tension that is inherent to literature itself as it was theorized at the end of the 18th century [Brown 2009].^[2] The separation between the literary and textuality in general is a necessarily unstable one produced by the attempt to elevate the aesthetic to a mode of experience in its own right. Jacques Rancière has used the term “literariness” to describe the function of literature as a way of perceiving and interacting with the world autonomous from any particular subject matter or genre, an innovation of the aesthetic theories of the late-18th century culminating in the work of Balzac and Flaubert. Here, the literary stands abstracted from individual works of literature as part of a broader aesthetic regime that can be seen as, according to Rancière in *The Aesthetic Unconscious*, “legitimizing an unconscious truth not to be found in an individual history but rather in the opposition between two orders,” orders such as “the *figural* beneath the *figurative* or the *visual* beneath the represented *visible*” [Rancière 2009, 64]. In light of this itinerary of the concept of the literary in the period of modernity and its aftermath, we can see how techniques of not-reading do not eschew the concept of the literary but re-inscribe it on another level of formality. Not-reading involves articulating a sort of “unconscious truth” of literature grounded no longer on individual works but on the literary itself. Kirschenbaum’s work on the digital forensics of electronic literature suggests just such a notion of the literary with its critique of what he calls the “screen essentialism” in which “the graphical user interface is often uncritically accepted as the ground zero of the user’s experience” [Kirschenbaum 2008, 34]. In place of the individual work, Kirschenbaum relentlessly documents what, in the stunning conclusion to *Mechanisms*, he calls the “mute evidence” of “irrevocable difference” [Kirschenbaum 2008, 258] — the evidence of the mechanism itself operating behind any individual work. This status of data accorded to literary works, as we will see, undergirds the notion of the literary that emerges in the wake of not-reading.

It is precisely here that the depiction of machine reading in Ghosh’s *The Calcutta Chromosome* will allow us to address the question of the digital literary. Ghosh’s novel is a text that is famously difficult to classify: an historical novel set in the future that uses science fiction to pose questions about how the existence of a comprehensive, worldwide electronic archive refigures the possibility of cultural history. The narrative of the novel is reconstituted in between the gaps and silences of the archive, weaving together traces of the literature of imperialism and other varieties of “colonial modernism,” including the writing of military scientists and other officials, documents of European Spiritualism, and modern Hindi and Bengali vernacular literature [Ghosh 2001]. Vernacular literature is thematized in the novel in the figure of the writer named Phulboni, a name that inverts the pseudonym of the historical Bengali author Banaphool.^[3] If the novel situates vernacular literature, in the figure of the Bengali novelist, next to other records of the digital archive, it does so in order to give it too the status of data in an archive of electronic textuality. Ghosh’s work thus engages with the digital in order to imagine how to read the silence of the vernacular within the archive of modernity.^[4] Not-reading

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appears in the novel as a way to figure the silence (also a form of not-reading) around the vernacular, the recovery of which involves engaging with the “forensic imagination” at a moment of archive fever. I begin, then, with an investigation of the role of world literature in the digital archive as a way to understand *The Calcutta Chromosome*’s interest in situating the status of vernacular literature alongside the extreme inscription of electronic textuality. In this way, Ghosh’s exploration of the status of world literature *vis à vis* the digital archive allows us to think through the function of the literary in our own techniques for not-reading.

World Literature and the Digital Archive

The category of world literature is useful to think about in terms of the depiction of machine reading in *The Calcutta Chromosome* given that a significant variant of not-reading was first suggested in the context of the study of world literature. I refer of course to Franco Moretti’s proposal for “distant reading,” which shares an important if sometimes overlooked set of interests with similar calls for world literary studies^[5] [Moretti 2000]. Ghosh’s work is thus a useful starting point for thinking about not-reading in the context of world literature. *The Calcutta Chromosome* after all focuses on a New York-based Egyptian-born knowledge worker named Antar who uncovers the research of a Calcutta-born amateur historian of medicine named Murugan regarding a British scientist in India. Both Antar and Murugan have been employed by a non-profit named LifeWatch, which has since been swallowed up by a transnational corporation named the International Water Council, which undertakes among other things a cataloguing and investigation of global water resources in a near future suffering from “the depletion of the world’s water supplies” [Ghosh 2001, 7]. Antar investigates Murugan’s mysterious disappearance with the help of a digital archive and artificial intelligence named Ava. Antar and the reader are then led through a series of digital forensic operations, including Ava’s recovery of a deleted email sent by Murugan. Antar discovers that Murugan was in the process of solving a medical mystery, namely the secret behind the British colonial scientist Ronald Ross’s “official” discovery of the mechanism of malaria’s transmission. Through his research, Murugan uncovers the existence of a loosely organized group of indigenous scientists and Spiritualists who had developed a technique for the transmigration of souls while using cerebral malaria to treat syphilitics in Ross’s lab. It was thus an indigenous scientist named Mangala and her assistant, a migrant laborer, who allowed Ross, an otherwise mediocre scientist, to “discover” the mechanism of malaria’s transmission for which he was awarded the Nobel Prize in Medicine in 1902.

