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Introduction

The genome has destroyed humanity. If the double helix is an icon of the modern age, then the genome is one of the last grand narratives of modernity. This book is about a period of science that took place over two decades, one that may not yet have ended (only entering a different phase), but which contains the ingredients for the destruction of its primary reference subject: the modern concept of the human. The genome is the last in a set of descriptions about biological life that privilege the individual organism as the primary unit of evolutionary history, the genome as the primary unit of individual life, and the gene as the primary unit of the genome: the age of biological atomism. This has given way to the age of complexity, which means more than just saying that things are more complicated than genes. At a moment when the chasm between information, meaning-making and truth-telling seems to grow ever wider, understanding complex systems as ‘networks of multiple interacting causes that cannot be individually distinguished’ means ‘dancing with them,’ rather than seeking universal solutions (Poli 2017, 181). Nonetheless, the quest for cause, effect and solutions is an older and harder logic, alloy in the wheels of the stories we tell about the worlds we inhabit, about ourselves, our power, what we value and our logics of valuation, how we communicate – with each other and with nonhuman entities – and how the worlds we inhabit also inhabit us.

The genome was one such story. It promised a blueprint that would tell us about biological complexity, and why human worlds seem so deeply complex in comparison to nonhuman ones: a code that could tell us not only what makes us human but how humanity is made and remade. Sequencing the human genome was to open up uncharted territory in the realm of human health and scientific understanding. These aims gave way to other questions when results of sequencing did not offer the answers molecular biologists had assumed they would find. Humans express about 2 per cent of their entire genome, and what molecular biologists had long dismissed as ‘junk DNA’ is in fact instrumental to the ongoing expression and silencing (methylation) of genetic material. The story of the genome was inconclusive, and this lack of conclusion has introduced

a whole new set of questions around the ways organisms are more like ecosystems than individual actors, constantly interrupted and contested and consumed by – and cohabiting with – others (Margulis and Sagan 2003). Ed Yong calls this the ‘long waltz’ of the holobiont (2016) – me, plus my bacteria, fungi, viruses and more – creatures living in community with others, communicating across dimensions of matter, remaking ecological lifeworlds anew, in complicated and sometimes dangerous ways, and in the process undermining modern notions of liberty located in the individual.

Molecular biology has entered the so-called postgenomic era, but what exactly this shift means and to whom it matters is under considerable negotiation. Before investigating new metaphors of self and society introduced by what Jenny Reardon has called ‘the postgenomic condition’ (2017), this book looks back over the era of the genome – the narratives it produced and was produced by, its neologisms and homonyms, analogies and metaphorical infrastructure. Reading the era of the genome through literary and cultural imaginaries is a way of anticipating and countering some of the repetitions of what has come after it – the recapitulations that tread familiar ground – as well as attending to imaginaries that fall outside, resist or outright refuse the reduction of life to molecular text. The idea of the genome has transformed horizons of self, health, wealth, labour and identity, while also depending on older constructions of human experience without necessarily declaring these as partial or suspect.

Artefact of neoliberal globalism, relic of late capitalism, cultural phenomenon of Faustian proportions, the massive cult power of genomics – practices of sequencing the whole genome – dominated the life sciences over the 1980s and 1990s. The dates of the Human Genome Project’s conception correspond to the transformation of capital flows from the late 1970s and early 1980s, with industrial production outsourced from Western Europe and the United States to South Asia, South East Asia, Latin America and Africa, and finance capitalism becoming a new globalized mode of deregulated exchange. As Reardon notes, these reconfigured relations meant new forms of governance, ‘reconfiguring who people were and who could legitimately represent them’; amid these transformations, genomics offered ‘powerful new practices for differentiating among human beings’ (2017, 72). This capitalism of finance flows needed new target subjects, whose function in this regime began to encompass not only labouring and consumption but also donating information via digitalized data collection. Genomic information became a prototype for this regime after the landmark 1980 ruling of *Diamond vs Chakrabarty* in the United States, which legalized the patenting of engineered biological matter. This opened the

door for the whole-scale commercialization of genomic information, and the United States set a new global standard for private biotechnological companies seeking to cash in on technologies of cloning, sequencing and editing biological material.

Encountering oneself as a string of code means not just thinking about what makes us human, but confronting ourselves as human beings in code: an encounter akin to Jacques Lacan's account of the mirror stage, seeing the self reflected back at oneself for the first time, when a relation is established between organism and environment (2001). In the genomic situation, this moment of self-recognition is mediated by an apparatus of political and economic interests – the substitution of bodily appearance with a collection of letters. Kaushik Sunder Rajan has argued that in this novel biopolitical arrangement, 'the life sciences are overdetermined by the capitalist political economic structures in which they emerge' (2006, 6): not caused by them, but made into a context – an environment – for the perpetuation and prolongation of capitalist modes of production. In this regime, he adds, 'life becomes the explicit centre of political calculation' (79). This in itself might not be seen as something new; what is crucial for the era of genomics is the scale at which political calculations of biomatter can be made into surplus value by new technologies of data capture. The individual is on the precipice of disappearing into caches of comparative data, which in turn shift 'the grammar of life towards a future tense' (Rajan 2006, 14). That is, a conception of life as something that can be mapped, calculated, predicted, engineered and rearranged either for the benefit of individuals who can afford to invest in their own futures, and/or the futures of their offspring.

