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# New poetics of postcolonial relations: global genetic kinship in Zadie Smith's *White Teeth* and Amitav Ghosh's *The Calcutta Chromosome*

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## ABSTRACT

Conceptions of genetic kinship have recently emerged as a powerful new discourse through which to trace and imagine connections between individuals and communities around the globe. This article argues that, as a new way to think and represent such connections, genetic discourses of relatedness constitute a new poetics of kinship. Discussing two exemplary contemporary novels, Amitav Ghosh's *The Calcutta Chromosome* (1995) and Zadie Smith's *White Teeth* (2000), this article argues further that literary fiction, and postcolonial literary fiction in particular, is uniquely positioned to critically engage this new biomedical discourse of global and interpersonal relations. Ghosh's and Smith's novels illuminate and amplify the concept of a cultural poetics of genetic kinship by aesthetically transcending the limits of genetic science to construct additional genetic connections between the West and the Global South on the level of metaphor and analogy. As both novels oscillate spatially between the West and a postcolonial Indian subcontinent, the texts' representations of literal and figurative genetic relations become a vehicle through which the novels test and reconfigure postcolonial and diasporic identities, as well as confront Western genetic science with alternative forms of knowledge. The emerging genetic imaginary highlights—evoking recent sociological and anthropological work—that meaningful kinship relations rely on biological as much as on cultural discourses and interpretations, especially in postcolonial and migrant contexts where genetic markers become charged with conflicting notions of connection and otherness.

Among the countless ties that bind the globalised world together, notions of genetic kinship have recently emerged as a powerful new discourse through which to trace and imagine connections between individuals and communities around the globe. As a new way to think and represent such connections, genetic discourses of relatedness, I argue, constitute a new poetics of kinship. Part of the profound 20th-century molecularisation of biological and cultural life, this genetic poetics of kinship provides both epistemological and aesthetic structures to newly unfolding imaginaries of personal and communal inter-relations.

While genetic discourses have reshaped notions of kin across the social and cultural landscape, they have provoked particularly complex responses in postcolonial literary fiction. In this article, I delineate how two exemplary contemporary novels,

Amitav Ghosh's *The Calcutta Chromosome* (1995) and Zadie Smith's *White Teeth* (2000), aesthetically and critically explore the opportunities and pitfalls of perceiving global kinship networks through the perspective of Western genetic science.<sup>1</sup> Genetic thinking can be observed to refashion notions of one's relation to family and community in a wide variety of fictions, but in postcolonial literature, the stakes of this rethinking are unusually high.<sup>2</sup> Questions of kinship, which are always bound up with matters of identity, are heightened in postcolonial and diasporic contexts because here they become the subject of heated political debates about issues such as national identities and the futures of entire cultures.

Genetic discourses of relatedness give biological-material shape to the familial and communal ties that stretch across the postcolonial globe. At the same time, genetic markers of kinship are always also culturally mediated and appropriated. This combination of biological materiality and cultural mediation makes genetic kinship a highly productive discourse for postcolonial criticism and the representation of diaspora. The concept of genetic kinship traces the dispersion of genetic communities on a biological level and provides a new discourse through which to explore cultural constructions of identity and family in a globalised world.<sup>3</sup> In this latter sense, genetic kinship becomes a new central dimension in what Stuart Hall seminally discussed as the production, rather than rediscovery, of cultural identity in diaspora.<sup>4</sup> Representations of global genetic kinship networks further appeal directly to recent critical efforts to analyse, through the concept of translocation, the material alongside the more imaginative ties that connect perceived spaces of origin and postcolonial and diasporic spaces.<sup>5</sup>

A focus on translocation also emphasises the spatial rootedness of knowledge. This becomes significant when we recognise that the genetic discourses of diasporic kinship originate in Western biomedical institutions. On the one hand, the appropriation of Western genetic science to explore the experience of diaspora and exile offers the potential for what Edward Said referred to as 'liberation within the same discourse inhabited by Western culture'.<sup>6</sup> On the other hand, thinking diasporic relations through genetic discourses runs the risk of perpetuating the persistent privileging of Western over non-Western epistemologies that Ashmita Khasnabish identifies even within postcolonial

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discourse itself.<sup>7</sup> As a result, the very language through which the matter of postcolonial kinship is addressed is itself clearly implicated in the power dynamics of postcolonial relations between the West and the Global South or, more precisely, in the context of Ghosh's and Smith's novels, between the West and the Indian subcontinent.

Since both texts have prominent Western settings, they can be considered postcolonial in Rajeev S Patke's sense of engaging with 'the internalization of asymmetries, an ongoing process in which native inhabitants and non-European migrants struggle to find voice and representation within the cultural dynamics of a settler country'.<sup>8</sup> Conceiving the internalisation of asymmetrical conditions of power, belonging and identity as a chief characteristic of postcoloniality foregrounds the new angle genetic discourses bring to postcolonial studies as these discourses quite literally move the discussion inward and onto the level of the genes. On this level, in turn, new possibilities arise to rethink and represent such asymmetries, alleged internal differences but also particular kinship connections marking the life of the postcolonial subject.

Genetic discourses, of course, already inform postcolonial studies in a major way through discussions of the controversial claims of a genetic basis for race and the increasingly widespread direct-to-consumer genetic testing services (more on this later). While related to genetic concerns about race, attention to genetic kinship refocuses the analysis away from an encompassing concept of race and towards particular networks of kin, like the family, thus affording a new perspective on the production of diasporic identities. Moreover, genetic conceptions of kin, though not without their own shortcomings and blind spots, appear to have a more reliable foundation in biological and cultural reality than genetic conceptions of race. The majority of scientific and academic commentators today seem unanimous in stating that in light of shared ancestors, advanced globalisation as well as continued human migration over millennia, there is no genetic basis for race.<sup>9</sup>

Genetic kinship, in contrast, has been accepted as a biological reality in recent years with much less resistance. This is amply evidenced by the popularity of genetic ancestry testing and the ubiquity of expressing relatedness through genetic discourse, both in popular and academic contexts.<sup>10</sup> At the same time, highlighting genetic markers of kinship over cultural bonds risks reducing the wealth of human social interaction to matters of biology. Such biological reductionism rekindles long-standing feuds over the roles of nature and nurture, as well as the larger role of biology in society, both established concerns in feminist and postcolonial studies.<sup>11</sup> In the following, I will argue that part of the attraction of the new genetic discourse of kinship, especially as concerns its literary appropriation, lies in the fact that, contrary to popular perceptions, genetic science does not provide easy answers to the central questions surrounding diasporic and global kinship and identity. In *The Calcutta Chromosome*, as well as in *White Teeth*, seemingly unproblematic discourses of genetic relations are implicated in highly complex and ambivalent cultural and political contexts. The texts' critical potential to shed light on the cultural meanings of biomedical reconceptions of kinship through genetics is inextricably linked with their aesthetic appropriation of the scientific discourses which they imaginatively transcend. Even though the novels engage with the new poetics of genetic kinship in very different ways, they both illustrate the power of literature to explore, from a molecular level, new forms—and also failures—of connection across the globe.