In piecing together this narrative, the writing and speeches of a Bengali vernacular novelist named Phulboni are crucial to the final unraveling of the mystery. For, as we learn, Phulboni himself encoded the Spiritualist program for the transmigration of souls in a series of short stories revolving around the migrant laborer figure named Laakhan. The interpretation of the Laakhan stories becomes the final step in the unraveling of the medical mystery and in many ways the culmination of the novel — they reveal not only how the Laakhan figure had been active in the preservation of the “Calcutta chromosome,” but also point to Phulboni’s own involvement with the Spiritualist program at the time of Murugan’s disappearance. Phulboni’s ghost stories appear as the final forensic operation of many beginning with the recovery of Murugan’s LifeWatch ID by Ava. The literary thus plays a starred role in the novel *vis-à-vis* the digital; the vernacular literary text is recovered and presented in the novel just as Murugan’s deleted email is recovered from the digital ether. Placing the literary and the digital on the same terrain, the writer of vernacular literature joins the global diasporic knowledge worker in the novel’s imagined aesthetic utopia.^[6] In fact, the digital archive Ava already functions as a technology of the vernacular literary; Antar, we are told, has selected a localized interface for Ava in the Arabic dialect of his Egyptian village. Thus, at times in Ava’s language Antar “would recognize the authorship of a long-forgotten relative in an unusual expression or characteristic turn of phrase” [Ghosh 2001, 14].^[7] Ava’s “localization” functions in this way as a technology for recovering the vernacular expressed in terms of the literary, that is, “authorship.”

Phulboni’s articulation of literariness provides a key to understanding the function of the work of literature in a novel where reading is otherwise depicted as machine reading or not-reading. As I have suggested, Phulboni’s work plays a significant role in the novel, not just in the form of the Laakhan stories, but also as short speeches punctuating the text. As Claire Chambers has noted, Phulboni’s discourse on “silence” provides a foundation for what Murugan terms “counter-science,” the method used by the indigenous researchers including Mangala and Laakhan to develop the

“Calcutta chromosome” [Chambers 2009].^[8] At the same time, Phulboni’s speeches provide a theorization of the concept of the literary that ties the novel’s depiction of literary works to both counter-science and the digital archive. According to Phulboni’s speeches, silence is closely connected to the concept of the literary itself: “indeed the Word is to this silence what the shadow is to the foreshadowed, what the veil is to the eyes, what the mind is to the truth, what language is to life” [Ghosh 2001, 29]. Precisely this notion of silence crops up again in Murugan’s description of counter-science, a method that “would in principle have to refuse all direct communication, straight off the bat, because to communicate, to put ideas into language, would be to establish a claim to *know*” [Ghosh 2001, 104–105]. In contrast to the claim to know implicit in scientific discourse is the assertion of silence by the practitioners of counter-science including Phulboni, the vernacular literary writer. Ava’s digital forensic operations thus take place as yet another articulation of the relation between speech and silence alongside both vernacular literature and counter-science.

We can see how the depiction of the digital in the novel dovetails with Phulboni’s articulation of the literary through a closer reading of Ava as digital archive. Ava, we learn in the first pages of the novel, has been programmed by the megacorporation International Water Council to generate detailed metadata pertaining to material objects so as to collect information that may someday benefit its activities. Antar’s job is to oversee and facilitate Ava’s data collection:

Somewhere along the line she had been programmed to hunt out real-time information, and that was what she was determined to get. Once she’d wrung the last, meaningless detail out of him, she’d give the object on her screen a final spin, with a bizarrely human smugness, before propelling it into the horizonless limbo of her memory. [Ghosh 2001, 4]

While digital archiving is described as a “horizonless limbo,” it is also filled with “meaningless detail.” Machine memory lacks a horizon of intelligibility because it is not capable of producing meaning or interpretations. Hence, the corporation has tasked Ava with the recording of all the details of the world: “The investigation Officers had run everything they could find through Ava, all the endless detritus of twentieth-century officialdom — paper-clips, file-covers, diskettes” [Ghosh 2001, 7]. Antar comes to understand, based on his own experience observing foreign archaeologists in Egypt when he was a child, that the corporation’s vast archival endeavor has to do with the historical consciousness of those who are doing the archiving. Antar realizes that:

