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Tropical Topographies: Mapping the Malarial in *The Calcutta Chromosome*

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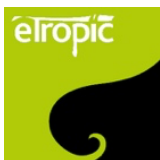
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Abstract

This paper reads colonial archives of malaria in conjunction with Amitav Ghosh's futuristic medical thriller *The Calcutta Chromosome* (1995) and contends that the novel, loosely based on Sir Roland Ross, ruptures narratives of colonial expertise. The colonial expertise on malaria is embodied by Ross, an officer in the Indian Medical Service; this is in contrast with the model of expertise proposed by the novel. While Ross's expertise is predicated on the domination of nature and controlling diseased tropical landscapes, the novel resists imperial strategies of mapping and disease control. This paper argues that *The Calcutta Chromosome* presents an alternative attempt to map the malarial, rewriting history by displacing actors such as Ross and instead placing two colonial subjects, Murugan and Mangala, at the centre of new mapping practices. The novel further questions the notion of 'colonial improvement' which malaria facilitated in imperial regimes. Deviating from the colonial history of improving the native body and landscape as a cure for malaria, the novel foregrounds subjugated subjects working at the peripheries of laboratories and scientific practices and thus subverts the notion of the 'improved subject' by proposing the idea of the mutational, transformational 'Calcutta chromosome.'

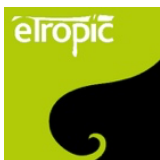
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Introduction: Malarial Landscapes and the Indian Tropics

Ronald Ross, an officer in the Indian Medical Service, received the Nobel Prize for Medicine in 1902 for his work on the lifecycle of the malarial parasite. In his *Memoirs*, Ross sums up how he was introduced at the Nobel ceremony: he was congratulated for revealing “the mysteries of malaria” and his role in the enterprise of public health is acknowledged with the claim that he had “founded the work of preventing malaria, this veritable scourge of many countries” (Ross, 1923, p. 479). His *Memoirs*, along with the collected letters between Ross and Patrick Manson, and Ross’s foray into public health in his published manual *Mosquito Brigades and How to Organise Them* (1902) illustrate the importance of his work. In *Memoirs* and *Mosquito Brigades*, Ross builds a persona of expertise seasoned by the years he spent working for the colonial service in India. In the former, Ross frames his work on the malaria problem as his duty, a way to contribute to “the all-important matter for tropical sanitation” and to save “a gigantic amount of misery in the world” (Ross, 1923, p.125). Ross alludes to his experience multiple times with an emphasis on his 20 years of experience in the tropics (Ross, 1902). Ross’s accounts thus present the solution to the malaria problem as something driven by human will and energy. This is evident in Ross’s use of heroic sea voyaging metaphors to capture his journey as he compares himself to Columbus (Ross, 1923, p. 227), projecting himself as someone who sailed on stormy seas to finally achieve success.

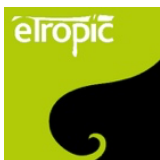
Ross’s views on India and the tropical character of the Indian landscape come across in *Memoirs* and in the letters that he wrote to Manson. Ross viewed malaria as a tropical disease which was a major obstacle to the settlement and civilization of the tropics by the white race (Ross 1923). By the 1830s the notion of degeneration of whites in the tropics had taken hold, prompting a search for areas suitable for European habitation in India (Harrison, 1999). Consequently, there was a drive to map India into different zones based on climate, since the belief was that Europeans lived longer in more ‘temperate’ regions of India. This led to mapping India according to climatic zones, classed by the potential of landscapes to house Europeans. The resulting enterprise of ‘medical topography’ was similar to the botanical and military mapping and surveying projects undertaken by the British in the late 18th century (Harrison, 1999). The idea that certain climates are intolerable to Europeans is also echoed by Ross when he complains that the climate in India is hell and that it is making him ill (Ross, 1923). It is in this context that one needs to understand Ross’s remarks in *Memoirs*, which links climate and disease, when he wonders whether Indian civilization has fallen into decay because of the climate and whether the same will happen in Europe (Ross, 1923). As David Arnold has shown, the association between



malaria and India was prominent between 1890 and 1920, even though malaria was a problem in southern Europe in 1900 (1998; 1999). India's inclusion in the geographical imaginary of the tropics meant a shift from the view of India as the seat of an ancient civilization, towards India as a landscape overrun by tropical overabundance of nature and proliferating disease (Arnold, 1997). Ross's views echo the same sentiments which led to the rise of tropical medicine and the subsequent views of the tropics as a diseased landscape (Worboys 2012; Arnold 1997). The fact that Ross's pioneering work on malaria was carried out in India strengthened the links between India and tropical disease (Arnold 1997; 1998). The improvement of the diseased landscape was to be undertaken through Western medicine, with the help of experts like Ross.