## RETHINKING KINSHIP THROUGH GENETICS IN A GLOBAL WORLD

In his erudite history of genetic science, tellingly titled *The Gene: An Intimate History* (2016), Siddhartha Mukherjee frames his account of the development of genetics with a personal genetic history of his own family. More specifically, Mukherjee describes several cases of mental illness in his family, mapping the relations between his afflicted and healthy relatives through the language of genetic risk. He recounts that his grandmother and father believed the Partition of India by the British in 1947 to be the cause for his uncles' conditions, the 'political trauma sublimated into their psychic trauma'.<sup>12</sup> Later, while working as a doctor in the USA, Mukherjee learns of studies linking mental afflictions with genetics, which effects a geneticisation of his perspective on his family back in India. His embrace of a genetic view of kinship does not rule out the impact of incisive environmental 'triggers', such as the Partition. Moreover, he concedes that a lot about what actualises the genetic risk transmitted through his family still remains unclear.<sup>13</sup> However, at the same time, his new genetic outlook on his family's medical history and the explanations it offered brought him 'a strange interior solace – answering some of the questions that had so haunted my father and grandmother'.<sup>14</sup>

Mukherjee's account is insightful in the context of this study. Not only does it provide an example for a genetic kinship network with global dimensions, one typical of many migrant families, but also his family history directly connects India's colonial and postcolonial history with a familial narrative of genetic risk. This perspective then shapes his understanding of his relations to his nearest kin, as well as of his own identity. In addition, his personal story includes the revision of traditional forms of explanation, in this case of the causes of mental illness, by the Western science of genetics, a site of potential conflict more deeply explored in the novels by Ghosh and Smith. Finally, Mukherjee's perspective on kinship reveals some of the pertinent medical concerns accompanying a genetic understanding of family relations, namely, inherited diseases, genetic risk and the ethical dilemma of genetic testing, which raises issues of genetic privacy, responsibility towards one's family members and the potential of discrimination and intervention.<sup>15</sup> Mukherjee's genetic family history exemplifies the epistemic and larger political and ethical implications of this new perspective on kinship in an age of ever-increasing global relations, both on the level of families and on the level of science and biomedical technology.

Mukherjee's genetic history of family and migration showcases Western science as intimately entangled with the globalisation of knowledge during the 20th and 21st centuries. The histories of globalisation, in turn, as Anne Pollock and Banu Subramaniam state, cannot be understood 'without taking into consideration the histories of colonialism and its aftermath'.<sup>16</sup> Moreover, the globalisation of science and technology is not only an effect but to some degree a cause of the historical globalising processes given their 'centrality [...] to the colonizing mission of imperial powers'.<sup>17</sup> The conception of global genetic kinship is thus inseparably bound up with the processes and discourses of globalisation and postcolonialism.

Twentieth-century assumptions about kinship in what is arguably the concept's home discipline, anthropology, were for the longest time informed by a Western understanding of sexual reproduction, which served as the yardstick against which any non-Western understandings of kinship were measured.<sup>18</sup> Towards the end of the century, this 'Eurocentrism' manifest in the opposition between fixed biological fact and cultural diversity

was criticised in the 'new kinship studies'.<sup>19</sup> Increasingly, the analytical contrast between biology on the one hand and society and law on the other, which underpinned such classic studies as David Schneider's *American Kinship* (1968), was replaced by an acceptance of constitutive inter-relations between biological and cultural dimensions of kinship.<sup>20</sup> A greater attention to the complex interplay of biological and sociocultural dimensions of kinship not only occasioned a postcolonial emphasis on the value of non-Western systems of knowledge, it also questioned the predominant position of biology in Western notions of kinship relations.<sup>21</sup> Paradoxically, particularly in a postcolonial context, the rise of genetics has both re-emphasised biological over cultural relations and further destabilised the boundary between biology and culture in the practices and understanding of kinship.

In postcolonial and diasporic contexts, genetic relatedness can be turned both into a signifier of connection or of fundamental difference between former coloniser and colonised, or between supposed native and migrant. In this, genetic kinship behaves similarly to geneticised concepts of race. Genetic ancestry testing, especially those variants that test for and compare single-nucleotide polymorphisms across individual genomes, routinely provides assessments as to a person's ethnic ancestry, stating in percentages, for instance, how 'African', 'European' or 'Asian' someone is.<sup>22</sup> There are numerous problems with these kinds of results, ranging from limitations of data to the very concepts underlying the test in the first place.<sup>23</sup> Due to the nature of its reliance on genetic data, the testing process inevitably reduces to biology such central matters to the experience of diaspora as ethnicity and origin. Such reductionism neglects the plethora of cultural factors that could equally be considered to determine, or at least describe, ethnicity or kinship. What is more, the test's results are highly susceptible to divergent interpretations.<sup>24</sup> It is this contradictory dynamic which has rekindled public suggestions of genetic foundations of race, even though an overwhelming majority of commentators have refuted any such claims for decades.<sup>25</sup>

Although the concept of kinship exceeds questions of race and includes a variety of additional sociocultural factors, race and kinship are closely related. Both establish and close off networks of connection between individuals and communities, at home and in diaspora. With a view to ancestry testing in particular, Koenig *et al* state that such 'genetic race verification services have potentially serious implications for community concepts of kinship and nationhood'.<sup>26</sup> Genetic conceptions of kinship, for instance, via geneticised notions of race, not only present new avenues for connection but also new ways to envisage and justify exclusion from existing or future kinship networks.

The same kind of paradoxical effect of genetic thinking on cultural imaginaries of kinship extends beyond the sphere of the individual and the family and shapes perceptions of nationality and kinship on a global scale. In her study of 'geographies of relatedness', Catherine Nash argues that the phenomenon of genetic genealogy produces contradictory reactions as it unfolds its impact 'across the scales of family, nation and humanity'.<sup>27</sup> The notion of genetically related 'national families', for instance, illustrates the geopolitical scope of genetic discourses of kinship. The concept fuses nationalism with genetic kinship and pits it against a transnational family produced in diaspora, which could easily also be framed in genetic terms. In a globalised world marked by a lingering postcolonial asymmetry in access to resources, power and forms of identification, genetic imaginaries of kinship negotiate starkly divergent interpretations of what genetic relatedness means on national and global scales.

In such divergent interpretations of genetic kinship, the meaning of genetic difference is a key variable. The relative absence of difference can signify strong communal bonds. At the same time, difference is also a vital marker of identity, and biologically informed models of kinship may obscure individualising markers of difference, genetic and otherwise. In postcolonial thinking, from Said's 'universal humanism' to Khasnabish's recent emphasis on a common humanity derived from Indian philosophy, a fundamental similarity often functions as a key political and philosophical asset.<sup>28</sup> Establishing universal human kinship on the molecular level of genetics, genetic difference in turn becomes all the more political because its emphasis requires the effort to insist on its significance in a context where genetic similarity is foregrounded on a global scale.

Literary fiction is uniquely predisposed to engage with the poetics of postcolonial genetic kinship. According to Édouard Glissant's *Poetics of Relation* (1997), literature alone is capable of unearthing all the existing and possible relations within a culture defined by postcolonial transformation.<sup>29</sup> Genetic science provides a new and additional discourse through which to think and construct in literature the networks of postcolonial and diasporic relations that exist and develop among families and communities around the globe. I will begin my analysis with *White Teeth* because Smith's appropriation of genetic kinship remains close to more traditional networks of kin, highlighting the role of the family in its representation of diaspora and multiculturalism. *The Calcutta Chromosome* then affords a radically expanded conception of kinship that goes beyond the bounds of the family and imagines a seemingly utopian kind of postcolonial connection among former coloniser and colonised and across the globe. Both novels illuminate and amplify the concept of a cultural poetics of genetic kinship by aesthetically transcending the limits of genetic science to construct additional genetic connections between the West and the Global South on the level of metaphor and analogy.