They saw themselves making History with their vast water-control experiments: they wanted to record every minute detail of what they had done, what they would do. Instead of having a historian sift through their dirt, looking for meanings, they wanted to do it themselves: they wanted to load their dirt with their own meanings. [Ghosh 2001, 7]

Ava’s archiving therefore describes a circuit from historical meaning to the “horizonless limbo” of memory. Ava functions through a kind of archive fever in which what Kirschenbaum refers to as the “forensic imagination” is enabled by the necessary oblivion of the archive’s memory. We can thus place the opposition that arises in digital archiving between “meaning” and “dirt” alongside Phulboni’s opposition between speech and silence, or the word and the world. In this way, the digital archive is grounded on the same concept of literariness as Phulboni’s works of vernacular literature and Murugan’s notion of counter-science.

At issue in the novel’s discourse of the literary, I am arguing, is a concept of data that underlies not only literariness but also the discourse of machine reading or not-reading. As recent critics in postcolonial historiography and media studies have shown, this concept of data or evidence is closely connected to an historical consciousness that also encompasses the archival impulse in new technologies of representation. As Dipesh Chakrabarty describes, “Historical evidence (the archive) is produced by our capacity to see something that is contemporaneous with us ... as a relic of another time or place. ... A particular past thus becomes objectified in the observer’s time” [Chakrabarty 2007, 238]. If the document in the archive is seen as an objectification of the past in the present, the status of evidence may be compared to the photographic image as a way of capturing the presence of the past in an objective form. Mary Ann Doane’s *The Emergence of Cinematic Time* has documented the way “a logic of the archive” functions in photography and cinema’s “problematic and contradictory task of archiving the present” [Doane 2002, 105]. Specifically, the indexical theory of photography that sees the photographic image as the direct emanation of an object situates the

status of the image as evidence in terms of historical consciousness. Evidence is, then, that which in the present directly emanates from what Chakrabarty calls a “particular past,” from “another time or place” into the present time of the observer. This logic of historical evidence is inseparable from the claims of technologies of representation to give unmediated access to objects in the world. For Doane, new technologies of the archive present an extension and intensification of this claim to immediacy.^[9] In this view, the digital archive presents the culmination of a logic of the archive in which historical evidence is seen as the immediate emanation of a past reality.

Exactly this question of the status of data brings together the threads of world literature and the digital archive. In her study of the British book trade in colonial India, Priya Joshi emphasizes the importance of data in making visible aspects of the past occluded in traditional historical accounts [Joshi 2002].^[10] For Joshi, this is not a speculative project but is made possible by the very data accumulated in the existing archive. She writes: “Within a historical record that has emphasized the data of production, patterns of reading as consumption nonetheless make themselves visible, paradoxically within the very data and statistics that apparently eschew them” [Joshi 2002, 27]. For Joshi, the material history of the production and consumption of literature emerges from the archive in the form of quantitative data. Franco Moretti also frames his proposal for distant reading using quantitative methods around the question of the status of data. In *Graphs, Maps, Trees*, Moretti points out that quantitative research “provides data, not interpretation” and emphasizes that his method is one of “explanation” rather than “interpretation” [Moretti 2007, 9]. Moretti, in his explication of distant reading, repeatedly notes being struck by the surfeit of texts one encounters working in the archive. Distant reading emerges self-consciously as a response to the archive’s surplus; it is simply not possible to read the more than 30,000 novels produced just in one country in one century, so new techniques are required, ones that deal with the archive by reducing texts to data for explanation and no longer meanings for interpretation [Moretti 2007].^[11]

Among the criticisms of Moretti’s proposal for distant reading, perhaps the most interesting has turned on this question of interpretation versus explanation, which is to say, on the evidentiary status of data in the archive. In a reply to Christopher Prendergast, Moretti revises and expands his distinction between interpretation and explanation [Moretti 2006]. He acknowledges that the two are in fact intertwined, and that explanation requires interpretation. In a remarkable passage, Moretti explains this nuance with recourse to the example of Freudian dream interpretation. Moretti quotes Paul Ricoeur’s *Freud and Philosophy* to say, “interpretation cannot be developed without calling into play concepts of an entirely different order, energy concepts” [Moretti 2006, 82]. In Freudian psychoanalysis, dream interpretation can only proceed on the basis of an understanding of the dream-work underlying the production of dreams, what Freud identifies as the mechanisms of condensation, displacement, and the conditions of representability. In other words, concepts involved in the explanation of the dream are indispensable in producing an interpretation of it. Moretti compares distant reading with dream interpretation, then, in which the use of “energy concepts” are required to produce an explanation of aesthetic forms. This is what Moretti means when he describes “form as the most profoundly social aspect of literature: form as force” [Moretti 2007, 92]. An aesthetic or literary form, for Moretti, is the result of operations of force from outside the text that are social and material, and the task of distant reading is to grasp these forms in the abstract in order to read the traces of this force.

