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Cultivating dreamworlds

Genetics in the Soviet Union underwent a different trajectory in the post-war period, split into two areas of research – molecular biology and plant breeding – directed towards two different areas of Soviet development: military defence and agriculture. From the mid-1930s to the early 1950s, the latter faction dominated, leading to ‘informational starvation’ for geneticists trying to keep up with the rapid advances in the increasingly global and industrialized field of molecular biology (Levina and Sedov 2000). During the 1930s, Trofim Lysenko, the now-infamous amateur botanist, led a campaign against genetics and geneticists. This led to the banning of genetics in 1948 (which he denounced as a ‘bourgeois science’), and the exile and expulsion of prominent Russian geneticists out of the Soviet Union or to gulags. While ‘Lysenkoism’ became a synonym for pseudoscience across the world, the exiling of molecular biology from Soviet science was by no means total. This was largely due to the development of biological warfare programmes in the interwar period, which picked up pace with the advances in biotechnology following the discovery of the double helix. Molecular biology in the Soviet Union continued under the secretive and often remote aegis of national defence. The so-called Fifth Problem – creating protective barriers for biological warfare from other nations – ensured funding for molecular biology in the post-war period.

At the same time, Soviet biology was also marked by the powerful metaphor of cultivation, part of a utopian vision where Soviet workers would nurture resources collectively (industrial and agricultural) and where the biology of workers might be cultivated at a mass scale. The biology of adaptation was applied to the figure of the New Soviet Person, a vision of a Soviet subject emerging out of Soviet environments, transcending differences of culture, language and land across the Soviet Union: a unified and collective subject formed by the Soviet state. Biological and aesthetic forms were placed on a continuum as tools of cultivation. In this imaginary, the Soviet state was akin to a soil in which crops could be cultivated in the right environmental conditions.

By the era of the genome, molecular biology in the Soviet Union was organized principally around the creation of biological weapons in secret laboratories, a history that is still marked by gaps. The Soviet biological weapons programme meant the development of a large workforce of expertise in molecular biology, and by the 1970s, this included methods of engineering bacterial and viral genomes through cloning and replication. Alongside this, the environmentalism of Lysenko still wielded influence over the experimental imaginaries of Soviet biology, exemplified in the genographic studies of the 1970s. At stake in both strands of Soviet biology was contributing to national projects of defence and agricultural production. This is key: while this was going on, the Soviet Union was heading into catastrophe, unable to withstand the pressures of the global financial crisis during the early 1970s, and ultimately losing its position as a viable political and economic alternative to the Euro US.

This conflict exposes two opposing metaphors of biology in policymaking in the post-war period: engineering and cultivation. While molecular biology offered tools and techniques for isolating parts of the genome, cloning them and joining them to other parts (of the same genome, or of other species), plant breeding was wedded to pre-molecular ideas around environmental conditioning that also predated Soviet governance. Here, I look at two texts of the so-called Soviet 'Thaw' period – Boris and Arkady Strugatsky's *Roadside Picnic* (1972) and Kir Bulychev's 'Another's Memory' (1985). In their different representations of adaptation and molecular biology, these texts offer an alternative to the selfish gene, while also registering the dissonance between cultivating Soviet futures through a synthesis of collective, environment and individual, and engineering them at molecular levels. This was also a tension between biology as a technology of production and as a strategy of defence.

These texts are part of a body of Soviet sf that made its way into Anglo American publishing through various English translations during the 1970s and 1980s. Istvan Csicsery-Ronay describes this period of translation of Russian sf into English as a temporary creative boom between West and East: 'Soviet sf represented an alternative tradition altogether, and ethical-literary environment far different from the fast-forward techno-modernity of most Western and Japanese sf' (2004, 337). He reads this as part of a movement to frame imaginary futures for both West and East, at a point when neoliberal globalism had yet to sediment its ascendancy. Mikhail Suslov and Per-Arne Bodin have argued that during the 'golden years' of Soviet sf – from the 1950s to the 1980s – 'sf gave the intelligentsia an instrument to reflect on the technological optimism

and the Communist teleology of Soviet modernisation' (2020, 6), in a trajectory markedly different from those of other post-war industrialization projects.

Crucial here is the importance of literature as a technology of national cultivation. In these texts, narrative is part of an environment that cultivates new subjects, a theme in Soviet dream-making from its inception. Soviet sf of this period reckons with what Susan Buck-Morss has called 'the passing of mass dreamworlds' (2000, 276) – dreamworlds initially imagined in social realism – and looks towards new possibilities offered by new globalized technologies. At the same time, they depict the future of humanity as an ambiguous landscape fraught with contesting visions of its use-value. Are bodies machines for dismantling, cloning and rearranging, or is the collective one holistic organism, moving in all its complexity towards realizing new possibilities for life itself?

Both Bulychev and the Strugatskys consider the failure to the imagination posed by the disintegration of Soviet utopias, and the fallacy of naturalism as a principle of truth under Stalinism. These are lifeworlds where the chronology of world-building is reversed, upended or held suspended. Fragments of shadow worlds slice into the present, from ambiguous origins and with unclear purpose. The West appears in these texts as a monolithic, shadowed entity, modelling biotechnological infrastructure. Uses of this apparatus remain veiled behind obscure state interests. Narrative form and biotechnological infrastructure are placed in uneasy concert, while contesting visions of the human fragment chronology and resuscitate forgotten or repressed pasts. The possibility of cultivating dreamworlds haunts the margins: a spectre of collective consensus that never really was. These texts explore the chaotic sorts of dreams that occur in the imaginative configurations of environment and body, at borders which might destroy, speed up progress, or which hold characters suspended in abandoned and disintegrating terrains where nothing grows.

Mutual aid

Collective cultivation was a central metaphor in Russian life up to and during the Soviet period, whose economy was heavily dependent on agricultural production. The land and climate of Russia were constituent parts of Russian biology, in ways that diverged considerably from Anglophone interpretations of Darwin, which emphasized the organism's individual strategies of survival – for itself and its closest biological kin. The idea of an immutable line of inheritance passed down from one generation to another contradicted systems of common and collective

ownership in both imperial and Soviet Russia, and these models of ownership – if only in theory – formed methods of experimentation in biological research. While Western genetics came out of a Lockean ideology of private property, with the figure of the capitalist-as-patriarch as a central character, Russian biology was organized around agricultural practices that involved larger numbers of people, often necessitating the collective pooling of resources.

The history of biology in imperial and Soviet Russia offers a frame for understanding the prominence of environmentally induced, collective adaptation in Soviet biology. Russian biology had taken up a different Darwin in the mid-nineteenth century, a version much more focused on collective adaptation than an individualistic version of natural selection. Russia had a harsher climate and larger terrain – a four-month growing season and vast areas of land where nothing grew at all (compared to England's eight-month one). After the abolition of serfdom in 1861, rural peasant communes were sites of technological innovation and, eventually, political resistance. There was no central jurisdiction, and often communes were doing the best they could with what little tools and infrastructure they had, closely attuned to the unpredictable conditions thrown up by the environment, year after year.