## GENETIC FATE AND THE POSTCOLONIAL FAMILY IN *WHITE TEETH*

Zadie Smith's *White Teeth* has become an important cornerstone in recent British fiction about multiculturalism, and Smith's examination of postcolonial and diasporic identity politics has arguably emerged as the foremost concern in critical discussions of the novel.<sup>30</sup> A focus on kinship relations in this context reveals a new perspective on the text's aesthetics of identity formation, especially regarding the interplay of biological and cultural dimensions of the characters' continuously transforming identities. In the novel, the biological dimension of individual and communal identity finds expression in discourses of genes and blood. Genetic discourses of inherited characteristics dominate, however, and invocations of blood relations appear to buttress the novel's interrogation of genetic heredity by dovetailing it with its historical precursor discourse, rather than suggesting an alternative view of the conjunction of heredity and identity.

Previous critical analysis of the novel's engagement with genetic science mostly zooms in on issues of genetic determinism and the perceived conflict between genetic nature and socio-cultural nurture.<sup>31</sup> When attention is paid to the inter-relation of genetic determinism and matters of postcolonial identity, the focus is primarily on the extent to which characters' identities appear to be subject to genetic predisposition.<sup>32</sup> I shift the focus of my analysis to the intersubjective relations figured and reconfigured through a discourse of genetics in the novel. Such relations are bound up with questions of genetic determinism,



which help to make sense of the nature and consequence of these relations. However, their primary concern, as well as analytical virtue, lies in uncovering the communities of kinship from which postcolonial identities are shown to emerge in Smith's novel. In particular, a focus on genetic kinship illuminates the central role of the family in the text's negotiation of postcolonial identities.

Frequently, explicit and implicit discussions of genetics in the dyad of nature and nurture in the text appear, on second sight, to be more concerned with establishing the import of family relations and their impact on characters' identities. In the novel, the conversation between Joyce Chalfen and Clara Bowden about the origin of their children's intelligence is a case in point. For Joyce, the mental agility of her husband and children is clearly 'in the genes' because 'nurture just won't explain it'.<sup>33</sup> Asked about the root of her daughter's intelligence, British-Jamaican Clara responds that it must be 'the English in my side' (354). Her answer is meant to please her hostess. To herself, Clara thinks that, actually, her colonial English grandfather was not that bright at all: 'Probably even Grandma Ambrosia was smarter than Captain Charlie Durham' (355). The passage clearly undermines any belief in the primacy of genetic nature over nurture. However, more significantly, I argue, Clara's contemplation of her genetic kin deploys the issue of inherited characteristics to enact a complex and comic investigation of her sense of self in the persistent shadow of colonial politics.<sup>34</sup> Her intimidation by the representatively 'English' and middle-class Joyce leads Clara, to her later chagrin, to emphasise her own genetic claim on English kin. Privately, however, she asserts her Jamaican heritage by rejecting the superior influence she just attributed to the genes of her English ancestor. Their discussion of genetic predispositions is tangled up with a more emotionally charged interrogation of genetic kinship. This exposes the lingering postcolonial structures of assumed English superiority that also characterise the scene's internal power dynamics. Even though Clara in the end manages in some measure to rewrite these dynamics, the meaning of genetic kinship in the novel emerges at the potent intersection of familial and national histories.

The genetic fate of the identical twins, Millat and Magid, provides another, even more elaborate, example of how questions of genetic determinism are linked with the novel's overarching concerns about family and national belonging. Twin studies have long been a staple in genetic research to test the respective influences of genes and environment on individuals. In an aestheticised fashion, the novel conducts its own twin study by showing Millat and Magid emerging as completely different personalities from their respective teenage years. Marcus Chalfen, the novel's primary geneticist character, and Joyce's husband, confidently pronounces that 'never in my life have I come across a couple of twins who prove more decidedly the argument against genetic determinism than Millat and (Magid)' (367). The narrator later further cements the novel's overall scepticism of genetic determinism, stating that the twins' identical genomes had 'reached different conclusions' (463).<sup>35</sup> However, in the larger context of the novel, the twins' different paths figure prominently in the text's exploration of the ties between families and national culture. In this way, the twins exceed the function of mere test subjects in a study of genetic determinism.

The reason why the twins spent their teenage years apart is directly connected to their father's deep anxiety over the loss of his Bengali heritage in his new diasporic home in Britain. This heritage, for him, is deeply engrained in his biology—'nothing was closer or meant more to him than his blood' (98). In particular, he emphasises his relation to Mangal Pande, whom he claims was a national hero resisting British oppression. Ironically,

in his attempt to salvage his cultural legacy and that of his family, he not only fails to live up to his ancestor Pande but also breaks his family apart. Having succumbed to what he perceives as Western temptations—drink, a dwindling of faith, an affair—the twins' father, Samad, decides to send both his sons back to be educated in Bangladesh. However, he can only afford one ticket, and so the twins are separated and Magid alone is sent away. In a further ironic twist, Magid finally returns almost as a caricature of the British colonial gentleman. He appears thoroughly Westernised and is devoid of the religious fervour his father had hoped to instil in him in Bangladesh—he even dares to order bacon (450). Millat, in contrast, has joined a group of harmless but fervent Muslims, satirically called 'Keepers of the Eternal and Victorious Islamic Nation' or 'KEVIN' (301), although his self-image as a gang member is highly influenced by Hollywood films. While all these differences between the two brothers also undermine notions of genetic determinism, they more pressingly embody their father's conflicted sense of self, which has engulfed their whole family.

Samad's and the twins' troubled relationship is figured through a genetic discourse that often exceeds the bounds of established genetic science in order to poetically depict how their familial relations shape their cultural identities. Consider, for example, the narrator's comments when Samad is about to meet the English woman with whom he is having an affair: 'And the sins of the Eastern father shall be visited upon the Western sons. Often taking their time, stored up in the genes like baldness or testicular carcinoma, but sometimes on the very same day' (161). The narrator fashions Samad's self-conscious guilt, which Samad understands as his personal assault on his Bengali heritage, as a heritable condition. The genes here mark both the kinship relation between father and sons, as well as the space through which moral failings are seen to reverberate along a familial lineage. At the same time, this geneticisation of his guilt is clearly indicated as a conflation of genetic science and Samad's trepidations about his own and his sons' assimilation to British culture. The narrator's division of the family into the 'Eastern father' and his 'Western sons' underscores Samad's cultural unease. Familial ties are here imagined through genetics and reflect the identity conflicts besetting families in a postcolonial society.