“Form as force” operates for Moretti as a mode of imprint in which aesthetic forms are directly inscribed in the data of literary production. Data provide a kind of historical evidence in which historical meanings are one and the same as the objects of analysis. As he elaborates, “As in an experiment, the force ‘from without’ of large national processes alters the initial narrative structure beyond recognition, and reveals the direct, almost tangible relationship between social conflict and literary form. Reveals form as a diagram of forces; or perhaps, even, as nothing but force” [Moretti 2007, 64]. Moretti is interested in reading these social forces and “national processes” that originate in the “from without,” or the material world in the form of the literary text, an interest he attributes to the influence of Marxist criticism from the 1970s. Distant reading is then a form of reading that seeks to abolish the individual work of literature in order to achieve a broader identification between texts and the world. The goal is a criticism where individual texts are replaced by text as such, literature by the literary, no longer seen as a separate register but as one form of the data of the world, now opened to social and material analysis. As we have seen, the literary is by no means absent from this maneuver. Literary form has simply been isolated from individual cases and grasped as an abstraction. Literary works have been replaced by the literary as such, which is precisely what is at stake in Moretti’s version of not-reading, as he puts it:

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“world literature is not an object, it’s a *problem*, and a problem that asks for a new critical method: and no one has ever found a method by just reading more texts” [Moretti 2000, 55].

If not-reading seems to underlie the study of world literature in Moretti’s influential proposals, Ghosh’s own longstanding interest in world literature may provide one way to understand the function of the Phulboni character in relation to the digital archive in *The Calcutta Chromosome*. As we have seen, the concept of world literature is significant not only to postcolonial criticism but also new modes of reading associated with digital humanities. In a fascinating email exchange between Amitav Ghosh and Dipesh Chakrabarty, Ghosh picks up on an intuition of Chakrabarty’s that the Bengali writer Rabindranath Tagore’s writing on “world literature” is based on a translation of this concept from Goethe. While Chakrabarty acknowledges that the evidence for this genealogy is only intuition, Ghosh does not hesitate to express his concurrence with Chakrabarty’s insight [Ghosh & Chakrabarty 2002]. The exchange between Ghosh and Chakrabarty is interesting in terms of assessing the stakes of digital reading in Ghosh’s text inasmuch as Chakrabarty’s writing on planetary reading has received attention alongside Moretti’s proposals for distant reading. Tagore is an interesting figure to take up in the context of *The Calcutta Chromosome* inasmuch as Phulboni’s Laakhan stories are at least in part modeled on Tagore’s ghost stories.^[12] One final intertextual reference for Phulboni in the novel is worthy of comment: the postcolonial Hindi writer Phaniswarnath Renu, whose ghost stories have also been identified as a source for the Laakhan stories. As Bishnupriya Ghosh has pointed out, Tagore and Renu are important sources for the Phulboni character because they “saw their literary projects as crucial to the formation of a national ethics beyond the narrow concerns of territorial governance and sovereignty” [Ghosh 2004a, 201]. Both writers used their cultural capital as literary writers to advance political projects in colonial and postcolonial contexts. This is the significance of the fact that we are first introduced to Phulboni at an award ceremony: like the digital, the literary as marker of prestige functions on a transnational level, literally beyond the nation.

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The figure of Tagore is thus significant in the novel in another, less obvious way — like Ronald Ross, Tagore is a Nobel Prize winner. The Nobel Prize as a marker of the literary is evident when one considers Ghosh’s reflective essay on “The March of the Novel Through History: The Testimony of My Grandfather’s Bookcase,” published in *The Kenyon Review* [Ghosh 1998]. The essay describes the disparate collection of books amassed by a certain “book-loving uncle” and “the regime that stood between me and the bookcases” when another “branch of the family that was very far from bookish” forbade him from “secret pillaging of the bookcases” [Ghosh 1998, 14]. Despite the feeling “that books rotted when they were not read” and a sense of “injustice that nonreaders should succeed in appropriating” such a library, it is paradoxically as a result of this experience of non-reading that Ghosh learns the meaning of “a proper book” [Ghosh 1998, 14]. And it turns out that the organizing principle for this collection of books had little to do with their content; rather it was the status of their authors as winners of the Nobel Prize. Ghosh then gives a reading of the Nobel Prize itself as “both symptom and catalyst of a wider condition: the emergence of a notion of a universal ‘literature,’ a form of artistic expression that embodies differences in place and culture, emotion and aspiration, but in such a way as to render them communicable” [Ghosh 1998, 16]. For Ghosh, the internationalization in the idea of a world or “universal” literature was the lesson of the novel in the former British colonies. With the novel as an international genre came also a version of not-reading, the novel as an institution having more to do with its globality than with the contents of any one work or the style of any one author. This is why it is significant that Phulboni is first introduced in the novel in the context of his appearance at an award ceremony. The literary thus figures in *The Calcutta Chromosome* for this reason: because the literary is the category that conveys a set of values precisely in the form of its opposite: not-reading, silence, or oblivion.