Does the messiness of matter go away with the advent of datafied and predictive futures? Eugene Thacker places biological exchange in the era of the genome alongside other forms of exchange – political, cultural and economic – while acknowledging that unlike these three other spheres, the stuff of biology is messier, wetter and less congruous than more obviously divisible units of power, signs and value (2005). More than this: it is unevenly overlayed, shaped by and constitutive of all three realms. Genomics relies on the messiness of materiality, partly to keep uncertainty locked into its speculative forms of value-making, and partly because of its connection to older practices of what might also be termed biotechnology – livestock, breeding and agriculture (2005, 19). For Thacker, genomics is not purely informational, but is based on a contradiction: 'that biology is information, and that information is both immaterial and material' (2005, 21). It is in this contradiction that the basis of genomics' epistemological onslaught to capitalist modernity lies. In a nutshell, because it cannot be

contained to the realm of unit-thinking. The reliance of biological thinking on metaphors from other realms – on biological stuff being like value, like signs, like power, while never completely reducible to these things – ends up undoing the logic of unit-thinking. It becomes impossible to ‘think’ the body ‘in’ space, restricted to specific fields of action, parts becoming relevant at different points in chronological time. Systems biology has come closest to getting at this, but bodies are not networked either. Knowledge about the operations of life itself are at best, partial; hence, learning how to dance with them, rather than reducing them to value, signs or power relations, is vital.

In this unwieldy kaleidoscope of possible meanings, where technology breaks biomatter down into component parts and tries to make sense of them, narrative is both a strategy of containment and a way of dancing with complexity. As Clare Hanson puts it, ‘From the outset genetics has been entangled with meanings which extend far beyond the biological’ (2020, 19). Genomics has done new things to processes of signification, ‘allowing us to grammatically conceive of life in certain ways, not in terms of an Aristotelian poesis, but rather as those whose futures can we can calculate in terms of certain disease events happening’ (Rajan 2006, 14). This marks a departure from the imaginative field of evolutionary theory in the nineteenth century, which, to follow Gillian Beer, moved between two elements: growth (as experience) and transformation, which fuelled nineteenth-century preoccupations with *märchen* (folklore), fairy-tale and myth (Beer 2010, 97). Genomics is largely uninterested in growth, and appropriates transformation into either genomic diagnosis (i.e. deleterious transformations that might be visible in the genome) or genomic futurism (i.e. the editing or eradication or insertion of elements that might facilitate better, longer and more productive lives). To sell itself, genomics has relied on repurposing words that carry a degree of stability and recognisability for its own logic, and which taken together convey a metaphorical field of pattern – code to signify configurations of genes, pair to signify the arrangement of nucleotides, sequence to signify the order of pairs. It also relies on forms of juxtaposition and contrast, and constructs molecular temporalities (the time taken for certain genetic processes to occur) to insist on the necessity of speed in its experimental operations. Maps and tracking devices proliferate, while molecular worlds are translated into sequences of signs.

For Rajan, this amounts to a take-over of the grammar of life: no less than the biomedicalization of ontology, and the reduction of poesis (as transformation or making) to the level of the molecular. But is this takeover as total as it looks? This is one of the biggest questions of this book: how is language involved in an

ongoing negotiation over the status of the human, and how does the messiness of what genomics does not account for – other histories, other forms of inheritance, other modes of being – interrupt and destabilize the seemingly implacable logic of cause and effect bound up in the idea of a molecular script? Mike Fortun is more optimistic about the possibility of resistance in language: ‘language, which allows us to invent concepts that are a little off the chart, is one of the few things that can keep up with the inventions of genomicists’ (2008, 29). Rather than submitting to a version of life determined by code, narrative in the age of the genome involves complex compositions of power negotiations, semiotic events and value fluctuations, which are attached to a range of interests and relations, mechanisms and localities.

Such negotiations intensify the relationship between speculation and narrative. Fabrizio Terranova offers an expansive understanding of ‘the force of narration as a way to tell stories which can make “possibles” exist’ (in Pihet 2017, 66–7). This is more than reducing aesthetics to narrative; it is to use fabulation to ‘create autonomous objects . . . no longer connected via a whole string of attachments’, which confound the presuppositions of storytelling within established literary genealogies (67). For Didier Debaise, this sense of fabulation nourishes a form of speculative philosophy that departs from post-Kantian idealism, which involves ‘thinking beyond a purely human perspective or condition, taking into account the importance and irreducibility of abstractions, freeing the imagination from any exclusive ties to representations, intensifying the sense of possibles . . . without losing the pragmatic sense of experience’ (in Pihet 2017, 68). Narrating genomics necessitates this mode of speculation in forms of representation already beyond the human as finite individual, and the ethical dilemmas of body-as-code exceed what legal frameworks have been able to imagine, let alone legislate.

Narrative in the age of the genome is concerned as much with what falls outside the calculable, statistical and algorithmic as it is with tracing the ways that genomics offered a prototype for the rearticulation of humans at the beginning of the twenty-first century as producer-consumers of data in the Global North or as peripheral and precarious manufacturers of technologies for interpreting these data in the Global South. Critiques that foreground the operations of racialization as a condition of capitalist production have articulated this difference as one constituted by racial capitalism (Robinson 1983). Hortense Spillers differentiates between flesh and body, and between ‘captive and liberated subject-positions’ (1987, 67). The ideology of genomics has been complicit in economies of flesh, ‘that zero degree of social conceptualisation that does not escape concealment under the brush of discourse, or the reflexes of iconography’

(67). This is an economy of marks made data, constituting crimes against bodily matter. Flesh produces an idea of the body as a productive agent, a unit of possible liberation, around which a host of practices can be organized. In Lars Schmeink's words, 'health is no longer a necessity for survival in a social group that depends on it, but rather a lifestyle choice, the body becoming a work of art or a demonstration of scientific possibilities' (2016, 147). Keeping hold of the racialized distinction between these forms of labour is key: genomics has facilitated the consolidation of these two groups in technologies of algorithmic governmentality, where information of the flesh generates narratives of the body, which fuels production, which needs more information to keep up with the speed of innovation.