Using genetic discourses of kinship to reflect underlying issues and themes, like Samad's anxiety, is a recurrent aesthetic strategy in the novel. The twins' school, for instance, is named after an English colonialist who, supposedly to help them improve their stations, brought groups of Jamaicans to Britain. There, however, they ended up living lives of deprivation. The Englishman's legacy is described as running 'through people's blood and the blood of their families; it ran through three generations of immigrants who could feel both abandoned and hungry even when in the bosom of their families in front of a mighty feast' (307). The statement does not so much seriously indicate hereditary transmission of trauma in epigenetic terms. Instead, it uses a discourse of biological heredity analogically to emphasise the lasting impression of inequality and lack on a community. Similarly, when the narrator describes Millat's violent act of rebellion at the end of the novel, the invocation of an inherited genetic predisposition to rebel appears more metaphorical than literal: 'His is an imperative secreted in the genes and the cold steel in his inside pocket is the answer to a claim made on him long ago. He's a Pandy deep down. And there's mutiny in his blood' (526). The recourse to genetics here underlines a performance of self that draws on genetic notions of kinship to fortify a cultural and national continuity across the gulf of globalisation and diaspora.

In addition to these aesthetic appropriations of genetic kinship, genetic discourses of relatedness inform and emphasise the central structural role played by the family in Smith's interrogation of postcolonial identities. Ryan Trimm goes as far as stating that 'Smith's novel uses the family as a miniature of the nation'.<sup>36</sup> Smith, however, not only draws on the family to depict its importance for its particular members. She dramatises the characters' conflicted postcolonial identities through the interaction of the novel's three central families, the British-Jamaican Joneses (Archie, Clara and Irie), the Bangladeshi Iqbals (Samad, his wife Alsana and their sons Millat and Magid) and the wealthier middle-class Chalfens. The Chalfens function as the supposed template of Englishness in the novel, even though it emerges that they, too, are marked by migration and diaspora as Marcus's family are third-generation Polish immigrants. Over the course of the narrative, the Chalfens become the focus of acute diasporic kinship anxiety on the part of the first-generation immigrant parents, Samad and Alsana, as well as Clara. Although not for Clara's husband, for him being 'a father was such a solid genetic position in his mind (the solidest fact in Archie's life), it didn't occur to him that there might be any challenge to his crown' (343). Archie's indifference here appears as a striking example of the ease his privileged position as a white man affords him. Never having been seen as a racial other, he lacks the diasporic desire to protect his cultural identity and family against hybridisation. The more time Irie and Millat—and later Magid—spend at the Chalfens' house and the more they appear to become integrated into the Chalfen family, the more their immigrant parents perceive this development as a threat to their families' biological and cultural community. Alsana is desperately 'trying to keep this family together' (344). She fears an even greater assimilation in the second-generation immigrant sons and daughters of her extended family, who embrace Said's diasporic 'alternative communities' with much less apprehension.<sup>37</sup> Alsana's fear manifests itself in a vision of the dissolution of her family's sense of kinship and cultural identity in an undifferentiated gene pool of mixed lineages and ethnicities—'their Bengali-ness thoroughly diluted' (327).<sup>38</sup> Alsana would surely have emphasised the significance of genetic ancestry testing had the service been around at the turn of the millennium.

The increasing integration of Irie, Millat and Magid into the Chalfen family highlights the role of culture in kinship relations as they expand their previous familial sphere through non-biological forms of connection. At the same time, their presence in the Chalfen household exposes the superficiality, so Smith seems to suggest, of much middle-class emphasis on multiculturalism.<sup>39</sup> Marcus only really appreciates Magid—the most traditionally anglicised of the three children—and becomes Magid's 'English father'.<sup>40</sup> Irie, although deeply infatuated with the erudite Chalfens (319–21, 343), is only deemed competent enough by Marcus to rearrange his filing system. Moreover, Joyce's fascination with Millat remains literally superficial, since she is drawn most of all to his extraordinary and seemingly 'exotic' beauty (319–20). Within the sphere of the Chalfen family home, Smith stages a tableau of diasporic tension between Eastern and Western identities, cultural and biological forms of kinship and male and female exploitation.<sup>41</sup> Smith's depiction of the interfamily feud—which includes a scene of interfamily espionage (347)—and the cultural anxieties from which it springs, powerfully illustrates the ingrained importance of kinship relations in the negotiation of diasporic identities and belonging. However, the cause for the familial tensions also gives a glimpse of the facility with which the second generation could forge new

connections unburdened by oppressive values of biological and cultural purity.<sup>42</sup>

Genetic conceptions of kinship in the novel also connect the text's exploration of diasporic kinship and identity with contemporary biotechnology. As Everett Hamner remarks, the text combines the 'impact of twentieth-century shifts in immigration and biotechnology'.<sup>43</sup> Marcus Chalfen's research project is the genetically engineered 'FutureMouse' (326), whose public presentation marks the conclusion of the novel. The mouse's life is supposed to be completely pre-engineered—contradicting Marcus's rejection of genetic determinism to an extent—in order to study the physiological function of genes. Ultimately, this is geared towards the advance of medical treatments: 'a cure for cancer, cerebral palsy, Parkinson's' (312). His belief in the 'perfectibility of all life' is what most enrages the protestors at the unveiling of FutureMouse (312, emphasis original), causing them to neglect the medical application he envisions for his research.<sup>44</sup> The novel offers a critique of the new forms of biopower that genetic engineering enables,<sup>45</sup> for instance, through the countervoices of the protestors, Marcus's arrogance as well as the final escape of the mouse from its glass cage. At the same time, Smith also draws attention to the problematic and reductionist cultural appropriation of some of genetics' medical promises. She ultimately remains ambivalent as to the project.

However, the novel also makes use of the biotechnological discourse of Marcus's research in chimaeras and transgenesis, studies in genetically fusing elements from different organisms (312), to describe Irie's growing integration into the Chalfen household. The narrator pronounces Irie as becoming 'transgenically' fused to the Chalfens, prefiguring in genetic terms Joyce's later assertion that Irie has become an 'addition' to the family (342, 353). Similarly, when inspecting the photographs of the Chalfen family, Joyce announces that they look '[l]ike clones of each other' (314). These biotechnological images of relatedness expand the novel's genetic vocabulary of kinship. They illustrate both the aesthetic function of genetic science in the novel as well as associate notions of genetic relatedness with the urgency of the discourse and debate around genetic technology and biomedical application.

At the end of the novel, questions of genetic identity and kinship are again emphasised. This time, the emphasis underlines a vision of familial bonds that transcends both the burdens of biology and postcoloniality. In the narrative, Irie is the character most troubled by the bodily visibility of her difference. Her anxiety about her appearance reflects the novel's concerns with a sense of otherness derived from racial stigmatisation. She considers her body 'genetically designed with another country in mind, another climate' and her attempts at a 'makeover' are framed as a struggle with her 'genetic fate' (266, 268). Trying to change her appearance, Irie rebels against two crucial dimensions of postcolonial identity conceived through genetics in the novel: race and family. Unlike Millat, who 'lived for the in between' (351), Irie desires assimilation. The novel makes clear that her genetic fate is limited to certain aspects of her appearance.<sup>46</sup> The text further qualifies her desire for assimilation by the persistent inequalities and maltreatments characterising the immigrants' lives in the story. This renders assimilation a problematic and undesirable obfuscation of past and present social and political asymmetries.