In contrast to this narrative of expertise, wherein the solution to the malaria problem comes from a rational, scientific, and anthropocentric approach, Amitav Ghosh's novel *The Calcutta Chromosome* presents an alternative history of malaria research through Murugan, a self-described "world's greatest living expert on Ronnie Ross" (Ghosh, 2001, p.198). Murugan hypothesizes that the real work of solving the malaria problem was done by a secretive religious group led by an Indian woman named Mangala, who works as a cleaner in a Calcutta lab to which Ross eventually makes his way.¹ Murugan presents his hypothesis in conversation with various characters in the novel, in particular his Egyptian colleague Antar, and a magazine writer in Calcutta named Urmila. These characters, themselves, capture malarial geographies. Murugan and Urmila come from Calcutta, where Ross also worked and finally solved the malarial problem, while Antar is from Egypt. The novel presents a trajectory which links these malarial locations through a Hungarian archaeologist journeying from India to Egypt, and who met Antar in his boyhood. The link between India and Egypt is likewise established in Ross's *Memoirs* and his manual *Mosquito Brigades*, as well as in one of Ross's letters to Manson. Ross, disgruntled with the situation in India, considers working for "other masters," and asks Manson's opinion on working in Egypt (Ross, 1923, p. 297). Ross identifies Ismailia in Egypt as "the perfect proof" of the "long and tedious malaria work" (Ross 1923, p. 470). Ross's approach to tropical medicine, which relied on sanitation and altering landscapes, brings together multiple malarial geographies in which Ross casts himself as a protagonist. While Ghosh's novel likewise draws together the same malarial geographies that appear in Ross's narratives, the novel presents these geographies in order to produce a narrative that deviates from the colonial anthropocentric mode. Furthermore, contrary to the

¹ Mangala's religious sect wants to use Ross in their quest, so they feed him bits of information to advance the theory of malaria that he finally arrives at. Ross making his way to the lab is one of the steps that the sect undertakes to make sure that its aims are met.

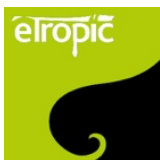


discourse of medical topography which sought to map India, the novel reveals an alternate discourse which frustrates attempts at mapping and surveying malarial geographies.

Scholarly engagement with the novel has studied it as science fiction, a form that enables it to question the boundaries between science, viewed as objective and neutral, and fiction, viewed as subjective (Chambers, 2003). Another reading frames it as an instance of 'social science fiction,' with the novel itself constituting a tropical laboratory which enables a rethinking of the human (Nelson, 2003). It has also been examined as a text in which silence deconstructs the superiority of western science (Banerjee, 2010). I continue by foregrounding silence and the tropical landscape, while framing the central problematic of the novel as a conflict between two modes of communication about the nature of expertise.

In this paper, I propose that the novel accomplishes the production of an alternative narrative by framing malaria as a problem of communication. On the one hand, through Murugan's research, the reader is given access to a colonial network of communication comprised of archives of letters, memoirs, and reports. The correspondence between Ross and Manson, Ross's memoirs, and *Mosquito Brigades* (his tract on controlling mosquito populations) fall into this category. This communication lays bare colonial bureaucracy and materially demonstrates the cataloguing, describing, and mapping undertaken in the context of tropical medicine and practices of colonial knowledge making. To this end, I read Ross's writings and treatises on malaria and tropical hygiene in conjunction with the novel. I propose that as opposed to these material archival traces of colonial epistemologies which rely on mapping and surveying, Ghosh's novel presents an alternate immaterial form of communication which operates through a regime of silence (Ghosh, 2001, p. 218) and leaves no traces. Thus, my approach to the futuristic novel is to place it alongside colonial writings on malaria and hygiene manuals on how to conduct oneself as a white person in the tropics.

I argue that through the immaterial practices of communication brought to the forefront in the novel, *The Calcutta Chromosome* ruptures the narrative of expertise that Ross builds in *Memoirs* and *Mosquito Brigades*, while questioning the anthropocentric accounts of the solution of the malaria problem. In this process, the novel also casts doubt on the narrative of colonial improvement and its premise of rescuing the colonies from malaria. The narrative of improvement framed malaria as an attribute of an "embarrassing past" which colonies could leave behind with the help of the English colonizers (Roy, 2017, p.101). Reading John MacCulloch's 1829 treatise on malaria,

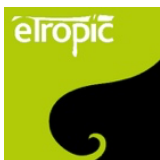


as well as James Johnson's and Randal Martin's work on the influence of tropical climates on Europeans in conjunction with the novel, I suggest that Ghosh's text presents an alternative concept of 'improvement' through the introduction of the 'Calcutta chromosome.'

Situating the 'Calcutta chromosome' as a part of the immaterial communication practices foregrounded in the novel, I further argue that these practices constitute what I refer to as 'guerrilla ecologies,' unintended consequences of colonial anthropocentric drives which acquire a life of their own and initiate unmappable, uncontainable networks of communication. As opposed to the colonial modes of mapping, guerrilla ecologies represent an alternative engagement with the world, focusing on the invisible, and that which cannot be accumulated into rigid frameworks. In his hunt for the solution to the malaria problem, Ross draws attention to the search being a struggle against nature itself. He states that nature is a "sorceress," one that he cannot be tricked by (Ross, 1923, p. 224), and later writes about the slipperiness of nature which employs "nasty tricks" to evade Ross's attempts at mapping it (p. 274). Thus, Ross's conception of expertise involves dominion over nature while making its processes intelligible in the framework of Western science. As opposed to Western medicine which Ross employs to map and catalogue nature, guerrilla ecologies inhabit the very slippery nature that thwarts Ross in his journey of expertise and control. Here, Ghosh's novel, through the figure of the laboratory cleaner Mangala, offers a different model of expertise. Mangala discovers the malarial parasite and the etiology of the disease; however, unlike Ross who tries to establish his claim on the discovery, Mangala uses her knowledge to provoke differential etiologies. She creates something that transcends space-time. In the process, Mangala defies the panoramic gaze that sought to control tropical landscapes through tropical medicine. In contrast her guerrilla ecologies establish a decentred engagement with tropical landscapes, one in which the human and the nonhuman are entwined.