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The Aesthetics of Machine Reading

As we have seen, the novel is centered on depictions of machine reading, which provide a set of aesthetics framing the text’s discourse on the literary. Although *The Calcutta Chromosome* is Ghosh’s only science fiction novel, and only novel addressing the digital, as a blogger and active Twitter user, Ghosh’s own status as author is in many ways deeply invested in new media. It is similarly interesting to think of email itself as a genre informing the scholarly exchange between Ghosh and Chakrabarty that I addressed above. Email and other digital technologies can be seen as scholarly infrastructure facilitating intellectual exchange among a global community of diasporic intellectuals. The depiction of

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machine reading and digital forensics in *The Calcutta Chromosome* fits very much within this context. The novel thus proceeds through Antar's attempts to piece together the medical mystery sparked by the disappearance of his former LifeWatch co-worker Murugan and his archival work on Ronald Ross's discoveries about the transmission of malaria. This process reflects the novel's own generic instability as it pulls together textual records in a variety of formats and sources, including diaries and letters of medical researchers, spiritualists, Murugan's own research, and finally the work of Phulboni, the writer of vernacular literature depicted in the novel. As Bishnupriya Ghosh describes the novel, "The narratives of several scientists, administrators, linguists, missionaries, doctors, and Spiritualists are constantly displaced, replaced, cut and pasted" [Ghosh 2004a, 213], a formal effect of the novel she also refers to as "grafting." This sense of "cut and paste" through the novel is the method of the archival recovery that Antar undertakes with the assistance of Ava. Antar mines the digital archive in order to piece together the sources of the narrative left behind by Murugan's attempt to unravel the mystery. Digital forensics become key to this work as Antar realizes that a deleted email from Murugan containing an account of his discoveries may provide the key to understanding what happened to him. To do so, Ava must "rummage through the accumulated memories of all his old, superseded hard disks" [Ghosh 2001, 127]. The "hard disk" as a physical medium is described as a writing technology not far from the account given by Kirschenbaum in his work on the "forensic imagination" inasmuch as it exists as a layering of memories where earlier traces can emerge to the surface through more recent traces inscribed over them. Murugan's email exists as what the novel calls a "binary 'ghost'" [Ghosh 2001, 127], making Ava one of several Spiritualist medium figures in the novel.

The novel thus suggests forensic analysis as a reading strategy that we situate alongside a broader range of new reading practices that have been generated by quantitative approaches to literary study. Regarding his own use of computer forensics to read a work of digital interactive fiction, Kirschenbaum writes, "This exercise [forensics] allows us to explore critical reading strategies that are tightly coupled to technical praxis, here including the use of a hex editor to inspect heterogeneous information once deposited on the original storage media" [Kirschenbaum 2008, 20]. Computer forensics of a digital literary text involves analyzing the text as data, "heterogeneous information" that is now only recoverable as hexadecimal codes. The viewing of text as code may render it illegible to traditional close reading but can nevertheless enable a form of reading closer to the "technical praxis" involved in the production of the work. The reading practice that Kirschenbaum develops here exists in a continuum with other forms of reading that have been proposed in conjunction with new practices of electronic textuality. Specifically, the prospect of digitizing increasingly wider swaths of the literary archive and of storing bibliographic information on that archive in a searchable form opens literary history to new forms of machine reading and quantitative methods. Elsewhere, Kirschenbaum himself has advocated data mining as an approach to the analysis of poetry, which he describes as continuous with a long history of changing reading practices [Kirschenbaum 2007]. Indeed, under the influence of Moretti, data mining and other quantitative methods have become known as "distant reading," the very opposite of traditional close reading. Kirschenbaum himself has made this connection when he writes, "The adoption of computational techniques within the humanities allows us to build tools that support the basic tenants of not-reading or distant reading" [Kirschenbaum 2007]. The specific goal of new computer-driven tools for reading is to counter the close analysis of an individual text as in close reading. Individual texts recede into the background in favor of an analysis of text as such.