Irie's strategy in the end has given rise to divergent readings. In short sequence, she sleeps with both Millat and Magid. She then becomes pregnant and the narrator offers a glimpse of her living together with her 'fatherless little girl' (541), Joshua Chalfen and her grandmother in Jamaica. Her daughter is fatherless in the

sense that her patrimony cannot absolutely be established—the twins' genetic makeup is identical after all. The novel thus seems to offer us a final vision of family life that boasts a combination of biological and non-biological relations, skips a generation and, through Irie's daughter, transcends the seeming definitude of genetic relatedness (although, of course, ironically, this transcendence is only comprehensible with recourse to the discourse of genetic kinship). According to Mindi McMann, this final utopian image is marred by the fact that its rejection of historical and biological burdens appears to be possible only outside of Britain.<sup>47</sup> Roxanne Covelo, in contrast, reads the ending more optimistically, arguing that the ending's 'vision of a universe in which origins matter little or not at all is not distressing but liberating. Utopia for Smith is a post-hereditary place'.<sup>48</sup> Covelo notes, however, that, with regard to the novel as a whole, it remains open to 'what extent this is actually possible'.<sup>49</sup> I would add that Joshua's presence in the envisioned kinship network in Jamaica represents a continuous translocal link to their shared British home country, though now devoid of colonial ambitions. Irie's new family cannot in fact escape the relations that connect them to their families and histories back in England, but these relations now seem less fraught with conflict. Moreover, since her daughter combines the cultural and genetic heritage of a network of family in Britain, Jamaica and Bangladesh, she comes to epitomise the very notion of global genetic kinship. This final flicker of postcolonial utopia in *White Teeth* resonates with a similarly utopian, if radically different, form of global genetic kinship developed in *The Calcutta Chromosome*.

#### NEW FORMS AND GEOGRAPHIES OF GENETIC KINSHIP IN THE CALCUTTA CHROMOSOME

In *The Calcutta Chromosome*, Ghosh combines his fictional exploration of diasporic identity with a critical interrogation of Western science in the face of non-Western approaches to knowledge. The novel is set in a near future when technological globalisation is even more advanced, with increased levels of cyberconnection but also surveillance 'around the globe'.<sup>50</sup> Global migration has also increased and the text's two protagonists exemplify what the novel reveals to be an often isolating and disorienting mobility that includes multiple diasporas. Antar grew up in Egypt and, after studying in Moscow, now works in New York City (5, 9). Murugan is originally from Calcutta but also worked in New York City until he disappeared on a research trip back to Calcutta. These multiple settings in *The Calcutta Chromosome* contrast with the singular focus on London in *White Teeth*. The representation of diasporic and native space in Ghosh's novel therefore places a greater stress on translocation than we find in Smith's text. This translocal focus in *The Calcutta Chromosome* is closely connected with the novel's exploration of alternative and localised epistemologies. In India, Murugan searched for evidence that the discovery of how malaria spreads, which won the British Ronald Ross a Nobel prize in 1902, was actually the feat of Indian researchers working at Ross' laboratory. The novel's plot centres on Antar's attempt to reconstruct Murugan's trip and research and narrates its story in temporally and geographically fragmented segments. Antar and Murugan were colleagues, both working for the International Water Council, a massive global corporation that houses Antar's direct employer, the company LifeWatch, a 'global public health consultancy and epidemiological data bank' (5, 8). The global corporate structures in the novel underline the near future's connectedness of the globe, not just on the level of markets and capital but also on the level of the individual body and health. I

argue that the text's combined negotiation of diasporic identity and localised science gives rise to an aesthetic vision of postcolonial kinship that, on the level of characters, crosses national, temporal and gender boundaries. Moreover, on the level of discourse, Ghosh articulates forms of relatedness that integrate Western genetic science with alternative Indian epistemologies.

Antar's life is marked by social and cultural alienation and representative of the majority of immigrants depicted in the novel.<sup>51</sup> He works from home and, after losing his wife and child in an accident, his only regular company consists of the regulars at a café at Penn Station. The space of the café itself resembles what Munkelt *et al* have described as a 'highly condensed translocal space' that strongly references the individual home countries of the regulars who are joined together by their shared experience of diaspora.<sup>52</sup> The spatial setting of the train station further underscores the feeling of transience and cultural homelessness shared by the patrons of the café (9, 15). Their sense of community is reminiscent of the 'alternative community' Archie and Samad find at the O'Connell's pub in Smith's *White Teeth*. However, contrary to Antar, both Archie and Samad still have their genetic families to return to. In *The Calcutta Chromosome*, the café community cannot make up for the loss of Antar's family and the growing desolation around his home as more and more families move away from the neighbourhood. He dreams of going back to Egypt but cannot afford to (5). In his diaspora, he moreover begins to lose his connection with his home country and culture. He has 'grown rusty in the (Arabic) dialect', in which the artificial intelligence system, Ava, operating on his computer communicates with him. Ava is 'programmed to simulate "localisation"', a feat deeply ironic, given Antar's emotional and geographical distance from his country of birth as well as the pronounced artificiality of the undertaking (14).<sup>53</sup> Ava's programme appears to represent the idea, revealed a fallacy by Hall, that cultural identities can be reproduced without attention to the mediating context of life in a new country.

This absence of meaningful community and a sense of rootedness in Antar's life is contrasted by the novel's equivalent of the final optimistic image of global kinship in *White Teeth*. This genetic conception of kinship in *The Calcutta Chromosome* emerges from the novel's postcolonial negotiation of Western science. This critical interrogation of Western and non-Western scientific epistemologies is a foremost concern in the scholarship on the novel.<sup>54</sup> The research of Antar's former colleague, Murugan, is the primary vehicle of this epistemological enquiry. Murugan is convinced that Ross did not discover that malaria spreads through mosquitos by his own accord but that he was led towards this discovery by a group of Indian 'counterscientists', a man named Laakhan and a woman called Mangala. Murugan aims to rewrite scientific history and, through his findings, the novel challenges the reader to rethink the hierarchies between colonial British scientist and colonised Indian researcher that defined the scientific community at the time, extending imperial domination at the level of science and technology.<sup>55</sup> Against the background of Khasnabish's reminder of the persistence of such epistemological hierarchies, the emphasis in *The Calcutta Chromosome* on Indian epistemology appears particularly significant. In *White Teeth*, in contrast, alternative epistemologies to Western science only ever appear at all in the form of a more generalised scepticism against notions of race and otherness supposedly legitimised by genetic science. In the context of Ghosh's more extensive questioning of epistemic hierarchies, his focus on the field of malaria research, as Diane Nelson notes, is additionally suggestive because malaria is by nature 'a disease dependent on multiple connections'.<sup>56</sup> Malaria's inherent connectivity lends



metaphorical weight to the novel's depiction of substantial inter-relations between Western and Indian epistemologies during the colonial period.

According to Murugan, the 'counter-science' (103) pursued by the Indian researchers is premised on a completely different epistemological foundation from Western science. He explains that to the counterscientists, 'to know something is to change it, therefore, in knowing something, you've already changed what you think you know so you don't really know it at all' (104). The epistemological uncertainty of this scientific methodology proves confusing to the reader precisely because it confounds positivist Western standards of knowledge and scientific knowledge production. In the face of what in the novel appears to be the big breakthrough achieved by the counterscientists, their alternative reasoning is not rejected. Instead, this alternative epistemology performs a serious challenge to the assumed primacy of Western scientific knowledge. Science and so-called counter-science are shown to mutually propel each other forwards on an equal footing.