Landscapes of Tropical Medicine and the Making of Expertise

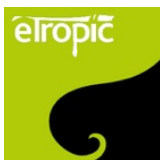
The expertise of two important figures in tropical medicine, Ronald Ross and Patrick Manson, reveals the landscape of this contested terrain. While both Ross and Manson believed in the possibility of the settlement of the tropics by the white race, their approaches to the problem differed: Manson's centred on research with an emphasis on finding pathologies and etiologies of tropical diseases to better protect the health of Europeans, while Ross favoured a method that addressed living conditions and sanitation to improve the tropical landscape (Worboys, 2012). Ross's approach thus reveals his belief that landscapes could be altered, and a salubrious landscape could



be produced as a result of human efforts. The following section begins by studying how Ross projects himself in the Ross-Manson correspondence, his *Memoirs* and *Mosquito Brigades*. Ross creates a persona of expertise by distinguishing himself from Manson, and this makes way for his subsequent emphasis on sanitation, which unveils his project of transforming tropical landscapes.

In the Ross-Manson correspondence, Ross frames himself as an instrument who is directed by Manson. In his letters, Ross further writes that all that Manson has predicted has come true and gives Manson free reign for using the observations Ross has made to advance Manson's mosquito theory. After having proved that the mosquito was the vector for filaria, Manson suspected that it was also involved in transmitting malaria. Manson's hypothesis was that malaria transmission involved drinking water, a theory Ross worked upon, as can be seen from the correspondence. Lutchman, Ross's Indian experimental subject, appears in the correspondence in this context. Ross feeds Lutchman a mosquito cocktail, but fails to discover any parasites in his blood (Bynum & Overy, 1998). However, in the futuristic science novel, the character Lutchman is a pivotal figure, and rather than just being Ross's test subject for malarial experiments he is actually part of the group, along with Mangala, which has chosen Ross to carry out its own plan and steers Ross away from the faulty hypothesis of malaria being transmitted through drinking water (Ghosh, 2001).

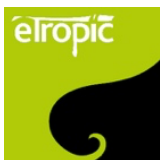
Meanwhile, in his *Memoirs*, Ross, while acknowledging Manson (and luck), carves out the importance of his own labour and diminishes Manson's role in the process. Following Manson's hypothesis that malaria is linked to drinking water, Ross tried to infect human beings with water from a marsh. After writing about the experiment, Ross immediately notes that these suggestions which came from Manson were obvious. Ross further adds, "Thus far Manson's induction had carried me triumphantly along, but it already began to fail me as a clue" (Ross, 1923, p.155). To establish that Manson was not receptive to the mosquito theory, Ross quotes from Manson's letter (p.193). Ross also clarifies a remark that he made in a letter to Manson about working with birds, which eventually led Ross to success. Ross worked with pigeons (and at another point with sparrows) to study an avian form of malaria. Manson encourages him to study birds in a letter dated 7th February 1898. In March, Ross wrote back to Manson saying he was remiss in not following Manson's advice to work with birds. However, the same letter, when reproduced in *Memoirs*, is accompanied by a footnote in which Ross reduces Manson's importance. Ross claims that he himself had suggested that Manson work with birds, thereby implying that Ross had instigated the key experiment which led to the eventual solution of the problem. He also adds that he was "much excited" when he wrote the letter (Ross, 1923, p. 271). Through the footnote, Ross



accomplishes two things. Firstly, he claims that the idea of working with birds had occurred to him even before Manson mentioned it. Secondly, by explaining that he was excited, Ross implies that he may have exaggerated things, such as Manson's role in the process. Thus, in *Memoirs*, Ross has moved away from the self-described 'instrument' for Manson. In addition, Ross takes the trouble to foreground where he and Manson diverged. He writes to reiterate the fact that Manson had not supported the idea that malaria is transmitted by the mosquito bite, but Ross had considered it possible (Ross 1923, p. 309). In this way, Ross builds his claim on the discovery and his role as a malaria expert while diminishing Manson's influence.

Accordingly, Ross projects himself as an authority on sanitation while maintaining that the malaria problem was important for tropical sanitation (Ross, 1923). It is in this domain that he builds his expertise, which becomes evident in *Mosquito Brigades* (1902). Through his public sanitation work, Ross aimed "to wage war against mosquitoes" (Ross, 1902, p. vi). He repeatedly refers to his experience in the tropics to construct expertise as an authority on vector control methods to regulate malaria. For instance, while writing about the habitat of the *Anopheles* larvae, he mentions his experience in India and Africa. Similarly, in a discussion of oils that can produce a film over water, thus inhibiting mosquito larvae, Ross mentions his experience in working with different samples. Ross also writes about his 20 years of experience in the tropics, substantiating this claim of experience with a specific example from India (1902). Finally, while criticizing imperial Britain's lack of action with respect to the prevalence of malaria in the colonies, Ross writes that the imperial sanitary and medical services are badly organized. In the appendix of *Mosquito Brigades*, Ross further emphasizes that the life cycle of the malarial parasite was obtained solely by his research between 1895-99 and that he regrets that he is forced to make "such a boastful statement" (1902, p. 61). With additional papers published in the *British Medical Journal* about anti-malarial measures through mosquito population control, Ross cements the validity of his ideas regarding vector control and its implementation.