Post-abolition Russian agricultural production was characterized (though unevenly) by a system of common ownership, collective forms of cultivation and a system of sharing risk, in ways that were incomparable to what was happening in Western Europe. Cultivating the land was both materially and imaginatively crucial in the emergence of widespread resistance to imperial rule; this resistance was built in part through the autonomy offered by the proof that lifeworlds might be adapted and engineered through collective practices, even with limited resources and in harsh environmental conditions. While in the West, evolutionary narratives were centred on the struggle for existence at the level of individual, Russian interpretations of Darwin were more interested in the question of transformation at a collective level. The biologist Dmitri Pisarev criticized the 'rational egoism' of Darwin's Malthusianism, and Nikolai D. Nozhin adopted the French politician Pierre-Joseph Proudhon's notion of *mutualité* in arguing that biological organization is fundamentally cooperative, rather than competitive, when it comes to the distribution of resources. (Malthus had argued that given the scarcity of resources, 'natural checks' to populations – famine, disease – were not only inevitable but to be welcomed, and demanded no state mitigations.) The organization of peasant unions at the end of the nineteenth century demonstrated the influence of collectivist methods over pre-Soviet labour struggles. Scott J. Seregny argues that these countryside coalitions drew

peasant concerns into the wider upheaval and unrest of the moment, in ‘the first relatively successful attempt to establish a mass political movement in the [Russian] countryside’ at the turn of the twentieth century (1991, 377). Mutual aid as a technique of cultivation moved across social and agricultural practices.

Pëtr Kropotkin took up the idea of mutual aid at the turn of the twentieth century in his essay collection, *Mutual Aid: A Factor of Evolution* (1902). While socialist revolutionaries believed that mutual aid was primarily a social phenomenon, Kropotkin was concerned with proving that mutual aid was an inherent feature of biological evolution, in ants as much as humans:

The ants and termites have renounced the ‘Hobbesian war’, and they are the better for it. Their wonderful nests, their buildings, superior in relative size to those of man; their paved roads and overground vaulted galleries; their spacious halls and granaries; their corn-fields, harvesting and ‘malting’ of grain; their rational methods of nursing their eggs and larvae, and of building special nests for rearing the aphides whom Linnaeus so picturesquely described as ‘the cows of the ants’; and, finally, their courage, pluck, and, superior intelligence – all these are the natural outcome of the mutual aid which they practise at every stage of their busy and laborious lives. (1902)

Kropotkin’s vision of ant-worlds is akin to a far-off utopia on another planet, one built to ideal specifications, spacious and deliberately conceived, and more advanced in design and ritual than human ones. The reference to Thomas Hobbes stands as a rebuke to the latter’s bio-mechanical theory of innate violence, his claim that there is no objective value-system outside human worlds, and his political arguments for absolute sovereignty as the only way of preventing perpetual war (2017 [1651]). Instead, Kropotkin joins Darwin in a fascination with cooperative systems among nonhuman species. Like Herbert Spencer, he is interested in the tendency of certain species to help each other, but unlike Spencer, this does not indicate a ‘natural’ division of labour analogous to that of industrial capitalism. So steep and serious are the obstacles that living groups have to overcome to survive, that – he writes – ‘no progressive evolution of the species can be based upon such periods of keen competition.’ These are examples of decentralized, nonhuman communities that make decisions through consensus, and shape habits around the constraints of the ecologies they happen to inhabit or move through; for Kropotkin, this is an example for human praxis.

Writing just before the fall of the Berlin Wall, Stephen Jay Gould – in accord with Daniel Todes – situates Kropotkin’s arguments in *Mutual Aid* within a long and popular history of anti-Malthusianism in Russia: ‘Kropotkin was part of a

mainstream flowing in an unfamiliar direction', which represented 'a standard, well-developed critique of Darwin, based on interesting reasons and coherent national traditions' (1988, 16). The question of resources, selection, and adaptation had a very different kind of relevance in 'an immense country [and] also, over most of its area, a harsh land' (1988, 17). On the steppes, under brutal conditions, it is the battle between groups and environment that might determine survival, rather than individual fitness. Malthus's principle of overpopulation was cultivated in the increasingly dense urban environment of 1790s London characterized by segregated deprivation, with seismic and transformational revolutions happening in Haiti and France. It did not map onto a sparsely populated area of vast distances whose landscape necessitated community survival in isolated areas, human and nonhuman alike. And as Kropotkin points out, it was under-population, not overpopulation, which was 'the distinctive feature of that immense part of the globe which we name Northern Asia' (Kropotkin 1902). As Gould argues, Russian critiques of this Malthusian, selective Darwinism were attentive to the difficulty of translating Darwin's construction of organic processes to other geological and meteorological environments. Recognizing Darwin's regional biases did not mean throwing his ideas out entirely, but adapting them into local practices.

Cultivating humans

Narrative and cultivation were closely aligned in the Soviet project. Soviet ideologues knew that to transform everyday processes of production – and, through this, to mould a new kind of citizen – it was necessary to tell different kinds of stories. The stories of the nation would be responsible for cultivating its subjects, across divisions of biological and social. At the Soviet Writers' Congress in 1934, Maxim Gorky decried the detective story as the paradigmatic genre of bourgeois literature, where a solitary detective ignores 'patent crimes against working people' in favour of 'mysterious crimes of the imagination' (1977). He reminded his audience – which included Karl Radek, Nikolai Bukharin and Andrei Zhdanov – that stories about stealing depend on an idea of private property that upholds a bourgeois fantasy. Literary and biological technologies for what the novelist Yury Olesha called 'engineering the human soul', a phrase taken up with enthusiasm by Stalin, were placed on equal footing. Socialist realism foregrounded labour processes as the primary narrative principle in the struggle for existence, eschewing bourgeois narratives organized around ancient times, single heroes, epics and romance. Likewise,

Soviet biology centred the figure of the collective as an agent of evolutionary change (human and nonhuman), a line of thought that dates back to nineteenth-century anarchist writing on mutual aid as a primary mechanism of evolution (over natural selection).

Soviet biology offered an alternative evolutionary framework for cultivating new social subjects under Stalin; while this was not strictly eugenic in the sense understood by Galton, this framework underpinned Soviet experiments in human biology, whose focus was the cultivation of the New Soviet Person. The banning of eugenics in 1948 was partly a response to the instrumentalization of Gregor Mendel's laws of heredity by Nazi scientists to bolster their racist pseudo-science during the 1930s and 1940s; even earlier than that, in 1927, the biologist Clarence Dunn visited the Soviet Union; there, he found that his 1925 textbook *Principles of Genetics* had its chapter advocating eugenic policies removed. According to the translator's preface, this was because 'its outmoded bourgeois capitalist ideas . . . have no relevance for our body of citizens' (in deJong Lambert 2013, 19). Instead, Soviet eugenicists 'aimed at establishing a Marxist, Soviet eugenics movement as part of a vision for a scientific organisation of society' (Pers Anders Rudling 2014, 46). Eugenics in the Soviet Union was interested not in racializing populations into a superior/inferior hierarchy, but in studying purported racial differences among the different territories of Soviet dominion for the sake of eventual incorporation into the Soviet project as New Soviet citizens as part of the collective productive force of the new nation.

This form of eugenics was drawn into the larger centralized vision of a Soviet dreamworld under Stalin. Human biology became part of the technological apparatus for achieving this utopia, through the idea of environmental cultivation. Model citizens might be cultivated through conditioning. The land was a key site of transformation in Soviet realism, with human and nature closely entwined. Soviet biology was less about dividing humans into component parts, and more attuned to possibilities for harnessing biological processes in technologies of collective cultivation. Biology was to be a domain for producing (and reproducing) the New Soviet Man and Woman: a new kind of human for the possibly endless prolongation of the Soviet project. The rise of Lysenko was made possible by the belief that humans – like plants – might be cultivated into being more productive and healthy, and bio-psychically sublimated into an ideology of selfless collectivism. Lysenko's theories were banked in a longer history of environmental influence over biological development in Russian biology, and the broader programme of Soviet biosocial engineering. While his agricultural experiments were generally failures, his political influence in Stalin's

government during the 1930s and 1940s reflected Stalin's wider ambition to engineer the soul of the Soviet subject.