As I have suggested, digital forensics in *The Calcutta Chromosome* describe a limit case of the ability to restore digital information, a point of what Kirschenbaum refers to as "extreme inscription" [Kirschenbaum 2008]. In order for the information to be retrieved Ava must not simply restore it from the material surface of a hard drive but, in one of the novel's most fantastical moments, must seek the electronic traces of the information from the atmosphere, an image of the "ether" to which forgotten digital information disappears. As the novel describes:

The message might still be found, Ava told him. It would just take a while. It had been typed on one of those old-fashioned, contact-based alphabetical keyboards. The electronic signals emitted by the keys were probably still traceable. It was simply a question of matching the electronic "fingerprint" of Murugan's E-mail message to every electronic signal that was still alive in the ionosphere. [Ghosh 2001, 127]

This depiction of Ava scouring the "ionosphere" is indeed a sort of limit case for the forensic imagination as Kirschenbaum would put it. But what the novel is doing in this account is dramatizing a fantasy of extreme recoverability

of electronic information enabled by digital media. Kirschenbaum's take on the discourse of the "virtual" in new media underscores the fact that what is thought of as the immateriality of information is in fact a form of materiality that is visible given the appropriate techniques and practices of detection and visualization. As he writes, "the ether into which digital objects are often said to vanish is a historically constructed and contested site, with a rich tradition of visualization and imaging/imagining that erupted in the late nineteenth century" [Kirschenbaum 2008, 67]. This facet of digital media is underscored in the novel when it turns out that Murugan's email could be recovered from a practically incalculable amount of data in only a matter of minutes. The fantasy invoked here would have it that all information has an electronic signature that can be located somewhere given sufficient processing ability. And thus, historical memory too can be reshaped and reconstituted, new narratives discovered and produced, and new meanings generated.

As is already clear, Kirschenbaum's study of digital forensics and electronic literature offers a number of surprising points of intersection with Ghosh's *The Calcutta Chromosome*. The imagination of the digital archive in *The Calcutta Chromosome* is very much informed by early discourses on machine reading and electronic textuality. At the same time, the plot of the novel turns on the use of digital forensics, the fact of the indelibility of electronic inscription. As Kirschenbaum puts it succinctly, "The hard drive, and magnetic media more generally, are mechanisms of extreme inscription — that is, they offer a limit case for how the inscriptive act can be imagined and executed" [Kirschenbaum 2008, 74]. *The Calcutta Chromosome* also presents a limit case for imagining the very possibility of digital forensics, the idea that any electronic inscription can be recovered, even inscriptions not written on to the surface of a hard drive disc. The impossibility of forgetting, both culturally and materially, is a constitutive property of electronic textuality. Kirschenbaum points out, "Computing is thus situated within a millennia-long tradition of reusable writing technologies, a tradition which also includes wax writing tables, graphite pencils, and correctible typewriter ribbons" [Kirschenbaum 2008, 70]. Inasmuch as electronic inscription is impervious to forgetting, what Kirschenbaum calls the "uniquely indelible nature of magnetic storage" [Kirschenbaum 2008, 51], we may add to this tradition of reusable writing, although he does not, Freud's example of the mystic writing pad, which provides a perpetually fresh surface for new inscriptions even as it stores a record of what came before.^[13] Moreover, as a science, computer forensics has a history that Kirschenbaum finds to be almost uncannily close to modern textual criticism, the nineteenth century disciplines of "questioned document analysis" and forensic science in general with its specialty in analyzing "trace evidence." Not only does digital forensics counter the prevailing notion of ephemerality in digital media, but also it provides a reading practice that offers an alternative to what Kirschenbaum sees as the screen essentialism of prevailing accounts of electronic textuality. Digital forensics makes visible for analysis the traces of electronic inscription generated by digital literature, in a sense freeing interpretation from screen.

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Ghosh is thus interested in the figure of the digital archive in part for its relevance to contemporary practices of memorialization and historiography. As Kirschenbaum's interest in digital forensics makes clear, new media raise significant questions about the ephemerality of cultural memory and the desire for a record that is impervious to forgetting. The critic Andreas Huyssen has explicated the contemporary condition of "memory fever" evidenced by the craze for museum building and other memorializing projects, which seems closely connected to the imagined implications for memory and forgetting offered by digitization. Huyssen addresses the concern over digital archiving from a perspective not far removed from Kirschenbaum's writing on digital forensics. Huyssen writes:

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Some have turned to the idea of the archive as counterweight to the ever-increasing pace of change, as a site of temporal and spatial preservation. From the point of view of the archive, forgetting is the ultimate transgression. But how reliable or foolproof are our digitalized archives? Computers are barely fifty years old and already we need "data archaeologists" to unlock the mysteries of early programming. [Huyssen 2003, 26]

The emergence of computer forensics as a full-fledged science speaks to the need to counteract forgetting. Kirschenbaum's critique of the view of new media as ephemeral aligns with this caution against over-anxiousness about digitization. What he calls the "forensic imagination" is therefore nothing other than a way to describe the practices of memorialization that emerge in contemporary culture to guard against this fear of oblivion. As Huyssen continues, "The threat of oblivion thus emerges from the very technology to which we entrust the vast body of contemporary records and data, that most significant part of the cultural memory of our time" [Huyssen 2003, 26]. The cultural stakes of the

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forensic imagination are closely connected with the institutions of the archive and the museum, emerging from this paradoxical relation between remembering and forgetting.