Narrative also attends to what Beer describes compellingly as 'the *chanciness* of consequences, the phantasmagoric outflaring of need and dread into acts which confirm their own predictions,' out of which 'determining patterns' might be resisted, and new stories made (2010, 202). This extends to moving about and playing around with evidentiary objects. By de-emphasizing some influences, and ramping up others – or by arranging them without any obvious order or logic, layering different strands of documentation together, or through strategies of withholding and distracting – narrative might deliver what Beer calls 'communal insights' (163). Not universal ones, but those formed through mismatching, cobbling together, where it is not truth or transparency that matters as much as some kind of temporary consensus over why a particular narrative might make sense at a particular time, in a certain place. If the genome has been purported to be a transparent ledger of existence, then narrative in the age of the genome attends to the sedimentations and unmarked burial grounds of forgotten evidence – the way it emerges in unexpected places, or when genomic proof cannot do the kind of cultural work it promises to do.

Central to this is the question of repair. As Evelyn Fox Keller notes, the shift from genetics to genomics in the 1970s was facilitated and motivated by the concept of genetic disease. It is this powerful concept – that disease events might be located in the genome and mitigated against – that 'represents an ideological expansion of molecular biology far beyond its technical successes' (1992, 293). The concept of genetic disease propelled genomics into the era of neoliberalism as the key to disease-free futures, which could be speculated on through both technological innovation and bioeconomic investment: the era of biocapital proper. Genetic disease 'created the climate' for the Human Genome Project: the massive, multinational effort of sequencing – in Keller's careful formulation – 'what has come to be called "the human genome"' (293): a reference genome

made up of aggregated data from several people, all falling under the Caucasian ethnic grouping, the majority of whom were male. The focus in molecular biology turned from the question of how genes mould certain traits or characteristics (physiological, behavioural), to genes that code for particular diseases. As Keller notes, 'good health' becomes attached to a normative reference genome, and deviations from this standard point to varying states of 'unhealth' or abnormality (295). Despite the elusive nature of the genomic norm, health futures are organized around the affective power of abnormality – the topos of deviations in need of repair – even when treatment might not be readily available.

Precision genomics – the tailoring of treatments to personal genomic data – has been granted a great deal of space, particularly in the corporate healthcare sector that targets private health consumers. It is the realm of a deeply rarefied market, trading on drug trials and gene therapies (replacing mutant genes with functioning ones) at the frontier of possible cures. Putting to one side the question of the varying efficacy of these trials and therapies, a bigger question emerges: whose futures are being privileged, and at what cost? Hilary Rose and Steven Rose discuss a rejuvenated transhumanism for a new millennium in genomic idealism characterized by entrepreneurs and big business, marked by 'the possessive individualism of the neoliberal economy, where the mantra is choice and the consumer is king or queen' (2012, 156). In such an economy, who benefits, who pays, and who is left out? There are questions around the ethnic diversity of biobanks, as well as the slow take-up of classed dimensions of health, and often 'appropriate representation has been left to the good conscience of the researchers' (Rose and Rose, 279). While the cost of whole genome sequencing has reduced dramatically since 2001 (from millions of dollars to one or two thousand, depending on the company), this is the equivalent of cracking the door open. Inside is a vast market promising possible cures at competitive prices that patient-consumer might wander around indefinitely, possibly at huge personal, economic and psychic cost. This route to healthcare is still in the process of establishing the realm in which it operates, and this uncertainty is partly generated by a 'collect now, ask questions later' approach to data gathering. As in other examples of Big Data, Big Genomics needs the scientific narratives to catch up with the information, so that it can be made into evidence (Prainsack 2017).

The composition of scientific narrative is a point of departure for this book – what narratives make data meaningful in the age of the genome? And how can narrative redirect flows of interest and information towards imagining a different set of correspondences between biology and society, attending to the

imbrication of one in the other at the level of empiricism, and taking risks with new metaphorical infrastructure? As Reardon reminds us, 'making genomic data valuable is a very hard problem' (2016, 122). The manifold challenges of knowing life in what Reardon calls 'the midst of a growing sea of genomic data' involve transforming plots and experimenting with genre for the sake of sense-making (Reardon 2016, 122) – that is, it involves the work of interpretation and poesis, within and outside the laboratory.

The relation between signification and valorization is one reason for positing molecular biology as the necessarily rarefied sphere in which liberal humanism has destroyed its own condition of possibility. This is because the limitations of genetic approximations matched with the grandiosity of genomic utopianism reveal a gaping hole in capitalism's speculative operations. Capitalism has not been able to perform the conjuring trick of making biomatter 'appear as the results of its own realization', nor to transfigure living processes into 'the result of its existence' (Marx, in McLellan 1971, 126). As much as it wants to, capital has not been able, consistently and completely, to 'create its own prerequisites' and to impose 'its own reality' when it comes to living processes (Marx, in McLellan, 126). The totality of organic life has always remained outside the creation of surplus value, escaping its reduction to dead labour, because capitalist modes of production have been unable to close the gap between labour power and living processes. The persistent illegibility of organicity means that living processes that expand temporal parameters of individual existence are never fully calculable as biopower. Their messiness – not only their spatial specificities but the *plurality* of relationality in their spatio-temporal configurations – has proved irreducible to the play of value, power, and signs. This messiness has pushed back at capitalism's ambition to annihilate multiplicity in favour of mass reproduction (even when this reproduction is given multiple and niche forms). It has been up to narrative to stage this irreducibility, often in spite of its own tendencies towards reduction.