Lysenko was an anti-Mendelian and a proponent of the theory of the inheritance of acquired characters in his agricultural experiments. He wanted to foreground the Russian biologist Ivan Vladimirovich Michurin's 'Creative Darwinism'. In his 1948 Lenin Academy speech, the same speech in which he banned genetics, Lysenko dismissed what he saw as Darwin's errors – the Malthusian influence, the struggle of the species and its contribution to natural selection and evolution. He argued that the environment is 'the sole force that drives organic change and evolution' (Schneider, 147). Through Michurin, Lysenko resurrected a form of Lamarckism in Russian biology (although he denied this was the case); he believed that organisms evolved through the inheritance of acquired characters in response to environmental stimuli.

The son of a kulak, Lysenko was working at a research station in the Caucasus to find crops suitable for freezing conditions in the early 1930s. His father Denis had sown winter wheat in the spring after keeping seeds in a sack under snow (he had been hiding them from grain collectors during the grain crisis). Upon planting, he saw that these seeds produced exceptionally high yields. Lysenko expanded this into a method of cultivation he called 'vernalisation': 'the transformation of winter-habited plants into spring habit' (deJong Lambert, 22); literally, 'making spring-like'. The idea was to promote the accelerated development of wheat plants by adapting seeds to sprout in colder temperatures, for the sake of fast and large-scale production.

The influence of Lysenko on research in genetics was by no means total; genetics was not eradicated, and when it reappeared as a legitimate field of research, it remained allied to the project of Soviet industrial development. Susanne Bauer argues, 'Despite Lysenko's influence on the Soviet life sciences, the terms genetics and cytogenetics began to reappear in medical research during the 1950s, yet they remained an "underground science", moving to radiation biology and mutations research (2014, 164). By the mid-1960s, Lysenko was declared a fraud and was condemned by Soviet geneticists for 'causing great damage to Soviet agriculture' (Graham 2016, 1). Despite Lysenko's fall from grace, his influence over Soviet biology – namely, his stance on the importance of the environment in shaping evolutionary change – influenced subsequent research in Soviet biology. The interim period between the banning and reinstatement of genetics as a legitimate area of scientific research produced something new and quite unlike anything that was happening in mainstream Anglo American biology at the time: a fusion of developmental biology and genetics.

By the era of genomics, this vision of the New Soviet subject had faded into the crumbling infrastructure of the global post-war boom. While the Soviet project was another decade from being over, the global financial crisis of the early 1970s ricocheted across the world, affecting both East and West, but the Soviet Union did not have the same capacity to overcome it as the West did. Later, the forcing of post-socialist regimes into IMF debt rescheduling and free markets – and the consequent challenge to workers' rights – led to the diminishment of Soviet dreamworlds. The global influence of emerging genomic technologies placed pressure on these alternative strands of biological thought, as well as the national drive to keep up as competitors in the various international techno-scientific races of the time. Not least of these was the development of biological warfare programmes, as I explore in a reading of the Strugatskys' *Roadside Picnic*.

The Fifth Problem in *Roadside Picnic*

Roadside Picnic depicts a dreamworld collapsing into rubble, where invisible toxicity seeps into the bodies of a peripheral blue-collar community – ostensibly in the United States, a small town in a former industrial state, or 'possibly Canada', speculates Ursula Le Guin. The novel can also be read as a story about the disappearance of Soviet utopias, as mysterious, illegible, immeasurable alien forces contaminate an industrial township. An unknown event – known as the 'Visitation' – has left six zones across the world with collections of enigmatic objects, powers that cause the dead to rise up from their graves as living corpses and mutations in the genetic code of those who go into the zones, expressed in their offspring. The zones are sites of a nameless catastrophe, steeped in Old Testament metaphors of divine retribution for human shortcomings. The living world at large is exposed to its fallout. If the narrative takes place around the date of its publication – the mid-1970s – then the zones appear in the early 1950s. This dates back to the death of Stalin and the subsequent Khrushchev Thaw period, which saw the softening of restrictions around information and infrastructure exchange from West to East, the discovery of the double helix and the development of post-war biological weapons programmes across industrialized nations.

Here, I read *Roadside Picnic* as an analogy for the Soviet biological warfare programme, its shrouding in secrecy and its experiments conducted in remote areas of the empire, a programme which connected Soviet development in material ways to modes of production in competitor industrial nations. The biological

warfare programme was one of the only sites of Soviet governmental investment that continued to allow an infrastructure for cytology and genetics within the Soviet Union; officially, genetics remained banned for another decade. Genetic research, still considered a Western import, was to remain in the laboratory. The first Soviet biological warfare programme ran from 1928 to 1972; along with Japan, it was the largest and most technically sophisticated in the world, and there was traffic between the two nations through shared infrastructure and knowledge exchange. As well as Japan, there were joint programmes between the United States, the United Kingdom and Canada, and China had its own. Many of the details around this first phase of the programme are unknown, because there was a moratorium on information and many records were destroyed. It was primarily a collaboration between Soviet military and Soviet industrial science. Biological warfare research was a significant source of funding for molecular biology institutions in this period, leading to what E. S. Levina and A. E. Sedov describe as 'hidden strings of compromise' between Soviet molecular biologists and the Soviet Department of Science of the Central Committee (2000, 425).

What is known is that the purpose of the programme was twofold. The first and most prominent strand of research was the development of strains of model bacterial organisms – foreign DNA – that would cause biological damage among enemy populations (weaponized pathogens). The second was to develop vaccines that would combat them; the code name for these efforts to create protective measures against biological warfare was the 'Fifth Problem'. For this, they needed test sites. In the early years of the programme, before the Second World War, three open-air test sites were established: the first at Tomka (later Staryyya Shikhany) in 1925, near Volsk – just over 900 kilometres from Moscow – covering 100 square kilometres, first used for military training and then, from 1933, becoming a testing ground for chemical and biological weapons, home to 1,000 personnel and eventually extending to 600 square kilometres (Leitenberg, Zilinskas and Kuhn 2012, 23). Two further testing sites were established on islands: Gorodomlya, north of Moscow (about 10 kilometres square), and Vozrozhdenhiye Island, in the Aral Sea. The former was to become the go-to site for testing weaponized pathogens, 'so isolated that it afforded a high level of biosafety to open-air test sites, eliminating the need for additional open-air sites' (Leitenberg, Zilinskas and Kuhn, 23). Isolation was not only a matter of biosafety but also a way of keeping these activities relatively secret.