What, then, does this reading of the “forensic imagination” at work in the aesthetics of machine reading offer us for assessing the stakes of the digital literary? In *The Calcutta Chromosome*, while digital forensics is the last of the archival strategies used in the novel to recover the fragmentary texts through which the narrative proceeds to this point, once Phulboni’s ghost stories are identified as the final piece of the puzzle, machine reading again becomes consequential in the final assembly of the Spiritualist program for the transmigration of souls. At the end of the novel, it becomes clearer why the novel takes the form of science fiction at all — because the perspective for taking in all the fragmentary narratives that the text assembles requires new reading technologies. As Murugan speculates, “maybe they’re waiting on a technology that’ll make it easier and quicker to deliver their story to whoever they’re keeping it for: a technology that’ll be a lot more efficient in mounting it than anything that’s available right now” [Ghosh 2001, 219]. This technology, it turns out, is Ava. Thus, the novel imagines a future of the digital in which the digital archive’s capacity for nearly infinite storage allows the reader, in this case Antar, to achieve the perspective of the posthuman future. The literary work, as the last of the “cut and pasted” texts of the narrative, is not peripheral to this process, but is conceptualized in the novel as central to the transformations enabled by the digital. As Bishnupriya Ghosh puts it in her reading of the text, “By the end of the novel, the vernacular literary tale is the *only* authoritative means through which the characters can decode the muddled and untruthful records of scientific discovery” [Ghosh 2004a, 214]. Machine reading, then, in the novel’s conclusion, is posited as the technology by which the local knowledge encoded in subaltern texts — unrecognizable in conventional histories — is preserved for the posthuman future of the novel’s imagined aesthetic utopia.

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The depiction of machine reading in *The Calcutta Chromosome* presents a number of challenges for our conception of the digital literary. The novel asks questions, in other words, about how the literary as such functions in light of the collapsing of distinctions by which all texts become objects of computational analysis or “not-reading.” While it is tempting to consider that the literary as a category is outmoded by “not-reading” (the tantalizing possibility held out by Moretti in the promise of going beyond the canon), my reading of *The Calcutta Chromosome* suggests that this is not the case. In such texts of the “forensic imagination,” “not-reading” does not eschew the literary so much as it articulates it on another level formality — the historiographic register of the inscription of evidence or data, of which computational methods and digital forensics may be seen as an intensification. If we return by way of a conclusion to Phulboni’s speeches on writing and silence we can expand on this insight:

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But here our city, where all law, natural and human, is held in capricious suspension, that which is hidden has no need of words to give it life; like a creature that lives in a perverse element, it mutates to discover sustenance precisely where it appears to be most starkly withheld — in this case, silence. [Ghosh 2001, 25]

The literary becomes visible at the point where the object exists as a kind of pure presence freed from the demands of exegesis. The literary speaks in its own voice inasmuch as it does not require the critic to speak for it. Thus, the paradoxical relation to memory we see in Ava’s digital archiving, where the object is imbued with the meaning of the archivist and thereby consigned to the meaninglessness of computer memory, is repeated. So too, the literary object both speaks and is silent, is recognizable as literary inasmuch as it is silent in the world, a condition that Rancière refers to as the paradoxical “silent speech” central to his notion of “literariness.” [14]

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This conception of the literary, memory and the digital archive ties together the novel’s historiographical project. In theorizing the Spiritualist program he has discovered in the secret history of malaria research, Murugan describes what he calls the “counter-science” that functions in contrast to established scientific endeavor. As we have seen, Murugan assumes that silence and secrecy would be foundational assumptions of the functioning of counter-science in contrast to the epistemological hegemony of scientific ways of knowing. The post-historicist perspective of the future adopted at the end of the novel through the mediation of Ava is thus the one that brings both the secret non-knowledge of counter-science and the silent speech of literature to culmination. As I have been arguing, this revision of not only the historical record as contained in the archive but also the entire historicist way of knowing is key to Ghosh’s project. The

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conclusion of *The Calcutta Chromosome* in Antar's embrace of the posthuman future prepared by the Spiritualist cabal continuing the work of the indigenous practitioner Mangala, discovered by Murugan's research, and encoded in the work of vernacular literature by Phulboni, is in line with Dipesh Chakrabarty's advocacy of the post-historicist perspective of the future in the now. Chakrabarty describes this futurity as the "other futurity we could refer to as the futures that already are" [Chakrabarty 2007, 250]. This, then, is what Ghosh's novel has to say about the future of digital memory and machine reading, that new reading practices function on a continuum with archival practice and literary aesthetics. The "silent speech" that is constitutive of the subaltern archive is also that which enables the transformation of reading in the digital age.