Ghosh's utopian vision of postcolonial kinship is a direct product of the inter-relating forces of Western and non-Western experiments in the novel. The resulting relations among the different characters thus appear as a reflection of the converging epistemologies that underlie the genetic discourse through which their kinship is being articulated. By guiding Ross in his malaria research, the Indian Mangala chances on the novel's eponymous 'Calcutta chromosome' (108). This is, however, only the name Murugan gives to the process unearthed by Mangala and her followers, namely, the process of transferring personalities from one body to another: 'For the sake of argument let's call it a chromosome: though the whole point of this is that if it really is a chromosome, it's only so by extension, so to speak – by analogy' (246). The exact nature of this chromosome is never revealed in the novel and, possibly, cannot be revealed in a Western scientific framework. Murugan explains that Mangala's discovery allows her to transfer personalities from one body to another by transfusing a particle, the chromosome, that carries the collected information about a person's character, but which itself cannot be heritably transmitted (247). The Calcutta chromosome, thus, in some regards, critically diverges from conventional assumptions about genetic science, where the inheritance of chromosomes is key, while reproducing classic genetic dogma about the information carried in the DNA. The extent to which personalities are genetically inscribed or prescribed is of course notoriously controversial and relates back to my discussion of genetic determinism in *White Teeth*. In *The Calcutta Chromosome*, genetic determinism does not play a substantial role as such, but it can be observed that both novels emphasise that genetic ancestry, while important, does not translate in any predictable way into individual personalities or cultural identities.

Although the Calcutta chromosome's alternative epistemological status is repeatedly underlined, its primary point of scientific and discursive reference remains genetic science.<sup>57</sup> In consequence, the kinship networks imagined through the chromosome's transmission are presented as genetic kinship relations. Further, in the Calcutta chromosome's stated transgressions of conventional genetic science, we can identify the same aesthetic appropriation of genetic discourse as was identified in *White Teeth*, for instance, in Alsana's genetic vision of Bengali identity.<sup>58</sup> Moreover, like Smith's novel, *The Calcutta Chromosome* uses its poetics of genetic kinship to map and negotiate the construction of diasporic identities and postcolonial relations.

The novel's particular imaginary of global genetic kinship comes to a head in the final scene of the narrative, when Antar

himself, or at least his personality, becomes fused with the other characters who have undergone Mangala's treatment. Aided by the latest incarnation of Mangala, in the body of his neighbour Tara, Antar is joined by a diverse community of people: 'There were voices everywhere now, in his room, in his head, in his ears, it was as though a crowd of people was in the room with him. They were saying: 'We're with you; you're not alone; we'll help you across'' (306). It remains unclear exactly what happens at this moment, whether his body becomes the receptacle of other personalities or whether he joins them in another body or, even, in a digital form.<sup>59</sup> In any case, the scene is much more significant for its emphasis on kinship. At the end of the novel, Ghosh here imagines a community of strangers from around the globe intimately connected and mindful of each other. Their connection is achieved via an aesthetic construct that combines genetic science with non-Western forms of knowledge—and is strongly reminiscent of the Hindu mythology of reincarnation. The new kinship relations among the group are remarkable not only because they envision a kind of biological kinship that is in fact the product of cultural and scientific manipulation, but also because they combine individuals from Western, Eastern and Southern backgrounds. As Nelson points out, 'the Calcutta chromosome lashes together rich and poor, in India and in diaspora; it links Egyptian and Armenian, journalist and Bollywood star, a self-made man and a nineteenth-century laboratory assistant, colonial science and post-colonial counter-science'.<sup>60</sup> Moreover, as Romanik remarks, 'markers of identity (race, class, religion and language) get displaced and come to be understood as series of interconnections'.<sup>61</sup> Through *The Calcutta Chromosome*, Ghosh offers a vision of genetic kinship that connects those who have been affected by the social and political consequences of colonial rule, including global diaspora. In light of their various cultural and racial backgrounds, it is the newly forged chromosomal relatedness that stands out as the strongest kind of kinship among them. Yet, at the same time, the genetic imaginary of their connection is expressive of profound relations between them and their histories. Because of their fused minds, they quite literally share their past experiences. Their individual and localised memories come together in another highly condensed translocal space: the geneticised diasporic body. This genetic imaginary of postcolonial relations appears utopian but evinces a real desire for connection across perceived national and ethnic boundaries.

Ghosh's vision of a global cross-cultural, interethnic kinship, established on the level of genes, powerfully imagines a poetics of postcolonial relations that may glimpse beyond the political, economic and epistemic inequalities governing the world in the novel. This optimistic vision of a future global kinship goes markedly further than the cautiously utopian depiction of Irie's new transnational family glimpsed at the end of *White Teeth*. However, this powerful invocation of unity in *The Calcutta Chromosome* also risks dissolving the difference that as an analytical and political tool fuels postcolonial appeals to diversity and which circumscribes the particular kinship networks, like the family, which are so vital to individual identity. As a case in point, Robbie Goh reads the community established at the end of the novel as a 'cacophony of voices' that recreates the notion of the 'body of the native' as 'an indistinguishable mass'.<sup>62</sup> Honing in on the novel's vagueness as to what exactly happens to the host body once a foreign personality has entered it, Goh interprets Mangala's identity transfer as a form of colonisation reminiscent of the other prominent colonial force in the text, the British colonial rule of India.<sup>63</sup> While the novel is indeed ambiguous about the fate of the host, I would argue that the plurality of voices at the end implies an accumulation of personalities in

the host rather than a hostile takeover by an invading genetic particle. Nonetheless, Goh has a point. It is crucial to keep in mind that, as I have stressed before, an appeal to genetic kinship might paradoxically invite others to see genetic ties among a particular group as justification to denounce them as more or less fundamentally other.

## CONCLUSION

Literary fiction is uniquely placed to engage with a cultural poetics of genetic kinship that has transformed our understanding of kinship relations in recent decades. The enormous public attention paid to genetic science has re-emphasised biology in considerations of kinship. At the same time, as Smith's *White Teeth* and Ghosh's *The Calcutta Chromosome* demonstrate genetic discourses of relations among kin can themselves become potent vehicles for a discussion of the interplay of biology and culture in the construction of kinship, especially as both texts self-reflexively contemplate the genetic science they employ. Frequently in the novels, questions of genetic nature versus socio-cultural nurture emerge as prominently imbricated in interrogations of kinship. As the authors consider whether it is genetics or society that accounts for the relations among characters, they transcend concerns about genetic determinism and lay bare the inextricable link between biology and culture instead. While genetic notions of kinship in *White Teeth* strongly foreground the family as a central institution in postcolonial identity politics, Smith reveals that biological relations alone cannot begin to capture the sociocultural meaning of kinship, particularly in the experience of diaspora. In *The Calcutta Chromosome*, in turn, it is only by literally manipulating genetic material—according to the counterscientists' cultural values—that Ghosh can develop his vision of postcolonial kinship.