By the 1970s, according to science historians Milton Leitenberg, Raymond Zilinskas and Jens Kuhn, the Soviet biological warfare programme 'probably had a validated biological weapons system based on the *variola* virus' (smallpox),

as well as a number of other biological weapons (45). The spectre of the early phase of extractive and settler colonialism through the transmission of smallpox to Indigenous populations is part of the muscle memory of militarized offence strategies, a global mode of territorial acquisition for the duration of colonial-capitalist modernity, a history in which the Soviet Union was also embedded through imported scientific infrastructures, and international knowledge and technological exchange with colonial powers. In *Dreamworld and Catastrophe* (2000), Buck-Morss describes the modelling of Soviet industrial townships in the 1920s and 1930s on those of American industrial cities that became epicentres of Fordist production, places like Gary, Indiana, and Detroit, Michigan. She details the visit of a group of Soviet engineers to Detroit, and their meeting with the architects who designed Henry Ford's River Rouge car assembly plant, and other prominent engineering companies (General Motors, Packard and Chrysler): 'this meant that a US capitalist firm [became the] designer of Soviet socialist industrialisation' (Buck-Morss, 165). This was not just knowledge exchange: in 1929, an entire Fordson tractor factory was constructed in Detroit and shipped to Stalingrad. Other similar imports resulted in what Buck-Morss describes as 'the largest technological transfer in capitalist history' (168). For Soviet ideologues this, too, represented a kind of alien contamination: could capitalist infrastructure be imported without its attending ideology?

Roadside Picnic offers an imaginary of biological warfare after something has gone wrong, when its effects are all that are visible, and the causes remain obscure and undecipherable, while set in a town that looks remarkably like one of the imported townships of Soviet industrialization. As Viacheslav Ivanov observes, the Strugatskys are particularly attentive to 'the flavour of contemporary science', particularly around theories of time and energy, and the social control of reproduction (2011, 9). These two themes merge in *Roadside Picnic* in its interest between the interaction of foreign code and environmental influence, the cultivation of biology through infrastructure, and vice-versa. The narrative begins with a promise of scientific hypothesis: an interview with Dr Valentine Pillman, a Nobel Prize-winning physicist, with a correspondent from Harmont Radio. (Harmont is the fictional town somewhere on one side of the Canadian border, possibly near Detroit, where the United States's Zone appears.) He is known for the discovery of 'the Pillman radiant': a theory of the Visitation's provenance and the spacing out of the six Zones across the globe. He describes the radiant acerbically, denying that it is either an important discovery, or really 'his' at all ('the radiant was discovered by a schoolboy, the coordinates were published by a college student, and yet it was named after me' (RP, 1)):

Imagine taking a large globe, giving it a good spin, then firing rounds at it. The bullet holes on the globe would fall on a certain smooth curve. The crux of my so-called important discovery is the following simple observation: all six Visit Zones are positioned on the surface of the planet like bullet holes made by a gun located somewhere between Earth and Deneb. Deneb is the alpha star of Cygnus, while the Pillman radiant is just our name for the point in space from which, so to speak, the shots were fired. (2)

Two interwoven anxieties stand out here: the arbitrariness of language and warfare as targeted contamination. In this logic, the toxic Zones have appeared seemingly at random, the result of some unknown presence firing shots across the earth, presumably colossal, if the proportions of spinning the world like a globe are kept in mind: an act of unprovoked, extraterrestrial violence on a global scale. In this new state of affairs, national borders are also arbitrary: there is no superior nationalism that can save the world from this attack, the implications of which, thirty years on, remain elusive. It is a crisis of language and any sense of human ownership over knowledge, too: Pillman's ambivalence about the 'discovery' being a 'discovery' (resisting the implicit coloniality on which international recognition of individuals is premised), about this 'discovery' being 'named after me', and his caution against placing too much faith in scientific vocabulary (a radiant is 'just our name' for a place that can only be hypothesized about) reflect a global crisis of epistemological coherence.

This ambivalence is lost on the interviewer – 'Dear listeners: finally, a clear explanation of the Pillman radiant!' – who goes on to remind these listeners that two days' previous was 'the thirteenth anniversary of the Visit' (2). The radio host stands in for a more general effort to make meaning out of the crisis, weaving disparate and incommensurable details into narrative out of which some kind of culture might be forged: anniversaries, prize-winning theories and famous scientists. Making sense out of the crisis is key to keeping some semblance of normality, and it is science that – at least initially – asked to give these assurances. This is a globalized effort involving ongoing promises of deduction and deciphering. There may be some grander secret to be revealed at a later date, or mystery to be solved: making the Visitation into culture places it in a logic of cultivation.

At a local level, these culture-making efforts make less sense. *Roadside Picnic's* protagonist is Redrick Schuhart, who enters the text as a laboratory assistant on a scientific investigation for the Harmont branch of the International Institute of Extraterrestrial Cultures (again, mapping the event as culture – as Visitation – to hold off uncertainty). This involves going into Harmont's Zone to collect data. In

time, these investigations are outlawed when the biologically deleterious effects of Zone begin showing up in the children born to those who enter it. Schuhart needs money; he has a young family, and his daughter has been born with some kind of mutation that means she is covered in fur and resembles a monkey, gradually losing her powers of human communication. He takes on work as a 'stalker', which became the title of Andrei Tarkovsky and the Strugatskys's loose adaptation of the novel in the 1979 film: a rogue agent who enters the Zone illegally to source some of its mysterious objects to sell to informal markets that have sprung up around the Zone along the edges of the Zone, extraction on the sly. The objects have no obvious meaning or purpose, but this uncertainty keeps value attached to them: they may well become useful at a future time.

If the Zone represents some kind of code inserted or spliced into particular sites across the globe, an illegible 'treasure trove' (110), then these objects are its unidentified sequences: a white metal bracelet that spins endlessly (89), and beads that become known as 'black sparks' that are used for jewellery (137). There is a genomic analogy here fused with the cultivation metaphor of Soviet biology – the Zone-code as cipher, producing forms that are in turn determined by external influences. Pillman conjectures that these sparks 'are actually vast expanses of space – space with different properties from our own, which curled up into this form under the influence of our space' (137). There are two things to note about this conjecture and its double helix lexicon: first, scale. The idea of small objects containing vast expanses of space corresponds to a biogenetic imaginary of the helix as a site of evolutionary time, extending well beyond the lifespan of an individual. Second, influence. The form of these objects, Pillman is suggesting, is in part influenced by the spatial dimension of Earth. Code can be localized, producing forms that are relevant to its environment, but also which are in some way determined by the configurations of this environment.

This fusion of code and cultivation was made possible by the kinds of cross-fertilizations of Soviet biology and Anglo American genetics throughout the course of the twentieth century. What is important in this discussion is the narrative ambivalence towards maintaining a distinction between the Zone and the context in which it has arrived. The border between the Zone and Harmont is more of a cultural articulation, which gradually erodes as the text goes on. This is a narrative about influence, its vagaries and incalculability, its seemingly arbitrary effects and the way it extends across biological and social realms – a theme which VanderMeer uses as an intertext in his Southern Reach trilogy, which I consider in the final chapter. The narrative momentum of *Roadside Picnic* is not generated by an architecture of causality, but by fragmented accounts of its effects. Amy

Ireland notes how this is registered through ecological transformation: ‘the environment changes suddenly and inexplicably, and cause-effect relations are indecipherable, if they even apply at all’ (2019, 67). This indecipherability gestures to an indeterminate traffic between phenomenology, epistemology and ontology in the text, between what is actually going on, constructions of reality and what this means for being. It seems that for the characters that hypothesize around the Zone, descriptions of its architecture and processes and the projections and expectations that its visitors place on it constitute what happens within it. In very literal ways, narrative structures outside Zone cultivate the parameters of reality within it.