Ross's emphasis on sanitation reveals his belief in the project of producing improved landscapes through human efforts. As an officer in the Indian Medical Service, Ross moves from Secunderabad, to Calcutta, and to Assam connecting different diseased tropical geographies. In addition to malaria, the colonial state sends Ross to Assam to study *kala-azar*, yet another febrile disease. The material traces of colonial communication, including the Ross-Manson correspondence, Ross's *Memoirs*, and *Mosquito Brigades* reinforce a picture of a diseased tropical geography while pointing towards disease control which prioritizes human drive and expertise fuelled by a desire for colonial improvement. After his departure from India in 1899 to England and the

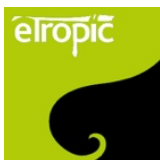


new school for Tropical Medicine, Ross set upon improving the tropical landscape for the white race while working on improving the productivity of tropical races (Arnold, 1999). I take up the theme of improving landscapes to increase productivity in the next section of the paper where I discuss how colonial improvement schemes for landscapes give rise to unintended consequences that counteract the very notion of productivity. *The Calcutta Chromosome* utilizes the same elements from Ross's narrative to reveal a different history of communication, one in which silences and gaps acquire importance, improvement acquires a different meaning, and mapping is resisted.

Guerrilla Ecologies and Human-Nature Entanglements

Ghosh's *The Calcutta Chromosome* takes Lutchman, who appears as a marginal figure in Ross's correspondence, and makes him into a pivotal character who drives the narrative. The novel also presents Lutchman as instrumental in steering Ross's work in the right direction so that the spiritual group behind Lutchman can advance its goals. By endowing someone like Lutchman with control and agency, the novel thus disrupts the narrative of expertise that Ross builds up through his various writings. The marginality of the native people involved in this malarial landscape of discovery is attested to in the novel when Murugan says "...they're fringe people, marginal types; they are so far from the mainstream you can't see them from the shore" (Ghosh, 2001, p. 106). The novel then makes visible that which has been rendered marginal and invisible in the construction of colonial expertise. I investigate colonial expertise not only through Ross's work, but also through James Johnson and Ranald Martin's work on tropical climate and diseases as well as John MacCulloch's treatise on malaria. To this end, I frame Ghosh's 'Calcutta chromosome' as a solution to the problem of improvement with respect to the tropical landscape and the European bodies which inhabited those landscapes, albeit a solution that remains inaccessible and invisible to the colonial narratives of expertise. The alternative narrative that Ghosh develops in the novel includes the people who are foregrounded in the revisionist tale of the malaria problem as well as the mosquito itself. This section of the paper argues that these networks of communication which are not visible in the colonial archival discourses, exemplified by Ross, create guerrilla ecologies. I use the term guerrilla ecologies to speak of networks that come into being as unintended consequences of the anthropocentric improvement drive, which acquire a larger significance and trigger invisible, unmappable, channels of movement and communication.

In the wake of the imperial scramble of the eighteenth and nineteenth centuries, representation of the tropics in colonial writing centred around two contradictory



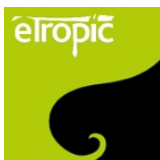
tropes. The first pictured the tropics as Edenic and paradisaical (Arnold, 2000). However, by the mid-nineteenth century, this conception of the tropics shifted from paradisaical to pestilential (Arnold, 2000; Stepan, 2001). The rise of disciplines such as tropical medicine further cemented the perception of the tropics as a hotbed of disease. It is in this context that the project of human acclimatization acquires significance amongst the medical practitioners of the nineteenth century, exemplified by texts such as James Johnson and Ranald Martin's *The Influence of Tropical Climates on European Constitutions* (1841). The core concern of these writers was to investigate whether the European body could acclimatize itself to the purportedly harsh environment of the tropics. Imperial expansion amplified these concerns of the well-being of the European body in a foreign environment: "...with increased penetration of Europeans into the topics [*sic*] and sub-tropics during the nineteenth century, more and more medical effort was directed towards the influence of climate on the anatomy and health of European settlers" (Livingstone, 1987, p. 360). Ross's question about climate in India must thus be read in conjunction with the British interest in Indian climatic conditions. Ross writes about the civilization in India:

Is it the climate or the diseases connected with the climate, or have we here merely the picture of an old civilization fallen into decay—what every civilization falls to, what China has fallen to and what, probably, the old Roman civilization fell to? If so, will the vigorous populations of Europe also sink some day to the same level, or can science find a way to prevent this? (Ross, 1923, p. 43)

Johnson and Martin's popular text on the impact of tropical climate on European constitutions provides answers to the questions posed by Ross. The text suggests that men and animals would degenerate when moving from a temperate to a tropical zone.