This irreducibility is not banked in recourses to ecological romanticism, but in attending to weird forms that escape valorization. For theorists operating within and alongside Marxian critique, the weirdness of living processes has offered a site of critical experimentation that stands against capitalism's attempts to portray its productive rationalism as natural rather than historical: Charles Sanders Peirce's *Interpretant* (1867), Henri Bergson's *élan vital* (1907), Walter Benjamin's *aura* (1935), Georges Bataille's *excess energy* (1949), and Gilles Deleuze and Félix Guattari's *rhizome* (1980). These interventions are epistemological in as much as they intervene in rhythms of relation between (organic) process and (socio-economic) production. These figures hold off living processes from

complete subsumption into raw material, because their signification cannot be fully processed by capitalism's metaphorical and machinic infrastructure. While accelerated operations of techno-scientific industrial complexes throughout the twentieth and into the twenty-first centuries have obscured this reality, the era of the postgenomic has shown up massive and irresolvable lacunae in biogenetic explanations of life and its processes. The tendency has been to try to lasso these lacunae back to the lexicon of unit-thinking, but this logic has run out of steam. In this situation, the weirdness of these processes takes form in narrative via resistance to and transformation of capitalism's *a priori* reductionism, contesting the ontological stability of its most valuable source of capital: living bodies.

The contest over genomic narratives has not been restricted to a science-culture war. There is a history of conflict within the life sciences around the appropriation of genetics into pernicious hierarchies of human and species, and this often rehearses resistance in the eighteenth and nineteenth centuries to biological accounts of supremacy. The 1960s and 1970s saw a flourishing of a radical science movement. In Anglo American biology, this was directed against the biologization of a patriarchal, heteronormative, militarized and white-dominated society espoused by theories of sociobiology and the selfish gene. A group of Marxist biologists – led by Stephen Jay Gould, Richard Lewontin and Richard Levins, along with feminist scientists like Rita Arditti, Ruth Hubbard, Ethel Tobach and Ruth Bleier – pushed back at forms of science that privileged both male practitioners and viewpoints that seemed to underscore masculinist essentialism (Rose and Rose, 290). These interventions were set against the ways that genetics was being used to naturalize social inequities in ways reminiscent of late-nineteenth-century co-options of evolutionary theory. The issue here was to argue against the flattening of social life into liberal universalism at the cost of recognizing and attending to historical inequalities. At stake for the US-based antagonists to sociobiology was a battle over 'what would constitute a liberal American society' (Perez 2013, 105). The arguments against sociobiology – partly due to its localization in elite universities in the United States – formed part of the globalized narrative around genetic reductionism and its possible evils as the decade went on, as genomics became constituted as a new global standard in biological research.

More recent examples of challenge include interventions from the non-profit Centre for Genetics and Society, located in the belly of the beast – Berkeley, California, next to Silicon Valley. University College, London's recent public reckoning with its infrastructure of eugenics – its buildings and laboratories named after Francis Galton and Karl Pearson, and its hosting of an under-the-

radar annual eugenics conference until as recently as 2017 – has galvanized discussions around the central role of British science in the development of a pseudoscience that for a long time has been primarily associated with Nazism (Bressey et al. 2020). This is particularly loaded in a context of austerity policies in the UK since 2010, which have acted as a form of everyday, bureaucratized eugenics through cuts to health, education, welfare and housing.

How to sustain this backlash against the classed, racialized, gendered and ableist fault lines of genomics, amid the eugenic forms of neglect that the COVID-19 pandemic has exposed in the United States and the United Kingdom? Angela Saini notes the continuation of racist stereotyping in health research against a backdrop of disproportionate death rates of Black, Asian, Hispanic and minority ethnic peoples: ‘time and again, I have seen health researchers erroneously invoke social categories as though they are biological ones’ (2020, 1605). She speculates that part of the reason for the continued reintroduction of race as a biological reality rather than social category into explanatory frameworks for health is because of the drive towards ‘personalised medicine so precise that every person’s biological profile is perfectly understood’; in lieu of the necessary data to do this, ‘researchers instead turn to social categories as proxies’ (1605). That is, the drive towards increasing individuation in health results in further entrenching racialized inequities, bound also, inevitably, to those of gender, class and disability.

Precision medicine offers projected models of life experience that move at pace towards what Steve Fuller has called the emergence of ‘Humanity 2.0’: ‘the mind-body problem’, he writes, ‘is increasingly operationalized, if not outright replaced, by those who . . . would continue to anchor humanity in our carbon-based bodies or those who . . . would leverage humanity into more durable silicon-based containers’ (2011, 3). If the rhetoric of Silicon Valley transhumanism cannot yet be matched by technology, these visions nonetheless shape the kinds of dreamworlds that feel possible, even while their horizons remain at a distance. These futures function as orbs dangled in front of consumers’ visions, while resistance towards the encroaching digitalization of everyday life – and the organization of datalogics around particular types of consumer – is restricted, counter-intuitively, to the same platforms that source data (documentaries on streaming services, social media campaigns, digital communications and the digital archives of street-level protests). While the space for speech seems to have expanded exponentially, the challenge of mounting a coherent, sustained and strategic collective resistance to digital co-option is fragmented across a multiplicity of sites.