Redrick’s daughter – nicknamed The Monkey – only comes into the text twice, directly. But her appearances gesture to anxieties around new forms of warfare that might cultivate new forms of human life, or – in the case of The Monkey – scramble the supposed phenotypic chronology of evolutionary time, taking humanity ‘back’ to earlier lifeforms. Returning home from the Zone one evening, Redrick passes his daughter’s bedroom door where she is sleeping, ‘covered in warm golden fur’: ‘he really wanted to pick her up, but he was worried he’d wake her, and besides, he was dirty as hell, drenched in the Zone and death’ (73). At no point do Redrick or his partner Guta describe The Monkey as a throwback or mutant; whatever she is, she is loved by them. Outside the home, she is a statistic of the Zone’s effects on generations born after its arrival, but in this domestic space, it is Redrick who is the contaminant – harbouring death – rather than the daughter being an evolutionary aberration. There is an acceptance here that the Zone in some way has transformed her, and that going into it means bringing back some of its influence into the home. More than this: Redrick does not have a choice. The income of his family depends on it. There is no longer any other way of making their life as a family work.

Redrick’s dilemma – being exposed to the Zone and reliant on it for income – reflects the longer-term precarity of Harmont, predating the Visitation. People cannot leave Harmont, because there is nowhere else to go. Part of the Zone’s toxic lure are the forms of income to be made from remaining close to it. A blue-collar town in the American semi-periphery (or a Soviet synecdoche) learns to make its living from the tourist attraction that sits right next to it. The Zone’s use-value as a cultural artefact becomes an economic necessity. Its topography helps retain a sense of mystery, exuding a mystique of extraterrestrial precision, its border marked by a ‘black thicket along the road [that] looks almost mowed’ (21). It helps the younger, childless Redrick in the novel’s earlier parts anthropomorphize whomever or whatever has been responsible for its construction:

These aliens must have been decent guys. They left a hell of a mess, of course, but at least they put clear bounds on their crap. (21)

Here, the younger Redrick imagines a dilapidated moral economy of mess and boundaries. The Zone is figured here as a private space, where anything is permissible so long as it does not seep past these borders into the public. It rehearses a fantasy of benevolent colonialism, where settling might be morally justified as long as settlers do not impose their standards (codes) on others. The fantasy of this equilibrium collapses, partly out of necessity and partly because Redrick comes to know better, but this early description corresponds to a strikingly liberal understanding of the division between public and private, and the basis for cooperative forms of social liberty.

This moral economy corresponds to the one that Evelyn Fox Keller identifies as ‘the mirage of a space between nature and nurture’ in her 2010 book on epigenetics. Nature is the space of the private – the ‘mess’ and ‘crap’ that needs bounds to be set around it – and nurture forms the boundaries of cultivation that enable this division. In this model, nature is innate and more or less immutable – the aliens cannot help their ‘mess’ – but nurture comes in to regulate its potentially damaging effects. Keller traces the emergence of this disjunction to Galton, and the point at which ‘innate’ comes to be synonymous with ‘heredity’. In historical terms, it is most unambiguously a concept of imperial Britain, a way of theorizing social differentiation as biological difference. In the Soviet context, something different is going on, but Redrick’s invocation of boundary-making as a condition of ‘decency’ corresponds, in this light, to a quietly eugenic management of heredity and public space, whereby those with messier (less fit) hereditary stock might be encouraged to keep it to themselves by not reproducing. This imaginary reinforces eugenics’ global appeal: the assumption of a legible correlation between heredity, phenotype and fitness that might be harnessed for the sake of social progress.

If Soviet eugenics was a matter of cultivation rather than selection – hereditary material and environmental influence coextensive – this put the status of genes on more difficult terrain in the Soviet Union. Of greater significance was the question, to borrow from Keller, of ‘causal interactions between DNA, proteins, and trait development’ (2010, 50). Redrick’s perspective shifts through the course of the narrative from this liberal division between public boundaries and private mess, refracted through the infrastructure of Western scientific infrastructure, to a more complex understanding of the forms of entanglement that the Zone exhibits, makes visible or produces. These illuminate not only a different

epistemological field but also the toxic lure of a reductionist framework, how it keeps people fixed on its mysteries while perpetually holding off any finite answer. Reduction needs uncertainty in order to generate profit; what would it be to admit to huge gaps in understanding? How can culture be built around the absence of words to describe what is happening, even if those words are part of a lexicon of absence and lack? And if culture cannot be constructed, what happens to the idea of the human, let alone 'progress'?

No definitive explanation for the transmission of damage between the Zone, Harmont and the world beyond ever arrives. The meanings of its objects continue to vacillate in more or less arbitrary ways, temporary placeholders of function: "We use them, although almost certainly not in the ways that the aliens intended," says Pillman, years on from his interview, but this is the equivalent, for him, of "using sledgehammers to crack nuts", the implication being that humans have no idea about the scale or force of the objects (136). In the electronics' salesman Richard Noonan's words, any hope of acquiring – "something fundamental from the Zone . . . that could revolutionise our science, technology, way of life" diminishes as time goes on (135). While the Zone's energies remain inscrutable, their deathly effects travel beyond the perimeters of Harmont, transmitted like a contagion when its former residents who lived through the Visit move away. Pillman explains to Noonan,

We don't know what happened to the poor people of Harmont at the very moment of the Visit. But now one of them has decided to emigrate. Some ordinary resident – a barber. The son of a barber and the grandson of a barber. He moves to, say, Detroit. Opens a barbershop, and all hell breaks loose. More than ninety per cent of his clients die in the course of a year; they die in car accidents, fall out of windows, are cut down by gangsters and hooligans, drown in shallow places, and so on and so forth. (139)

All this, and an increase in municipal and natural disasters: gas pump explosions, flu epidemics, tornadoes and typhoons. The mess of the Zone spreads out, a contamination characterized not by DNA sequences, but by a principle of disorder, disrupting human-made infrastructure and destroying ecosystems. The biological changes in those who have been in contact with the Zone register across both phenotype and genotype, and genealogy ('son of a barber, grandson of a barber') offer little in the way of stability or certitude.

These descriptions of death and catastrophe are terrifying not only because of their scale but also because of the apparent arbitrariness of this devastation. The only causal principle is proximity to the Zone and the time of the Visit, as if

some invisible force extends over the whole of the Area, binding all of those in its vicinity to its violent energies. And as Pillman notes, it is not the objects or ghostly resurrections that pose the greatest threat to the idea of humanity; these are to an extent imaginable, if not explicable. Rather, the Zone represents 'the violation of the principle of causality' (141): not so much an extension of the principle of influence, but rather a confounding of the logic of cause and effect.

To return to the argument with which this section began: the Zones as open test sites for biological weapons. There is a shift in the narrative from metaphors of exposure to metaphors of proximity. Bodies are not exposed to, or cultivated by, particular environments (political, social, ecological) – or vice-versa. Instead, the narrative becomes a site where the contingency and unknowability of what it is to exist with others becomes visceral; that is, detached from inherited infrastructures for seeing and knowing the world. The great project of cultivation cannot survive this transition. It is one thing to be cultivated within boundaries; quite another to be in proximity with all kinds of unknown entities and forces with different origin points and unknown trajectories.