But it is observed, that those animals translated from a temperate to a torrid zone, "many die suddenly, others droop, and all degenerate" ... Man would not fare better, if placed in similar circumstances....Of those Europeans who arrive on the banks of the Ganges, many fall early victims to the climate.... That others droop, and are forced, in a very few years to seek their native air, is also well known. (Johnson & Martin, 1841, p. 2)

Echoing the theory of tropical degeneration, Ross writes that he was "seedy" after spending seven years in India (Ross, 1923, p. 79). In their work, Johnson and Martin provide an exhaustive list of diseases that can afflict people in the tropics, how to treat

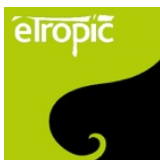


them, and how Europeans arriving in the tropics should dress, eat and drink so as to preserve their bodies. They supplement their case with archival evidence such as tabular data detailing mortality rates of different races, wind speeds, water levels in rivers and temperature changes in Calcutta to name a few instances. With accounts from colonial physicians, they construct a medical topography of the tropical world as imagined by the empire. Martin in particular was responsible for urging the government to compile topographical reports about the dangers in India (Harrison, 1999). In their treatise on tropical medicine, Johnson and Martin rely on the material of colonial archives to advance their argument about preserving the European body against the dangers in the tropics. They suggest that the mortality rates for people of colour are less than those of the Europeans. The directives provided in the text about how to conduct oneself as a European are then an attempt to solve the problem of European mortality in the tropics, supplemented with reports, tables, and accounts of colonial physicians. The concerns about the impact of tropical weather on Europeans were not just restricted to the time that the Europeans spent in tropical regions; these concerns followed them even after their return to Europe. This is exemplified by the phenomenon of tropical invalidism. Johnson and Martin advise that people returning from the tropics to England exercise caution, since the body cannot endure sudden transitions from one extreme to the other. They write:

The powers of the constitution, however plastic, cannot immediately accommodate themselves to great and sudden changes of climate, even when the transition is from a bad to a good one; and the tropical invalid requires full as much caution and prudence in approaching the shores of England, as he did in landing, at the former period, on the banks of the Ganges. (Johnson & Martin, 1841, p. 518)

Thus, the impact of tropical climatic conditions is made borderless and diffuse, following the white body across continents.² Tropical invalidism also brought into focus the body of the tropical returnee, raising questions about the empire, the biological attributes of Europeans to rule the world through empire and the seemingly irreversible transformations produced by tropical climates on European bodies (Bewell, 1999). This mode of colonial communication exemplified in the reports and memoirs of physicians reveals a preoccupation with the problem of preserving the European body and its acclimatization in the tropics. Through an alternative history of malaria, *The Calcutta Chromosome* presents a solution to the problem of acclimatization, but as

² For a contemporary analysis of this notion of disease, 'tropicality' and the 'temperate' world, see Clayton (2021) who maps the context of the COVID-19 Pandemic and climate change in the UK, while drawing attention to both the entwining and unravelling of the 'tropical' and the 'temperate' as distinct spheres.

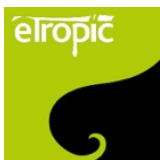


opposed to the visible, legible colonial archives, the novel proposes a solution that remains inaccessible to the colonial regime. Murugan frames his hypothesis of interpersonal transference as a solution to a degenerating body. The process involves transferring one's chromosomes into another's body, gradually becoming that person or taking over that person. He explains how the Calcutta chromosome transfer works to Antar:

Just think, a fresh start: when your body fails you, you leave it, you migrate—you or at least a matching symptomology of your self. You begin all over again, another body, another beginning. Just think: no mistakes, a fresh start. What would you give for that, Ant: a technology that lets you improve on yourself in your next incarnation? (Ghosh, 2001, pp. 108-109)

Interpersonal transference is important with regard to the question of European acclimatization for two reasons. First, the technique was discovered by Mangala, whom Ross's predecessor, Cunningham trains in his lab in Calcutta as an assistant. Cunningham is unaware of the level of skills that Mangala possesses and introduces her as a mere sweeper woman. In the alternate history of malaria proposed by Ghosh, Mangala is the genius who eventually pushes Ross to discover the life cycle of the malarial parasite so that she can solve the larger problem of interpersonal transference (Ghosh, 2001, p. 246). A servant, dismissed by the writers of colonial history, thus acquires a significance large enough to produce networks that evade scientists like Cunningham and Ross. Second, Murugan's framing of interpersonal transference as technology of improvement is important with respect to the suggestions of conducting oneself as a white individual in the tropics and the anti-malarial activities of colonial regimes.

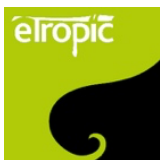
Treatises on tropical hygiene and malaria emphasize the importance of measures of improvement. Johnson and Martin's treatise features a section titled "Tropical Hygiene," subtitled "Hints for the Preservation of Health in All Hot Climates." The section proceeds to give a detailed analysis of how Europeans should dress, eat, drink, exercise, bathe, and sleep (Johnson & Martin, 1841, p. 539-567). This guide towards conducting oneself is also a series of measures which the authors think will improve the quality of European life in the tropics. In addition to these measures meant to improve life on an individual level, the question of improvement became a point of focus for the British empire. In the 1870s, malaria became a problem that brought together different parts of the British empire and other locations such as Queensland in Northern Australia, Virginia, Bengal, Massachusetts, Natal, French Algeria, Assam