Nikolas Rose puts it this way: ‘If our medical “imaginary” – our image of what healthcare should be – is “all about me” it may well have serious consequences for my willingness to pay for, let alone care about, the health of others who are not related to me – not just others in my town or country, but others in far away and distant places’ (2013, 351). Despite the caution, Rose emphasizes here the imaginative power of caring about others’ health, not in an abstract way, but in ways that might intervene in the corporate instrumentalization of genomics into an ideology of ostensibly private decision making. This is also a significant point of departure for this book – how narrative does not just register or represent, but can form structures of care that move past models of (atomized) individual and (ethnonational) population to collective aims for health.

The machinery of eugenics still determines genomic futures. Depoliticized accounts of climate change (Sealey-Huggins 2018), uncritical arguments about overpopulation in the so-called Global South, and the hardy postwar ideology of meritocracy as a route to longer and better lives (Hanson 2013) all illuminate an infrastructure of colonial capitalism that has not yet been dismantled. Genomics’ privileging of certain kinds of human over others is a reflex of a long history of eugenic thinking – the use of biological heredity to improve society via the breeding in of ‘good’ and the breeding out of ‘bad’ stock. This history of prevention and promotion has fallen along familiar lines of identification – class, race and ability – and also involves policing the reproductive rights of women (Richardson 2003). The sweeping popularity of eugenics across the political spectrum in the late nineteenth and early twentieth centuries is a history with which Anglo American biology at large has yet to reckon fully (Kevles 1985; Mazumdar 1991). Indeed, much contemporary scholarship around the early years of eugenics dates back to the scaling up of genomics. The bogey men of eugenics have long ceased to be caricatures of Nazi scientists; eugenics offered a scientific justification for centuries of imperial domination, enslavement, genocide and settler colonialism, while also anticipating the economic power of this hierarchy of human life in post-colonial globalism.

Narrative in the age of the genome engages and grapples with some of the life sciences’ most intractable imaginaries: survival of the fittest, human supremacy, resource scarcity and genetic norms. This requires a supple toolkit of rhetorical strategies, and often this means blurring the borders of mimesis (repetition/representation) and poesis (transformation/making). This book moves between these two methodological registers: the empirical and analogical. The ways that genomics is represented in form, plot, character and intertextuality (as evidence), and the ways that narrative intervenes in discourses of heredity

through the plotting and arrangement of space, time, metaphor and architecture (as epistemological field).

This involves a certain promiscuity when it comes to genre. Many of the texts in this book are huddled under the expansive umbrella of speculative fiction (sf). Joan Slonczewsky and Michael Levy note that in the new millennium, there is an enduring fascination with biotechnology as both a plot and anxiety of sf, which 'also leaves us fearful of biological warfare, and wondering how our moral traditions of the past millennia will survive the technological challenges of this one' (2003, 185). In *Liminal Lives* (2003), Susan Merrill Squier argues that speculative fiction offers a space for registering anxieties and ideas around biotechnology, as well as a space to imagine alternative uses, and to foreground alternative epistemologies: 'Fiction gives us access to the biomedical imaginary: the zone in which experiments are carried out in narrative, and the psychic investments of biomedicine are articulated' (17). But getting too mired in boundaries of genre can dissipate the more radical interventions of sf when it comes to form, metaphor and plot – knowing 'one set of things as fictional and another as factual' (Squier, 20). Sf not only represents fact in fiction but also tilts the metaphorical infrastructure of realism. When a character in realist fiction is sad and the sky pours with rain, we know that the ordinary rules of non-correlation between human and natural worlds privileged in realism are being temporarily suspended for the sake of pathetic fallacy: the exaggeration of affect via the orchestration of the external world to mirror a character's internal world. But in sf, the correlation between emotion and weather could be – and quite often is – made literal.

At the same time, 'realist' accounts of science often rely on the more radical temporalities and topographies of sf to set out their programmes and to institute their legacy. As Mieke Bal has argued, identifying a piece of fiction as a realist representation of a given lifeworld is a fallacy, and even a misunderstanding of fiction itself. Description does not interrupt narrative by reminding the reader of a text's grounding in a reality external to it, but is rather a 'motor of narrative': rain and sadness, weather and affect. Reading from description to description, 'the reader complies with, falls for, and perhaps incidentally, resists, the novel's appeal to her to construct the imaginary but coherent-enough world in which the recounted events can happen' (Bal 2007, 572). This book reads the various declarations, impositions and blurrings of genre in gauging what Fortun calls the 'affective register' of scientific developments (2016).

If the modern myth of liberal humanism has relied on a construction of individual time as chronological and has sequestered 'the environment' as a

context in which this individual develops, then one of the interventions narrative makes is in its representation of time. While genomics needs patient-consumers to invest in a certain idea of chronology in order to sell tests, drugs and therapies – and to sustain the horizon of a disease-free future – its technologies have also made the destruction of this ordering of time inevitable. When individuals disappear into databases, they are broken up into component parts, becoming disaggregated in a massive storehouse of genomic data. While they can also be fairly easily retrieved, concerns around this involve the misuse of data in insurance and employment decisions. On one hand, genomics promises a certain kind of continuity for the self in genealogical time. Dorothy Nelkin and M. Susan Lindee describe DNA as ‘a relic, a piece of the person that contains the full self’, as well as offering a portal to ‘lost biological connections’: quests for genetic roots, for example, ‘suggest that to find one’s biological parents is to find one’s essence, and that without this essence a person can never be complete, whole fulfilled’ (1995, 69). Narrative in the age of the genome offers routes to the past, where gaps in family history might be filled in, where the genetic can move to the limits of the known world and become a tool of ancestry-making. But as well as big reveals, it also de-sediments normative constructions of relatedness and kinship: who or what shapes our feelings of belonging, what allegiances and tribalisms accompany this, and how to forge solidarity with worlds that do not resemble our own?