In literature, medicine and anthropology, genetic science has rekindled biological conceptions of relatedness at the same time as revitalising enquiries into the cultural meaning and construction of genetic kinship. Smith's and Ghosh's novels exemplify the particular power of fiction to excavate cultural assumptions by reflecting them in a heightened fashion. With their particular aesthetics of genetic kinship, the texts go beyond the limits of current science and use genetic discourses to describe kinship relations quite outside the purview of contemporary genetics, be it Samad's notion of the heritability of his sins or Mangala's non-Western Calcutta chromosome. In both novels, genetic science becomes a means to discuss the cultural and political tensions characterising the postcolonial subject's kinship relations and diasporic identity. Moreover, at a more theoretical level, both texts illustrate the productive new perspective discourses of genetic kinship provide on central postcolonial concerns such as the experience and representation of diaspora and globalisation. As genetic articulations of kinship proliferate, in literature and beyond, it is one of the important tasks of contemporary literary and cultural criticism to dissect cultural invocations of genetic kinship. This is particularly the case in a global postcolonial context, where the urgency of such invocations is amplified, as is the need to examine their use of genetic science, as well as their underlying assumptions about the nature and meaning of kinship today.

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## NOTES

1. It was not appropriate or possible to involve patients or the public in the design, conduct, reporting or dissemination plans of this study.
2. See Roxanne Covel (2017), "The Genetic Fluke in Zadie Smith and Philip Roth: Order, Chaos and Utopia," *Neophilologus* 101 (2017): 621–37 (p. 622).
3. These two dimensions of material migration and cultural experience correspond to the two principal meanings of diaspora in current postcolonial theory. See, for instance, Mark Shackleton (2008), "Introduction," in *Diasporic Literature and Theory—Where Now?*, ed. Mark Shackleton (Cambridge: Cambridge Scholars, 2008), ix–xiv (p. ix).
4. Stuart Hall (1990), "Cultural Identity and Diaspora," in *Identity: Community, Culture, Difference*, ed. Jonathan Rutherford (London: Lawrence and Wishart, 1990), 222–37 (p. 224).
5. See Marga Munkelt (2013), "Introduction: Directions of Translocation—Towards a Critical Spatial Thinking in Postcolonial Studies," in *Postcolonial Translocations: Cultural Representation and Critical Spatial Thinking*, eds. Marga Munkelt et al (Amsterdam: Brill, 2013), xiii–lxxix.
6. Edward Said (2001), "Introduction: Criticism and Exile," in *Reflections on Exile and Other Literary and Cultural Essays* (London: Granta, 2001), xi–xxxv (p. xxvii).
7. Ashmita Khasnabish (2020), "Introduction," in *Postcoloniality, Globalization, and Diaspora: What's Next?*, ed. Ashmita Khasnabish (Lanham: Lexington Books, 2020), 1–12 (pp. 2, 22).
8. Rajeev S. Patke (2006), "Postcolonial Cultures," *Theory, Culture & Society* 23, no. 2–3 (2006), 369–2 (p. 370).
9. See Jonathan Marks (2002), *What It Means to Be 98% Chimpanzee: Apes, People, and Their Genes* (Berkeley: The University of California Press, 2002); Philip Ball (2019), "How I changed my mind about the biology of race," *The Guardian*, December 26, 2019, <https://www.theguardian.com/commentisfree/2019/dec/26/biology-race-angela-saini-misconceptions-science>; Catherine Nash (2005), "Geographies of Relatedness," *Transactions of the Institute of British Geographers, New Series* 30, no. 4 (December 2005), 449–62 (p. 455).
10. As a discourse, genetic kinship foregrounds significant genetic similarities between individuals as the primary indicator of relatedness. Such genetic claims of kinship may rely on actually identified genetic similarities, established through genetic testing, with testing varying in extensiveness from testing for selected DNA markers, as in paternity tests, to whole-genome sequencing. In popular parlance, however, claims of shared DNA are often made to express kinship ties without having previously tested for such genetic similarities.
11. See, for example, Sarah Franklin (2003), "Re-thinking Nature-culture: Anthropology and the New Genetics," *Anthropological Theory* 3, no. 1 (2003), 65–85; Catherine Nash (2004), "Genetic Kinship," *Cultural Studies* 18, no. 1 (2004), 1–33.
12. Siddhartha Mukherjee (2016), *The Gene: An Intimate History* (London: Bodley Head, 2016), 4.
13. Mukherjee, *The Gene*, 8, 493.
14. Mukherjee, *The Gene*, 8.
15. Mukherjee, *The Gene*, 8. See also Sarah Franklin, Celia Lury, and Jackie Stacey (2000), "Life Itself: Global Nature and the Genetic Imaginary," in *Global Nature, Global Culture*, eds. Sarah Franklin, Celia Lury and Jackie Stacey (London: Sage, 2000), 188–227 (p. 189).
16. Anne Pollock and Banu Subramaniam (2016), "Introduction to Special Issue: Resisting Power, Retooling Justice: Promises of Feminist Postcolonial Technosciences," *Science, Technology & Human Values* 41, no. 6 (November 2016), 951–66 (p. 953).
17. Pollock and Subramaniam, "Introduction to Special Issue," 956.
18. Nash, "Geographies of Relatedness," 451.
19. Nash, "Geographies of Relatedness," 451–52.
20. Janet Carsten (2020), "Kinship," *Encyclopaedia Britannica*, [www.britannica.com/topic/kinship](http://www.britannica.com/topic/kinship).
21. Recent advances in genetic testing, especially in preimplantation genetic diagnosis, have even more radically altered the dynamics of biology and culture in the realm of human reproduction and kinship (Carsten, "Kinship"). As the random inheritance of