Notes

[1] Kirschenbaum frames his work as a study of "electronic textuality and the digital literary" [Kirschenbaum 2008, 7], but what the literary itself has to contribute to discussions of digital forensics is unstated in his text. See also *Electronic Literature: New Horizon of the Literary* [Hayles 2008].

[2] Brown has a larger discussion of the itinerary of the concept of "literature" in *Utopian Generations* [Brown 2005]. For another historical account of the rise of literature at the beginning of modernity, see Eagleton, *Literary Theory* [Eagleton 2008].

[3] I am grateful to Bishnupriya Ghosh for this insight.

[4] There is an important body of criticism on the vernacular in modern and postcolonial literature. See Michael North, *The Dialect of Modernism* [North 1994], Bishnupriya Ghosh, *When Borne Across* [Ghosh 2004b] and Gauri Viswanathan, *Masks of Conquest* [Viswanathan 1989].

[5] See, for example, the essays collected in *Debating World Literature*, which republishes Moretti's "Conjectures on World Literature" among other contributions to the field, including Emily Apter's "Global *Translatio*: The 'Invention' of Comparative Literature, Istanbul, 1933", which situates Moretti's "distant reading" alongside the historical development of comparative literature as a discipline [Apter 2003, 78–79].

[6] I am indebted to John Su's reading of Ghosh's work in light of the "aesthetic turn" in postcolonial criticism [Su 2011]. Su gives a reading of Ghosh's *The Glass Palace* in terms of aesthetic utopianism, but the role of the vernacular writer Phulboni in enabling the posthuman utopian conclusion to *The Calcutta Chromosome* also fits Su's analysis.

[7] Compare this moment in *The Calcutta Chromosome* to Ghosh's realization that the Arabic dialect of the village where he studied in Egypt was actually closer to the ancient texts he was studying, leading to the uncanny experience of recognizing voices of village characters in thousand-year-old texts.

[8] See as well Bishnupriya Ghosh, "On Grafting the Vernacular" [Ghosh 2004a], to which I am much indebted throughout this article.

[9] As she writes, "The fascination with an impossible instantaneity is still with us, perhaps even more insistently, corroborated by a continuing chain of technologies of representation — photography, cinema, television, the computer" [Doane 2002, 106].

[10] The reading of the archive of "world literature," particularly in the context of colonial India, is not absent from Franco Moretti's work, particularly in *Graphs, Maps, and Trees* in his analysis of Priya Joshi's research on the British book trade in colonial India [Moretti 2007]. Moretti points out that Joshi's research is an exception to the overall trend he notices from comparative research on the "rise of the novel" in a number of national contexts, which he attributes to the reaction to the 1857 rebellion. (The question of how to read the mutiny of 1857 also figures prominently in the email exchange between Ghosh and Chakrabarty to which I refer below [Ghosh & Chakrabarty 2002].)

[11] Moretti sees his project as a way of displacing the question of how the received canon of literary texts fits into the broader archive of texts produced in just one period in one national context: "Yes, theories are nets, and we should evaluate them, not as ends in themselves, but for how they concretely change the way we work: for how they allow us to enlarge the literary field, and re-design it in a better way, replacing the old, useless distinctions (high and low; canon and archive; this or that national literature . . .) with new temporal, spatial, and morphological distinctions. [Moretti 2007, 91]"

Moretti replaces these "old, useless distinctions" [Moretti 2007] by replacing the reading of texts with the analysis of data.

[12] [Chambers 2009] and [Ghosh 2004a] both provide readings of the Laakhan stories in light of their intertextual references in the works of Tagore and Renu.

[13] Kirschenbaum:

“You can’t really erase a hard drive,” unequivocally state the authors of one computer forensics textbook, likening it to the way a child’s Etch A Sketch retains the images of previous drawings. In fact you can erase a hard drive, but it is a deliberate and painstaking process, best attempted with the proper tools by an expert who understands the full extent of the issues involved. [Kirschenbaum 2008, 60]

[14] For Rancière’s discussion of “silent speech” in relation to literariness, see *The Aesthetic Unconscious* [Rancière 2009].

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