This is not a misplaced romanticization of human, nonhuman and inanimate cohabitation. If experimentation with biological weaponry has the potential unleash catastrophic and unknowable effects, despite the assumed isolation of test sites, then thinking with proximity – rather than cultivation – becomes a political necessity. When considered not just in terms of their horizontal devastation (across space, in the present), but also their vertical damage (across time, annihilating futures), new tools of biological mass destruction necessitate new metaphors for thinking about the scale of consequence when something goes wrong. The binary of cultivation/heredity does not go far enough: it is not just that organisms are cultivated by their environments; rather, these forms of warfare introduce new temporal and spatial proximities that subvert established frameworks for knowing the world. This proximity is not just biological: it includes the forms of uncanny proximity facilitated by globalized biotechnological and industrial infrastructure, and the forms of competitive nationalism (both financial and territorial) that promote the endless production of defensive and offensive weaponry; it is the constant proximity to states of war, and forms of destruction that cannot be regulated and managed by enemy lines or national borders.

Roadside Picnic ends with this transition from cultivation to proximity. In the final section, Redrick is paid to go into the Zone with Arthur Burbridge, the son of the local mob boss, because Arthur wants to find a legendary golden sphere that other visitors to the Zone have talked about. The golden sphere is supposed

to grant wishes, a transcendental object capable of communication with those who seek it. When Redrick and Arthur find it, in something like ‘an abandoned construction site’, there’s nothing golden about it; it looks like a piece of junk, ‘closer to copper, reddish, completely smooth, and it gleamed dully in the sun . . . cozily nestled between the piles of accumulated ore’ (188). At first Red notices nothing unusual about it, but soon ‘looking at it became enjoyable’, and he wants to get closer to it.

It suddenly occurred to him that it’d probably be nice to sit next to it and, even better, to lean against it, to throw his head back, close his eyes, and think things over, or maybe simply doze, resting. (189)

There is a toxic lure about the sphere, a dance of beckon and threat, to borrow from Mel Chen’s theorization of toxic animacies. Chen discusses toxicity as a condition of sociality, rather than simply a property of an individual, group, or substance (2011, 272); a toxin ‘is not necessarily alive, yet enlivens morbidity and fear of death’ (265). Toxins can be thought of as ‘conditions with effects, bringing their own affects and animacies to bear on lives and nonlives’ (282). Toxicity involves different kinds of sociality, ‘straddl[ing] boundaries of “life” and “nonlife”, as well as the literal bounds of bodies, in ways that introduce a certain complexity to the presumption of integrity of either lively or deathly subjects’ (279). Chen gives the example of ‘labouring or literally intoxicated subjects’ – factory workers, agricultural workers surrounded by pesticides, residents in industrial and heavily polluted areas of the city – who ‘tak[e] into their bodies what their better-vested employers can avoid’ (276). The toxins inhaled and consumed by these bodies, as they destroy bonds of biological life (nerve endings, organ function, brainpower), produce other kinds of bonds that ‘link these groups, bonds that are recognized in the potent affinities of labour and immigrant activism, have been laid there from without, to suture and reinforce multiple transnational systems of racialization, labour hierarchy, and capital – and ultimately of affection or nonaffection’ (276). For Redrick, this proximity transforms his desire: from deciphering and extracting objects, to being absorbed by them, and from the certainty of cultivating boundaries to a liminal lingering.

Whatever force they find themselves near is neither to be trusted, nor a place to rest; rather, it re-enforces the violent forms of the system ostensibly outside the Zone. The sphere does not produce something new, nor bring something into being that was previously unavailable. Its animacy is generated through its absorption of systemic dysfunction. Redrick’s experience of a transfer of desire

from extraction to absorption is followed by a kind of response, the only action in the narrative that comes directly from the Zone. As Arthur leaps towards the sphere, ecstatic, shouting the entrepreneurial promises of the American frontier, 'Happiness for everyone! Free! As much happiness as you want! Plenty for everyone!' he is snatched up and squeezed to death:

Redrick saw the transparent emptiness lurking in the shadow of the excavator bucket grab him, jerk him up into the air, and slowly, with an effort, twist him, the way a housewife wrings out the laundry. Redrick had the time to notice one of the dusty shoes fly off a twitching foot and soar high above the quarry. He turned around and sat down. There wasn't a single thought in his head, and he somehow stopped being able to sense himself. Silence hung in the air and it was especially silent behind his back, on the road. (190)

This encounter establishes a direct relation, a response from some invisible force to the humans who have come close to it. 'Transparent emptiness' and 'silence' become characters in this description, agents with suggested intentions and depth, rather than abstract placeholders for human perception – an emptiness in human form – a set of hands that can twist, something harbouring an intention to conceal itself, and a surrounding silence composed of corresponding intensities. The environment takes on a different meaning here: not just atmosphere or sonic waves, but something deliberate, attentive and responsive to human presence. This response does not induce a doubling-down on selfhood and individual preservation, but an evacuation of both: Redrick's sense of himself extends into what is close and near – the silence, the road and the sphere.

The movement from metaphors of exposure and cultivation to those of proximity breaks with a certain way of understanding bodies 'in' contexts, whether cultivated by an environment, or by mysterious objects whose functions and effects cannot be deciphered. Looking at Arthur's dead body, Redrick notes the younger man's matted, tangled hair. The moment gestures back to The Monkey's soft fur, and creates an unacknowledged affinity between these children of Zone adventurers, both on their way to becoming detached from human appearance in manner and body, proximate to a biological future that has not been planned for. An evolution resulting from unknown causes, in an environment that cannot cultivate the kinds of bodies it needs to move history forward.

In the next section, I consider Bulychev's short story, 'Another's Memory' through this crisis of cultivation in Soviet biology, alongside the making of so-called genographic maps of communities living under Soviet rule in remote

areas of the empire during the 1970s. These maps were explicitly for the sake of charting and cultivating a productive workforce as Soviet growth declined as a result of global economic crisis, for working out the genetic basis for certain 'healthy' or 'unhealthy' populations, and for making policy recommendations in response to these data. At the same time, the dream of Soviet Man was fast disappearing as a horizon of possibility.

Genogeography and Kir Bulychev's 'Another's Memory'

Bulychev's story charts the dissolution of a eugenic dreamworld: the death of the New Soviet Man. 'Another's Memory' is set in a science institute for biological research, somewhere at Moscow's periphery, sometime in the early 1980s: the final decade of Soviet rule. The barracks village surrounding the laboratory – residences built for its workers in the 1930s – are beginning to crumble and are in the process of being torn down. A new building, promised for five years, has not yet been constructed. A crane 'with a huge cast-iron ball dangling from a cable' swings over the remaining barrack buildings, which have been gutted for glass and iron, and deserted (135). The city has 'engulfed' the institute, once in the countryside, and undeveloped land sits at its edges: 'a creek remained, surrounded by tall banks of new buildings' (136). The institute is a scientific island gradually engulfed by urbanization, disintegrating in the process. Barracks suggest a former military presence now in the process of being erased, a backdrop that foregrounds the collusion of scientific research and national security. The crane forecloses a moment of destruction, but it is as yet unclear what will take its place.

The famous biologist Sergei Andreyvich Rzhevsky observes this as he makes his way into the institute, coming in on the bus, forced to take public transport for the first time in a long time because the institute car did not show up that morning. He is introduced as character complacent to his surroundings and accustomed to the perks of the job: a chauffeur-driven car, access to international research (afforded only to Party members at this point in time), and his own research programme in genetic cloning. On his desk as he walks into the office are 'several official-looking envelopes,' 'a new English journal' and 'an abstract, from Leningrad' (136). He is someone to whom official mail gets sent, who is keeping up with international science, overseen by state observation, and a member of the Communist Party. The implication, then, is that Rzhevsky's success has been premised on his role in the Soviet Union's efforts to compete internationally in

the production of biological research. The plot follows Rzhevsky's experiments with cloning: first, of a chimpanzee, and then of himself. He is able to produce an adult clone using only his own genetic material, bypassing sexual reproduction and the womb.