- particular traits and genetic predispositions from one's parents becomes the object of choice and biomedical intervention, kinship is also remade and culturally determined. See Sarah Franklin and Celia Roberts (2006), *Born and Made: An Ethnography of Preimplantation Genetic Diagnosis* (Princeton: Princeton University Press, 2006).
22. National Institutes of Health (NIH) (2020), "Direct-to-Consumer Genetic Testing," Lister Hill National Center for Biomedical Communications, May 12, 2020, <https://ghr.nlm.nih.gov/>.
  23. Test results are only as accurate as the size of the previously gathered data set allows, explaining why small sets, such as Native American genome data, often prove particularly unreliable. See Hina Walajahi, David R. Wilson, and Sara Chandros Hull (2019), "Constructing Identities: The Implications of DTC Ancestry Testing for Tribal Communities," *Genetics in Medicine* 21 (2019), 1744–50.
  24. A high percentage in one rubric may to one person be taken to establish that race or ethnicity is genetically inscribed, seemingly legitimising race as a marker of innate otherness. To another, the very fact that, as a result of human migration, any person's genome will inevitably yield at least some diversity according to the test's parameters, undermines the very notion of a biological conception of race. These two divergent readings both claim genetic evidence as support.
  25. Controversy erupted, for example, around comments made by the Harvard geneticist David Reich, who suggested that, in his assessment of genetic variation data, behavioural traits and intelligence varied between certain populations and races. Kevin Mitchell (2018), "Why genetic IQ differences between 'races' are unlikely," *The Guardian*, May 2, 2018, <https://www.theguardian.com/science/blog/2018/may/02/why-genetic-iq-differences-between-races-are-unlikely>. On the recurrence of notions of race in population genetics, see also Nash, "Geographies of Relatedness," 455–56. In the context of genetic ancestry testing, in particular, Roth *et al* describe that such tests can both promote and reduce essentialist views of race but report that essentialist views are distinctly more common the lesser the knowledge of genetics. Wendy D Roth *et al*. (2020), "Do Genetic Ancestry Tests Increase Racial Essentialism? Findings from a Randomized Controlled Trial," *Plos One* 15, no. 1 (2020), 1–17.
  26. Barbara A. Koenig, Sandra Soo-Jin Lee, and Sarah S. Richardson (2008) "Introduction: Race and Genetics in a Genomic Age," in *Revisiting Race in a Genomic Age*, eds. Barbara A. Koenig *et al* (New Brunswick: Rutgers University Press, 2008), 1–20 (p. 4).
  27. Nash, "Geographies of Relatedness," 450–51.
  28. Said, "Introduction," xxviii; Khasnabish, "Introduction," 14.
  29. Édouard Glissant (1997), *Poetics of Relation*, trans. Betsy Wing (Ann Arbor: University of Michigan Press, 1997).
  30. See, for instance, Ashley Dawson (2007), *Mongrel Nation: Diasporic Culture and the Making of Postcolonial Britain* (Michigan: University of Michigan University Press, 2007), or Mindi McMann (2012), "British Black Box: A Return to Race and Science in Zadie Smith's *White Teeth*," *Modern Fiction Studies* 58, no. 3 (Fall 2012), 616–36.
  31. See, for example, Dawson, *Mongrel Nation*, 154.
  32. See, for example, Everett Hamner (2017), *Editing the Soul: Science and Fiction in the Genome Age* (Pennsylvania: Penn State University Press, 2017), 94; and Roxanne Covelo (2017), "The Genetic Fluke."
  33. Zadie Smith (2001), *White Teeth* (London: Penguin, 2001 [2000]), 354. Subsequent page references will be included after quotations.
  34. On genetics and comedy in the novel see Josie Gill (2013), "Science and Fiction in Zadie Smith's *White Teeth*," *Journal of Literature and Science* 6, no. 2 (2013), 17–28.
  35. See also Dawson, *Mongrel Nation*, 164.
  36. Ryan Trimm (2015), "After the Century of Strangers: Hospitality and Crashing in Zadie Smith's *White Teeth*," *Contemporary Literature* 56, no. 1 (2015), 145–72 (p. 154).
  37. Said, "Introduction," xxxiii.
  38. See also Covelo, "The Genetic Fluke," 631.
  39. See Ashley Dawson (2007), *Mongrel Nation*, 166; and Hamner, *Editing the Soul*, 118.
  40. McMann, "British Black Box," 627.
  41. The novel contains various other manifestations of non-biological kinship relations, from Samad's feeling of 'kinship' (101) with religious dissenters in the war, and Millat's membership of KEVIN, to the 'different kind of family' afforded to Archie and Samad by the patrons of their regular pub, O'Connell's (183). Such non-biological, cultural expansions of kinship expand the kinship relations explored by the novel and highlight the cultural dimension of the text's representations of genetic kinship.
  42. See also Taryn Beukema (2008), "Men Negotiating Identity in Zadie Smith's *White Teeth*," *Postcolonial Text* 4, no. 3 (2008): 1–15 (p. 8). The slippery slope that enables genetic science to be used to envision concepts of so-called biological purity is evoked in the novel by a reference to the discourse and practice of eugenics. Marcus's mentor in the end turns out to be the Nazi geneticist and eugenicist spared by Samad in the Second World War (see also McMann, "British Black Box," 619).
  43. Hamner, *Editing the Soul*, 94.
  44. See also Hamner, *Editing the Soul*, 126.
  45. See also Dawson, *Mongrel Nation*, 151.
  46. Covelo, "The Genetic Fluke," 625.
  47. McMann, "British Black Box," 631.
  48. Covelo, "The Genetic Fluke," 633. Cf. Trimm, "After the Century of Strangers," 170.
  49. Covelo, "The Genetic Fluke," 634.
  50. Amitav Ghosh (1995), *The Calcutta Chromosome* (London: John Murray, 2011 [1995]), 3. Subsequent page references will be included after quotations.
  51. See also C. A. Shinn (2008), "On Machines and Mosquitoes: Neuroscience, Bodies, and Cyborgs in Amitav Ghosh's *The Calcutta Chromosome*," *Melus* 33, no. 4 (Winter 2008), 145–66 (p. 145).
  52. Munkelt *et al*, "Introduction," xxxiii.
  53. See also Robbie B. H. Goh (2011), "The Postclone-nial in Kazuo Ishiguro's *Never Let Me Go* and Amitav Ghosh's *The Calcutta Chromosome*: Science and the Body in the Asian Diaspora," *Ariel* 41, no. 3–4 (2011), 45–71 (p. 55).
  54. See, for example, Claire Chambers (2003), "Postcolonial Science Fiction: Amitav Ghosh's *The Calcutta Chromosome*," *Journal of Commonwealth Literature* 38, no. 1 (2003), 57–72, or Diane M. Nelson (2003), "A Social Science Fiction of Fevers, Delirium and Discovery: *The Calcutta Chromosome*, the Colonial Laboratory, and the Postcolonial New Human," *Science Fiction Studies* 30, no. 2 (2003), 246–66.
  55. See also Barbara Romanik (2005), "Transforming the Colonial City: Science and the Practice of Dwelling in *The Calcutta Chromosome*," *Mosaic* 38, no. 3 (September 2005), 41–57 (p. 42–44).
  56. Nelson, "A Social Science Fiction," 246.
  57. See also J. H. Thrall (2009), "Postcolonial Science Fiction?: Science, Religion and the Transformation of Genre in Amitav Ghosh's *The Calcutta Chromosome*," *Literature and Theology* 23, no. 3 (September 2009), 289–302 (p. 297).
  58. On the chromosome as metaphor in Ghosh's text see also Julia Fendt (2015), "The Chromosome as Concept and Metaphor in Amitav Ghosh's *The Calcutta Chromosome*," *Anglia* 133, no. 1 (2015), 172–86. On the aesthetic integration of cultural and genetic discourses in *White Teeth* see also Gill, "Science and Fiction."
  59. In contrast to other characters in the novel whose personalities have been transferred into another body, Antar is the first to experience this procedure aided by a computer and the global network of the internet. There is some debate in the critical discussion about whether Antar at the end of the novel presents the evolution of Mangala's treatment completely into the digital realm (Thrall, "Postcolonial Science Fiction?," 299–300; Hugh Charles O'Connell (2012), "Mutating Toward the Future: The Convergence of Utopianism, Postcolonial SF, and the Postcontemporary Longing for Form in Amitav Ghosh's *The Calcutta Chromosome*," *Modern Fiction Studies* 58, no. 4 (Winter 2012), 773–95 (p. 789), or whether the digital medium is just another form of carrier enabling the Calcutta chromosome to pass over into a new host body (Shinn, "On Machines and Mosquitoes," 146, 155–56). In either case, the ability to digitally process the Calcutta chromosome again emphasises that it appears to transmit genetic "information," highlighting that the conception of the alternative chromosome remains bound up with its source discourse of genetic science.
  60. Nelson, "A Social Science Fiction," 258.
  61. Romanik, "Transforming the Colonial City," 44.
  62. Goh, "The Postclone-nial," 58–59.
  63. Goh, "The Postclone-nial," 55.

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