and British Guiana—hotspots that needed to be rescued through “regimes of improvement and circulation of quinine” (Roy, 2017, p. 97). The reports of malaria from these distant places were a result of communications in the form of journalistic reports, scholarly articles and memoirs written by physicians, officials, and soldiers (Roy, 2017). As can be seen from Ross’s *Mosquito Brigades*, these accounts emphasized that malaria was a problem that England had overcome and that the colonial regimes of improvement were instrumental in this progress. Ross writes, “Similarly, the time will most assuredly arrive when it will be just as hard to find myriads of mosquitoes being bred in the streets and backyards in civilized towns in tropics, as it is now to find slops being poured out of windows in English ones” (Ross, 1902, p. 41). In an early treatise, which made the term malaria popular in English, the author writes, “England is comparatively freed from this plague, and it has been freed from it by industry and attention” (MacCulloch, 1829, p. 6). Thus, in this scheme for malarial eradication, the colonies had to experience a series of historical processes that England had already undergone, processes that involved “regimes of improvement and the circulation of different varieties of cinchonas” (Roy, 2017, p. 101). The regimes of improvement were not just restricted to cinchonas and the circulation of quinine, they also focused on clearing the land and developing agricultural practices.

British intervention in India transformed the landscape in such a way that it encouraged the spread of malaria. Early texts about malaria, such as John MacCulloch’s influential 1829 treatise, mention clearing of the land as a factor that can bring down fevers. He writes, “the natural effect of clearing the ground for cultivation, is often also the cause of the diminution or extirpation of fevers” (1829, p. 97). MacCulloch even identifies India as a special case. Writing that there are situations where it is impractical to clear forests and woods, he adds that there are, however, cases “in which we must blame the policy of the councils of our colonial governments”. He then continues to mention the Indian case. “For India and its councils there is however an ample excuse as to this subject, great as are the evils produced by its uncleared lands” (1829, p. 98). The second half of the nineteenth century witnessed increased malarial deaths in Bengal as a result of the changes in landscape brought about by the British administration. In the eighteenth century, Burdwan was described as one of the most productive districts in Bengal by officials of the East India Company. However, the transformations in the landscape turned the region into a malarial hotspot that impacted its productivity.

Malaria was controlled, and the general prosperity of West Bengal was ensured by the seasonal flooding of the Ganges tributaries.... During the second half of the nineteenth century, however, the British transformed the physical landscape of northern Bengal. The process

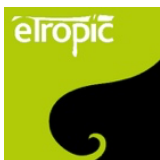


began with the construction of embankments.... Unfortunately, the various embankments and dams transformed the region's ecology in ways that...promoted the spread of malaria. (Packard, 2007, p. 4)

The colonial attempts at improving the landscape by constructing embankments produced a swamp like environment that proved to be ideal breeding grounds for a new species of Anopheline mosquitoes, *Anopheles philippinensis* (Packard, 2007). Efforts at improvement inadvertently gave rise to a new set of ecological conditions that counteract the very notion of 'improvement.' In fact, the plantational modes of cultivation introduced by colonial regimes around the tropical world encouraged the growth and movement of mosquito populations in previously uncharted directions, giving rise to guerrilla ecologies.

The transformation of landscape as a result of projects of improvement was not restricted to India and the British empire. The Dutch case in Surinam is another relevant example. The polders built by the Dutch planters and the natural swampy terrain encouraged the growth of the malaria vector *Anopheles darlingi*. The rice fields of Surinam ensured that the mosquitoes had a steady supply of blood through the enslaved people working in the fields. Surinam became dangerous for anyone without immunity to malaria to visit, with the place acquiring the reputation of an unhealthy spot for Europeans (McNeill, 2010). Thus, measures of cultivation that were meant to improve yield resulted in a situation wherein mosquitoes thrived, and the native population with malarial immunity fared better when compared to the newcomers. This immunity was a key factor in battles waged by Surinam's maroons against colonial plantations (McNeill, 2010). Similarly in Egypt, the construction of dams and linking together rivers created a new set of conditions that enabled the *Anopheles gambiae* mosquito to travel to new habitats. In the wake of the surge of malaria that followed in Egypt, in a private report, the British "acknowledged that the surest way to restore the health of the Egyptian population would be to destroy the dams" (Mitchell, 2002, p. 24). The human efforts to transform landscapes, driven by a desire to increase productivity, create contingent ecological networks that can neither be mapped nor surveyed. The above examples show that the measures of improvement undertaken in the name of uplifting the local living conditions created a guerrilla ecology, with networks that remained invisible and inaccessible to the colonizing power.