This clone, named Ivan, comes to consciousness with all of Sergei's memories fully intact, nothing repressed or forgotten, because he does not have the need to forget anything. This means that all the things that Sergei has had to forget in order to ensure some kind of psychological and professional cohesion come into his life: unwanted reminders of regrets, mistakes and the hurt he caused others. Ivan becomes a detective on a self-initiated investigation into Sergei's past, befriending one of Sergei's long-lost friends: a dusty archaeologist at the natural history museum. Much to Sergei's chagrin, Ivan chooses to train in archaeology rather than to follow in his father's footsteps and become a molecular biologist. The narrative accents Ivan's attention to history, rather than Sergei's experiments in technologized reproduction.

The story takes place at the tail end of post-war development of Big Science in industrial nations – particularly the United States, Japan, Germany, the United Kingdom and the Soviet Union – by which time Big Science had transformed the infrastructure of science research. Big Science carried a wartime legacy: military funding was key to the construction of big machines (the Large Hadron Collider in Geneva) – lots of them – and big laboratories (CERN). Sergei's cloning project is part of a global race to the finish: the Japanese are the Russians' closest competitors, "close to success"; while an article from the United States is "claiming some success with dogs" (144). Sergei needs to justify funding, and there are comparisons made between cloning and atomic research. His board is interested in scaling up: "Someday we will learn to do it on a mass scale," says the secretary of the biology division (144). The reference to mass production harks back to early years of Soviet production, here joined to the vision of reproducing a sublime body through the creation of 'a material environment whose larger-than-life proportions would allow . . . new super bodies to move in and take up residence' (Buck-Morss, 149). Sergei's experiments gain support through their nostalgic reference to an earlier phase of Soviet world-building, even as the infrastructure designed specifically for this purpose disintegrates and is shut down, replaced by the promise of laboratories that can rival those in the West.

At this juncture of degeneration and urban sprawl where socialist projects of industrial science are engulfed by capitalist rhythms of accelerated urbanization, suburbanization and unchecked speculative expansion, Soviet cultivation sits uneasily with Western reductionism: a model Soviet citizen to take the Soviet

Union forward into the next century, now expected to compete in a post-Soviet world economy. By removing the need for the unreliable mediation of the female body (as it appears to Sergei), and – literally – annihilating the space of the domestic, Soviet development can extend across both biological and industrial spheres by replicating the forms of its great men. Cloning would ensure maintaining the cultivated Soviet Man even as the ideological borders of the bigger Soviet project were in the process of disintegrating. Bulychev's story dramatizes the tension between molecular biology's future-oriented present – directed towards a looming global horizon at the fringes of Soviet science – and the ideology of cultivation in Soviet biology by collapsing them together. To clone Sergei is to clone the ideal Soviet Man; he is already perfectly adapted to his environment, or so it seems, a model citizen and the pinnacle of Soviet cultivation.

Cloning – a speculative technique of mass reproduction – suggests a particularly cinematic imaginary: the replication of images indefinitely, and the disappearance of the individual into a hall of mirrors. For Buck-Morss, the development of cinema at the beginning of the twentieth century offered a way of capturing “‘the mass’ as a coherent visual phenomenon . . . an imagined space where a mass body exists that can exist nowhere else’ (147). In both the super-projects of socialism under Stalin, the attempt to create a material environment to house new super-bodies – ‘the revolutionary mass along the expansive boulevards of Soviet cities’ – meant that the individual becomes lost (Buck-Morss, 149). She notes,

The Soviet citizen, like the Western man in the crowd, is exposed to a specifically modern anxiety of the meaninglessness of the individual that leads to enthusiastic endorsing of the process of doubling. (149)

As a technology of doubling, genetic cloning would make the socialist project real – the imaginary mass projected onto cinematic super-space – while also erasing any sense of individual outside this form. Sergei's project is couched within the dream of the Stalinist mass body, replicating the ‘sublime body of the leader, the gigantically proportioned image of Stalin himself’ (Buck-Morss, 145): a workforce of replica Stalins.

The fusion of cultivation and replication had a historical precedent in Soviet science policy, exemplified in the Soviet Union's large-scale population studies during the International Biological Programme (IBP), under the banner of ‘human adaptability’ studies. The IBP ran between 1964 and 1974, and was initiated by C. H. Waddington, who by this point had already coined the term

‘epigenetic landscape’ to describe the developmental pathways open to an embryo during foetal development (Waddington 1957). The IBP was a response to the call from leading ecologists to reroute the focus on space and technology and instead to develop ‘a synoptic collection of observational data on a global scale’, an attempt to put the biological sciences on the same kind of footing as the physical sciences (Aranova, Baker and Oreskes 2010, 183–4).

Genogeographic maps produced during this period were part of a number of public health policies in the Soviet Union geared towards the optimization of the workforce. Bauer notes that while Western approaches to population studies were more focused on heritage, and on ‘preserv[ing] the alleged backwardness of the populations they termed “unique”, Soviet science policy was geared towards drawing these communities into the wider labour force of the Soviet Union’ (Bauer 2014, 168). Soviet biomedical studies in the 1970s targeted different professional groups for the sake of increasing their productivity – most notably, factory workers, railway line workers and construction workers.¹ Soviet biomedical anthropologists worked with computer-aided modelling techniques which ‘rendered “populations” as systemic entities and enacted specific cybernetic versions of population, evolution and difference’ (Bauer 2015, 146). These studies often focused on communities living in ‘extreme conditions’, which might undergo forms of accelerated adaptation to changed environments – industrial exposure or extreme climates (Bauer 2014, 167). In 1977, a study was carried out on the adaptive physiology of high altitude populations, measuring their capacity to work, physical performance and adaptive capacity, and whether these high altitude conditions might have therapeutic effects (Bauer 2014, 168).

These maps were produced to track ‘humankind’s capacities to respond to changing environments and aimed to find physiological principles on adaptation to new conditions, which included contemporary and future workplaces and, possibly, outerspace’ (Bauer, 168), part of the broader – and temporary – optimism about new Soviet futures. What is important to note here is that these studies suggested a fusion of health policy and labour reform, geared towards optimizing both working conditions and the adaptive physiology of the workforce. Fast adaptation to changed environments was not only a national concern but a feature of evolution that could be manipulated to

¹ One study followed the workers who moved with the construction of the Baikal-Amur Magistrale, a railway line going across Russia, from Tayshet to Bratsk. Construction of the BAM line began in the 1930s, with the Tayshet to Bratsk section of it being built by inmates of the Bamlag gulag. Construction of the railway in the 1970s opened up the BAM service area to thousands of young people, with new settlements and bridges built.

match productivity with health policy, recapitulating earlier Soviet dreamworlds through new biomedical technologies.