In the era of the genome, memoirs organized around genomic figurations of essence, heredity and belonging were incorporated into a museum of the species. At the turn of the twenty-first century, Matt Ridley described the genome as ‘an autobiography of a species in twenty-three chapters’, twenty-three numbering the pairs of chromosomes that make up human DNA (1999). The genome was imagined as an archive of *Homo sapiens*, a normative subject constructed through technologies of sequencing and mean calculations of a composite reference genome. But what is omitted from archives – or what never make it in – is just as significant to investigating the narration of humanity in code. The HGP’s construction of this composite reference genome out of Anglo American genomes from people ‘of European ancestry’ was a demonstrably supremacist gesture, even as the HGP’s proponents insisted on the indefensibility of race as a genetic reality. In a discussion of decolonial aesthetics and museum, Rolando Vázquez Melken argues,

What happens in the museum is the constitution of a normative subject. A public that belongs to the cultural archive of whiteness attends the museum in order

to acquire the power and entitlement of the normative subject, yet for others the museum gives no possibility of any such identification and entitlement. (In Wevers 2019, 2)

Imagined as an autobiography in a museum of the species, the genome becomes part of an assemblage of racializing techniques that further legitimize the description of human value in biological terms. These techniques are necessarily complicit in adding to the formation and reproduction of a normative public within 'the cultural archive of whiteness'. This is insistently linked to the emergence of the bourgeois public sphere and the creation of national character through bric-a-brac of traits and tendencies that the rise of the novel-form and biography in the eighteenth century transformed into mass culture.

At the tail end of European modernity, the genome becomes a resource of self-cultivation, collapsing narratives of self and species into the molecular. For Paul Gilroy, this biologization of culture – the extraction of difference into statistical pre-emptions – marks a convergence of nature and culture, to which the power of race is central:

The messy complexity of social life is thereby recast as a Manichean fantasy in which bodies are only ordered and predictable units that obey the rules of a deep cultural biology scripted nowadays in the inaccessible interiority of the genome. (2004, 6)

To critique the construction of a normative human subject within a reference code is also to contest the hegemonic arbitration of humanity within the terms of racial supremacy. Inscriptions of race and ethnicity as geographic and phenotypic realities become placeholders for civilisation as an iteration of human sovereignty and for the work of encompassing natural and cultural spheres into the long-term project of human progress. I situate this critique within a plurality of 'alternatives to the legal conception of personhood that dominates our world', which seek to depart from 'a delimited notion of personhood as property', in Alexander Weheliye's words (2014, 81). Figured as a museum of the species, we might rethink how to inhabit this museum – to follow Vázquez, is it 'an instrument for the curator', and is this curator an individual or a community, a collective, an assembly? Decolonial interventions in the genome-as-museum would mean 'turning the museum into an instrument, so that the museum can be inhabited, resignified, made to speak about what goes beyond its enframing, and what is has been designed to silence' (in Wevers 2019, 10).

As much as it organizes health futures around individual chronology as a way of plotting of liberal personhood in orderly and ordered time, investment

in genomics also banks on ‘a time out of joint’, the juxtapositions of past and present for the sake of transhuman futures, at great speed. As Fortun has argued, the triangulation of speed – what he calls ‘the haste function’ (2008, 105) – ethnonationalism and corporate investment is one of genomics’ more disturbing trends. Iceland’s deCODE project sought to construct a mythological Icelandic heritage out of the imaginary of an isolated, centuries-old population; gathering donors for its database of Icelandic genomes, the project’s leaders deployed rhetoric which – in Fortun’s words – ‘pushed the incongruous inconsistencies of a time out of joint to their limit, reterritorializing an eleventh century sword in the territorial battles of twentieth century biosciences, where the opposition is not so much unarmed or unprepared, but unplugged’ (73). This is an extraordinary collocation of weaponry, drawing together premodern and late capitalist tools of colonization, conveying the *longue durée* of violence in which the biosciences are situated, however much this history is denied or played down with protests of scientific objectivity.

Fortun also identifies two intersecting possibilities for resistance here: first, vigilance over the appropriation of imaginary communities in techno-capitalist means for neo-eugenic ends; and second, plugging in to the technologies that facilitate the large-scale application of these technologies to imaginary populations. Thacker argues, ‘Sociobiology today is arguably not so much a school or scientific discipline as it is a way of managing the social as a collectivity’ (2005, 311). Biosciences in the twenty-first century are complicit in the datafication of the everyday, part of an increasingly globalized toolbox for managing and tracking the mass movements of people caused by warfare, economic deprivation, climate change, land dispossession and resource extraction. The spaces for social cooperation are not increasing, but quickly shrinking, while biotechnology – as part of a wider apparatus of personalized tech mediated increasingly through one or two devices (Reardon 2016) – upholds a mythology of bourgeois individualism. The work of resisting and transforming this state of affairs begins, then, by plugging into its conceits, feints, lures and networks; that is, its metaphorical infrastructure.