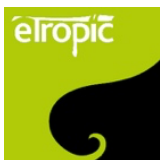
My formulation of guerrilla ecologies draws from Clapperton Mavhunga's theorization of how colonial powers construed pestiferousness, defining pestilence as "mobility of species" in ways that intrude on that of the human (Mavhunga, 2011, p. 155). Mavhunga argues that when colonial regimes dubbed the colonized as pests, it was



an acknowledgement of their resistance, or “that they moved about in ways the colonial regime saw as resistance” (p. 156). Developing the argument further, Mavhunga makes the case for guerrillas in Rhodesia as vermin beings, by drawing an analogy between the mosquito carrying plasmodia, the tsetse fly carrying the trypanosome and the guerrilla carrying communism (2011, pp. 162-163). Guerrilla ecologies are built on networks that emerge as unintended consequences of projects of improvement, acquiring a larger significance later on, as evidenced by the examples from Surinam and Egypt. Furthermore, these examples also rupture the narratives of control and expertise, while bringing into focus new protagonists. In the examples cited above, the mosquito emerges as a protagonist, utilizing new mobilities opened to it, and thereby creating new ecologies. The networks created in this fashion constitute new pathways of communication that remain inaccessible to centralizing powers; rather, these networks of communication remain diffuse, or even mysterious, as can be seen from the pre-Ross descriptions of malaria and from the mechanism of interpersonal transference in *The Calcutta Chromosome*. Rather than foregrounding anthropocentric drive and its connections to improvement, these new networks bring the nonhuman into the spotlight, and subvert the drive for control.

The diffuse networks of disease transmission narrativized in *The Calcutta Chromosome* can also be found in older theories of the disease, such as the ones advanced by John MacCulloch. Building on the definition of malaria as bad air, MacCulloch stresses that the pathways taken by the disease remain indecipherable. He writes about “the insidious or obscure roads by which it has been *communicated*” (1829, p. 59, emphasis added). He adds that certain states of atmosphere can *communicate* contagion better than others (p.101, emphasis added), and that malaria can move in curvilinear, capricious pathways (p.112). Here, disease is characterized as something that can be communicated, but as opposed to material communications which leave traces, MacCulloch’s characterization of malaria presents disease as immaterial, with misty, vapor like properties (p.120) that cannot be tracked or deciphered. Thus, MacCulloch’s project of constructing “a map of the Malaria of the world” (p.170) is at odds with the characterization of the disease as a capricious contagion communicated through air, since mapping requires pinning the disease down to specific territories.

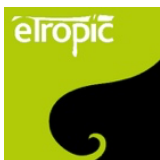
One of MacCulloch’s suggestions to reduce malaria is to clear the landscape for cultivation (1829, p.97), or to undertake projects of improvement. It has already been established how improvement initiatives can give rise to guerrilla ecologies which undermine the original project. *The Calcutta Chromosome* frames improvement as something that can be enacted on the body itself. As can be seen from the suggestions



laid out by Johnson and Martin about how to conduct oneself as a white person in the tropics, improvement is not just confined to the belief that landscapes can be altered, it can also be construed as techniques for conducting the body. The resulting enquiry into human acclimatization in the nineteenth century became a means to investigate the problem of the European body which was believed to degenerate in the tropics. I propose that what Murugan calls the 'Calcutta chromosome' is a solution to the European problem of improvement, albeit one that is presented through a network of immaterial communication that remains inaccessible to experts like Ross.

When Murugan explains interpersonal transference to Antar, he describes it as technology for improvement of the body, "a technology that lets you *improve on yourself* (Ghosh, 2001, p.109, emphasis added). However, as opposed to Ross who works to prove his expertise, the woman behind the Calcutta chromosome operates in silence. Characterizing the development of the Calcutta chromosome as counter-science, Murugan explains how such a discourse would rely on secrecy as a procedure, refusing all direct communication. Such a refusal also means that the people involved in the production of knowledge are not bound by the rules of establishing priority or expertise, as is the case with Ross. Murugan draws attention to the difference between Ross and Mangala in this regard. He explains that since Mangala did not need to write papers and proofs to substantiate her ideas, she wasn't hampered by the bureaucratic hurdles that someone like Ross would be subject to. This aspect of Ross's work becomes evident in his priority dispute with the Italians regarding the discovery of the malarial parasite.³ Unfettered by the demands to prove and demonstrate expertise, Mangala can forgo the usual channels of communication. Instead, the novel frames what would be considered abnormal as an attempt at this deviated means of communication. MacCulloch framed malaria as a contagion that can be communicated. In Murugan's account of the same disease, it becomes something that can alter the networks inside the brain, producing effects that have been compared to spirit possession (Ghosh, 2001). Thus, malaria alters neural patterns, producing alternate modes of communication that are perceived as hallucinogenic since they fall outside the normal. So, when Antar feels ill and hears Tara's voice both on the telephone and in the room with him, he attributes his perception to the fact that he was feeling feverish and imagining things. What Antar perceives as an imagined sound, or a hallucination, could be seen as a missed attempt at communication that Antar is ill-equipped to comprehend. The futility of bureaucratic

³ The Nobel Committee had originally intended the 1902 Nobel Prize to go jointly to Ross and the Italian team lead by Grassi. Ross accused Grassi of fraudulence and a controversy ensued (and still does).



communication is further signalled in the novel through the figure of the communications minister.

Urmila, a journalist who writes for the Calcutta magazine and later joins Murugan in his quest to find out the true history behind the discovery of the malarial parasite, is tasked with attending a press conference by the communications minister. Urmila is unable to attend the conference and the futility of conventional means of communication is encapsulated in the phrase that she imagines if she were to write the story. "*Today the Minister of Communications announced at a press conference that he believed strongly that communications were the key to India's future*" (Ghosh, 2001, p. 220, emphasis in original). It is a sentence that communicates nothing. In contrast to these methods of communication, the novel presents a world where silences, hallucinations and disguises are attempts at communication. Mangala and the group led by her employ silences and hallucinations to communicate. The novel presents malaria as a master of disguises, one that can affect the neural communication pathways in one's body. MacCulloch's characterization of malaria as "an aeriform fluid" (1829, p.100) that can attach itself to currents of air or solid objects speaks to the transformational qualities of malaria that Murugan highlights. It is precisely this transformational power that makes it difficult to communicate through material communication techniques, such as reports, correspondence or memoirs. Instead, Mangala's discovery makes its presence felt as the 'Calcutta chromosome', which defies the spatio-temporal mechanics of conventional communication.