A final note about worlds before turning to an overview of the chapters. If the texts here can be grouped into a genre – that is, if they share a common trait – it is the genre of unsatisfactory conclusions. There are plot holes, worm holes and loose ends. Some worlds come fully constructed; others start to move and transform through mechanisms of space-time that are left unexplained. Characters fall out of stories and into other ones that we never get to read. Genetic lineages are blurred, erased or lost. Moments of self-development

are sequestered in parentheses, while human trajectories are infiltrated by nonhuman ecosystems. Throughout, there is a stitching together of modern ruptures between ‘Man’ and ‘Nature’, those categories which have made possible what Jason Moore calls the Capitalocene, ‘the way of organising the relations between humans and the rest of nature’ that characterizes modern history since the 1400s (Moore and Patel 2018; Moore 2013). Narrative in the age of the genome reckons with the limits of atomized accounts of being in the world – at the level of gene, genome, organism, group and species – and reconstitutes forms of meaning-making that have constituted a logic of segregation: of humans from nature, from other humans, and from other forms and accounts of life itself.

World-building in these texts is never a complete or total endeavour, and is unmoored from the co-option of survival metaphors into measurements of relative fitness. It is more akin to what AbdouMaliq Simone has described as an ongoing working-out of scale in fragile and temporary collectivities, among those who live between different dimensions of time, proximities and interdependency, where characters ‘find themselves simultaneously in many space-times’ (2018, 55). This is a confounding of chronology made possible – even accelerated – by the social power of the genome, and its displacements of evolutionary history in segments of extracted code; with these displacements, the genome also unseats its claims to universality and its promises of utopias free from glitches in the code. Simply put, how can these be guaranteed, or controlled, or implemented, amid the vast rhythms that make up collective life? Plots without end engender a refusal to inhabit the body in terms that subject it to its ongoing capture and annihilation, even as its potential is capitalized on in the name of the futures of those who have not yet been born (the impossible, ‘real’ subjects of precision genomics, who never will be born).

The book’s five chapters are arranged more or less chronologically, and according to scalar units of calculation: genes and families in the 1970s, group and communities in the 1980s, data bodies in the 1990s, ancestral lineage in the 2000s and ecosystems in the 2010s. Chapter 1, ‘Deindustrialization and the Selfish Gene’, considers the genome as a prototype for a new kind of subject under neoliberal globalism, via new techniques of isolating and cloning parts of the genome. I situate E. O. Wilson’s sociobiological applications of genetics to behaviour and Richard Dawkins’s concept of genes as competitive and selective agents driven to perpetuate themselves in perpetuity, in a wider ideological battleground between the end of the post-war consensus around welfare and the role of the state. Reading Dawkins’s *The Selfish Gene* (1976) as an argument against trade unionism, I go on to readings of Doris Lessing’s *The Memoirs of a*

Survivor (1974) and Samuel Delany's *Trouble on Triton* (1976) through questions of whiteness and decolonization, eugenics, data profiling and queer kinship, and the emergence of genetic engineering as a tool of neoliberal self-fashioning.

Chapter 2, 'Cultivating Dreamworlds', moves away from Anglo American biology to consider genomics in the Soviet Union, contextualizing its fractious status in a longer history of Russian biology as primarily a domain of agricultural cultivation, rather than individual heredity. The chapter considers what I call the cultivation metaphor in Russian anarchist theories of mutual aid and Soviet agricultural policy, and in Soviet imaginaries of the New Man and the masses under Stalin. While officially banned from 1948, genetics was crucial for the Soviet Union's clandestine biological warfare programmes, and this is the context through which I read Arkady and Boris Strugatsky's *Roadside Picnic* (1972). By the late 1970s, a fusion of Soviet environmentalism and Western biotechnology mirrored a crisis of national cohesion as the Soviet Union moved towards its final years, its various crimes against its own peoples obscured and silenced, as Kir Bulychev's story about genetic cloning in a ramshackle government laboratory at Moscow's periphery, 'Another's Memory' (1985), shows.

Chapter 3, 'Memoir and the Laboratory', considers popular imaginaries of the genome in the decade when it reached global superstardom through the Human Genome Project and its utopian promises to revolutionize healthcare: the 1990s, a period rich in blockbuster science fiction and poised for new cultural objects of paranoia in the wake of the end of the Soviet Union. I consider how popular memoirs published by some of the HGP's key players transformed the genome into a cultural object that could give humanity the answers it sought about its place in the world and, more pertinently, account for its creaturely supremacy. Memoir becomes a space of experimentation akin to a laboratory, where new narratives for human progress are tested out. As I go on to argue in readings of Kazuo Ishiguro's *Never Let Me Go* (2005) and Andrew Niccols's *Gattaca* (1997), questions about possible abuses of genomic science were worked through in speculative fiction during and after the genome project, in which the spectre of eugenics loomed large. Alongside this, anxieties about the disappearance of character as a reliable site of development in the wake of sequencing technologies – where the individual is reduced to body part or aggregated sections of code – were registered by a crisis of narrative: how could the story of the human continue to be told when it was disappearing into vast genomic databases?

Chapter 4, 'Speculative Ancestry', contests the idea that bioengineering was a phenomenon novel to the late twentieth century, arguing instead that the history of colonial-capitalist modernity has been premised on trait thinking

and on splitting humans from their sense of developing through time, and into component parts of relative productivity: the logic of humanizing Europe through the dehumanization of millions of African peoples through the transatlantic slave trade and the system of plantation enslavement through which the cross-continental industrial development of Europe and America was made possible. For this reason, new technologies of genetic ancestry testing that emerged in the early 2000s were doing a different kind of cultural work among African American communities, attached to a precedent of discontinuous lineage, a *longue durée* of genealogy in the wake of obscured family histories, and held the promise of repairing the long-term damage done by stolen time. I read Saidiya Hartman's *Lose Your Mother: A Journey Along the Atlantic Slave Route* (2006) and Yaa Gyasi's *Homegoing* (2016) within the uncertainties that accompany this promise, considering how they foreground trajectories of non-biological kinship and ancestry-making in their reckoning with annihilated and occluded genealogies.

The final chapter, 'Toxic Infrastructure', reads the rupture to the idea of the genome as a transparent ledger of life at the end of the Human Genome Project through peripheral narratives of global shock. The postgenomic era has once more brought the question of environmental influences on genetic expression to the fore, with 'the environment' classed variously as molecular, lifestyle factors, exposure to pollution and epidemiology (disease). I introduce some of the key debates of the postgenomic era through narratives of two environmental catastrophes, global in scale and reach: the Chernobyl nuclear power plant explosion of 1987 in Svetlana Alexievich's *Chernobyl Prayer* (1997) and Jeff VanderMeer's fictional biological cataclysm in his Southern Reach trilogy, *Annihilation*, *Authority*, and *Acceptance* (2014). I read both as postgenomic accounts of the vast complexity of biological relationships, which coincide with anxieties around the illegibility of data, alongside its misuse or disappearance. The postgenomic era's central problem is not the gathering of data, but making this data legible while old certainties about the immutability of DNA – and the relative stability of the genome across life spans – start to break down. In both these texts, this coincides with a problem of genre: what new stories does the postgenomic yield about lifeworlds, what new characters does it introduce – or indeed, how does it change forms of characterization – and can these stories be told in an age of planetary crisis?

Finally, a note on this book's global methodology, which understands the global as a world-system reproduced through the ongoing production of core, semi-periphery and periphery, both within and across national borders

(Wallerstein 2006). This resists the wholesale application of categories of Global North and Global South in an era of rapid urbanization, at a time when megacities, rather than nations, are fast becoming the go-to units of calculation for international health and finance organizations. To borrow from Wallerstein, the methodology assumes that disaggregated phenomena of politics, culture, economics, structure (and, here, science) are imaginative constructs rather than reliable descriptions of the multiple ways worlds are experienced, lived, made and remade anew (2006, x). This is not just an argument for thinking with and in complexity; it brings into relief the various levels in which an episteme functions – in this case, the ontology of ‘natural’ processes. While genomics has certainly been a technology of globalization – part of the empirical standardization of organic life across the world – its influence is neither total, nor reducible to silos of social organization. For this reason, it has been vital to include alternative epistemologies and practices around genomics and human biology in my discussions of Soviet biology and African American ancestry testing. This book is not just about the globalization of genomics, but also about its differentiated cultural values and political relevance, which intersect and come into conflict with assertions and conceptions of where what is called human life sits in a wider panoply of living and non-living beings.

This book is also informed by a history of feminist critique that has challenged biological determinisms, particularly those in Black feminist scholarship, a site of critical enquiry that has long resisted the reduction of women’s lives to vessels for the reproduction of labour power to sustain a liberal humanist order organised around whiteness, as in the work of Dorothy Roberts, Alondra Nelson, Hortense Spillers, Joy James, Ruha Benjamin and Sylvia Wynter. The era of postgenomics has seen a new wave of feminist perspectives that caution against the instrumentalization of a branch of biology that could still be a compelling alternative to genetic reductionism – epigenetics – into new molecular essentialisms of environmental influence, a topic that Sarah Richardson, Hilary Rose, Evelyn Fox Keller, Ruth Müller, Susan Merrill Squier, Wendy Wheeler, Catherine Malabou and Clare Hanson have tackled in different ways and through a range of disciplinary perspectives: sociology, literary criticism, aesthetics, philosophy, the history of biology and political economy.

At this critical juncture in theories and technologies of life itself, there is a danger of falling back into older ways of framing life that privilege not only ‘the human’ as the centre of biological inquiry – the life-form to which other forms are compared – but also particular types of human. Instead, the life sciences and beyond can (and, in some instances, are poised to) transform the

epistemological field of their experimental practices, objects of analysis and tools of measurement. As Sophia Roosth and Astrid Schrader argue, feminist interventions in the construction of scientific knowledge emphasize the political urgency of ‘thinking across or beyond’ the critical and empirical, the semiotic and the material, as this practice ‘invites us to write and think against neat distinctions between theories and things, between matter and method, and to query the analytic constructs we have inherited’ (2012, 2). This is the challenge that this book takes up in its querying of the place and status of the genome, and the way that its terms of reference ended up doing the kind of transformative cultural work suggested by Roosth and Schrader, while not in the way that its key players may have hoped for or imagined. The idea of the genome as a reliable or total description of life itself has collapsed into something far more radical, which threatens the terms of its own logic.

As the development of novel gene editing technologies via CRISPR-Cas 9 and investment in their possible future uses happens at pace, it remains vital to emphasize the regionalism of genomics: its emergence out of a particular moment of Anglo American biology, its *a priori* commitment to a certain concept of DNA’s social power, and allied to this, a certain idea of what human freedom looks like. This book is situated in a large body of existing scholarship on the co-option of genomics into narratives of national, ethnic and group belonging, a phenomenon that has extended across the world, from nineteenth-century imperial biology into twenty-first-century descriptions of humanity’s future, creating centres, peripheries and enclaves in its wake.