The Calcutta chromosome allows its bearers to transcend boundaries of space, time and bodies. The novel proposes that this movement is made possible because Mangala's spirit possesses new bodies from time to time (Ghosh, 2001, p. 235). Thus, the body itself becomes a site of communication on the chromosomal level. This bodily transference could be read as a response to the European problem of preserving the white body in the tropics. However, in Ghosh's narratives, the bodies chosen for this immaterial mode of communication are people from the margins, or the colonized body, one that is situated in the realm of nature by both Ross and Ghosh. Yet, while Ross and Ghosh each situate the malaria problem in the realm on nature, their approaches to its solution differ. Ross's *Memoirs* echo the Victorian worldview of the tropics, characterized by "a crude dominance of nature over humankind" (Arnold, 1997, p.309). Ross frames himself as an explorer who attempts to reverse this domination. However, unlike Ross whose work aimed at conquering the natural through western medicine, Ghosh's narrative attempts to bring subaltern knowledges to the forefront.



Ghosh's novel spotlights subaltern knowledges through figures such as Mangala and Lutchman. Ghosh displaces the malaria problem from the parameters of Western science, and places it in the realm of the natural and the spiritual. Ghosh's secret sect led by Mangala operates outside the constraints of Western knowledge, thus making it akin to sorcery and witchcraft. While this makes Mangala's knowledge similar to the sorcery that Ross chides his blood donors and malarial experimental subjects for, Ross's attempts to influence his blood donors by paying them, however, leads the subjects to refuse this payment as they do not trust Ross and think it to be witchcraft.

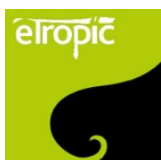
Through the figures of Mangala and Lutchman, the novel focuses on knowledges from marginalised sections of the society. Lutchman who later influences Ross is shown to have witnessed caste-based discrimination at the hands of an upper-caste man in Renupur. In this way the novel contests the knowledge making practices that existed between the British and the elites of the Indian population. As Kapil Raj (2001) has shown, the enterprise of mapping India required indigenous labour. James Renell, who is believed to have unified different traditions of mapping to produce one of the first maps of India, wrote a memoir which accompanied the map. The frontispiece of this memoir featured a Brahmin giving sacred manuscripts or *shastras* to Britannia while other Brahmins waited to do the same. Raj further writes how Renell's map was dense with information, even more than previous maps of Britain, and how this Indian map would later serve as model for mapping Britain in terms of detail and accuracy (2001). Contrary to this model of mapping, Ghosh presents marginal figures like Lutchman and Mangala, who would not have had access to sacred manuscripts. They are engaged in creating an alternate topography that defies representation and the surveying gaze. If attempts at mapping sought to fix contours of spaces, then Mangala's Calcutta chromosome defies the matrix of colonial space-time.

Pestilential Endings

The Calcutta chromosome, by transcending space and time, provides a response to the claim that the colonies had to undergo historical developmental processes to emerge from the past into civilization. Ross writes about how malaria has been an obstacle in settling and civilizing of the tropical regions of the world. "Probably malaria has done more than anything else to prevent the settlement and civilization of the vast tropical areas which would otherwise be most suitable for the human race" (Ross, 1923, p. 115). The mosquito gangs which Ross develops to counter mosquito larvae, and thus mosquitoes, is contingent on the presence of Europeans, with Ross recommending leaving the "native towns" to their fate till there is "an advance of civilization" which comes with the presence of Europeans (Ross, 1902, p. 45). As



opposed to this narrative of improvement driven by European will and expertise, *The Calcutta Chromosome* presents an alternative view wherein the people considered uncivilized by the Europeans discover a solution to a problem that preoccupied Europeans. Furthermore, this alternative history refutes the notion that all the actors in the narrative are human. Instead, Ghosh's take on malaria puts the spotlight on the pestilential: both people and animals who have been considered as pests. This paper has argued that the pestilential moves in unmappable trajectories that remains inaccessible to the colonial regimes. Through a reading of the work of Ronald Ross, this paper suggests that these uncharted movements disrupt the narrative of colonial expertise and colonial projects of improvement. As opposed to the narrative of improvement driven by anthropocentric will, I suggest that the mobilities of fringe actors such as the mosquito and the religious group in *The Calcutta Chromosome* exemplify guerrilla ecologies that thrive on invisible, unmappable movements. While the traces of colonial communication cited in this paper, such as the Ross-Manson correspondence, Ross's *Memoirs* and his *Mosquito Brigades*, reveal a desire to pin down disease etiologies and to command tropical landscapes through this enterprise, Ghosh's novel presents a different approach. Through guerrilla ecologies, the novel presents networks that resist colonial epistemologies of control. Instead, Mangala and Lutchman showcase subaltern knowledges that reside outside the realms of expertise which Ross pursues.



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