Bulychev's story is less interested in Ivan's physiology than the two-part question of whether the idea of the New Soviet Man could survive if this figure no longer had relevance to the next generation, and whether this citizen had ever appeared in reality. Upon what elisions and erasures was the cultivation of this subject premised? In a story organized around memory – what it is and whose it is – something has been forgotten. Rzhevsky's cloning project is criticized by one of his colleagues via a Romantic critique of Enlightenment optimism, which attends to the darker possibilities latent in harnessing biotechnology to competitive nationalism. One of Sergei's colleagues, Sidorov, 'opposed to Rzhevsky's methods', asks, "Where's the guarantee you're not going to create a monster?" (144). Mary Shelley's *Frankenstein* (1823) is invoked as an example of such an experiment going dangerously wrong, with catastrophic effects for its protagonist and his creation. The reference positions the laboratory in a history of colonial-capitalist innovation, in which the production of human-adjacent lifeforms that are not counted as human is paramount for the reproduction of labour power.

The laboratory figures as a site of enclosure, a place of private decision making, while the domestic residences surrounding the laboratory contain fragments of practices of communal negotiation. The laboratory does not have the resources to sustain itself, or to make improvements without the intervention of a manager. Sergei relies instead on the laboratory to stand in for the general Soviet project, a synecdoche for the Soviet whole. This compartmentalization has meant that his life has split into fragments – what is expressed (his intellect, his ambition, his scientific vision) and what has been silenced (his family, his friendships, any sense of communal organization beyond leading a laboratory team). The form of the text mirrors the constant interruption of the code of Sergei's life – his job, his work – by external details: the car that does not arrive, the cage door prised open, the clone who remembers everything. The short, concise, numbered sections are snapshots of his life reconstructed from essential details. When other details and characters attempt to exert influence or interrupt his stream of activity, they are abruptly parenthesized: the critical colleague, concerned friend and various unwanted reminders of past mistakes.

This starts to change with the arrival of Ivan. Ivan not only expresses Sergei's genes, but also has all of Sergei's memories. Unlike Sergei, Ivan has no reason to repress them. Instead, he becomes increasingly preoccupied by the life of his genetic original, and by what he sees as Sergei's grave mistakes and long-buried pain: 'Rzhevsky's fatigue, the exhaustion of his nervous system, was inherited

by Ivan' (201); the passive construction emphasizes the psychic weight of living with and in someone else's mistakes, and without having any context in which to situate them. Ivan's waking life is dominated by Sergei's past, which presses at the limits of his brain function.

To mitigate this, Ivan takes on the position of internal spy on behalf of the reader, doing the detective work that the reader is sealed off from. At this point, this science fiction story incorporates another genre: detective fiction. This is the genre that makes it possible for him to reconstruct the past, while the hyper-realism of science fiction seems only to offer the redaction of the past. What has been forgotten? Ivan only has Sergei's side of the story and finds himself emerging in the middle of the narrative that he only half understands, and in another genre. It is a love story and – apparently – a tragic one: Sergei loved a woman called Liza, who had a daughter from another relationship – Katya. The three of them lived together in the barracks, but he could not make it work; he was too insecure in his career and in his capacity to love them. Ivan tells Nina, his own love interest in the story:

'Rzhevsky wanted terribly to be alone – without Liza, without Katya, without anyone. He felt like a caveman whose life was over before it had begun. And he would never be a scientist. He was irritable and unfair to Liza.' (188)

The necessity of taking responsibility for women makes Sergei feel like throwback in a time where survival is reduced to primitive technologies without a fully formed linguistic system. For him, having a family means being unable to evolve. Liza left, taking Katya with her. She went to Vologda, a northern city with various industrial plants – a site of production, rather than innovation; a city of political exile, too, and the last metropolis before Siberia. Liza's flight to Vologda corresponds to the years of the gulags, with Vologda positioned at the fringes of the Soviet dream, at the borderland between fast-track industrialization and its human cost. Sergei's loss of memory corresponds to the deliberate forgetting of this longer history.

In Ivan's inherited memory, Liza's departure is bound up with sacrifice, indentured labour and tragedy: forcing out the demands of the domestic in order to fulfil the dreams of the new nation, with women's lives as collateral damage. Speaking to Nina, Ivan tells her that a few years later, Sergei had heard that she had been run over by a train – "or something like that" (189). Nina picks up on the intertext immediately, responding excitedly, "She jumped in front of a train. Like Anna Karenina! He did kill her!" (189). Sergei's account of Liza's fate – and his responsibility for it – is drawn from another text, where women's bodies line

the tracks of national progress. Viktor, also in love with Liza, paints Sergei as a character akin to Alexander Pushkin's Yevgeny Onegin, someone who "has gone all the way to the tragedy of solitude", an aristocratic anti-hero shaped by his sense of himself as a character larger and more fearsome than domesticated forms of love (197). The cultivation of a collective workforce gives way to an imaginary of a maniacal egoist, antithetical to the ideals of communal labour. In Sergei's case, this is under the guise of serving the Party while ensuring his own professional ascendance. Read this way, Sergei's creation of Ivan appears as the final desperate act of a megalomaniac, the only way he can try to ensure some kind of lasting legacy for himself.

Disrupting this narrative does not involve attacking the source – that is, on correcting Sergei. Instead, it involves moving the narrative from individual tragedy to communal comedy. It turns out that the other side of the story is not nearly so dramatic as Pushkin and Tolstoy's tragedies. Ivan travels to Vologda to find Katya, Liza's daughter, who tells him that far from being guilty of her mother's death, that Liza "wasn't mad at him at all. Not in the slightest" (211). Liza wasn't hit by a train, but by a drunken truck driver while crossing a street; this is not giving up the body to technological progress, but accidentally being taken out of it. Katya tells Ivan that the relationship would not have worked, because "he loved his work more. And Mama knew that" (213). Digging up the past, Ivan does not find as much tragedy as Sergei's repression had him believe he would find. Rather, he finds a kind of tacit communal effort, and life carrying on past the model of the patriarchal family. What Liza remembered – what she passed onto Katya – was that Sergei gave Liza a biography of Pushkin as a gift, and that they went to the movies, and that they visited Leningrad. Smaller events, where literature and life move next to each other in easier accord: no longer enclosed within the private sphere, enabling the sharing out of error and grief.

This resolution echoes the uneasy coexistence of forms of communal and enclosed production throughout the history of the Soviet Union, where 'the environment' is not the Russian landscape, but rather techno-capitalist forms directed by Party interests, infrastructure imported and harnessed for Soviet purposes – as if arriving from an alien planet. 'Another's Memory' asks what re-reading the environment would mean at the tail end of the Soviet Union. The answer it gives – if ambivalently – is through archaeology, in the form of Pasha Dubov, the awkward, earnest, ageing archaeologist whom Ivan befriends in the local natural history museum, and one of Sergei's old university friends left behind in his climb up the ranks. Ivan's choice to follow in Dubov's footsteps

positions him in the collaborative work of excavation, where the future is put on hold, and policy held off.

As well as offering a site for imagining Soviet techno-modernity, Suslov and Bodin suggest that Soviet sf allows for retrospective gestures at the latter end of Soviet dominion, to 'roll back history to the 1960s and push it in a different direction' (2020, 8). The story ends with a comic tableau. Ivan is recovering from an illness, visited by Nina – who, for reasons that aren't made clear, has lost interest in him in a way that seems more incidental than tragic – who is followed by absent-minded and noisy Dubov arriving with full shopping bags, and a bellowing Sergei comes in last, demanding to know why Ivan wants to give up science. The staging of the scene allows for a temporary truce between these converging and incongruous interests, without their curation into something productive. It is a scene of suspension, where various possibilities of national determination at a point of historical transition are held alongside each other. Sergei retreats from his position at the forefront of Soviet development, and a new generation with its eyes on lessons and objects from a complicated and troubled past are placed at the centre.

Through its strange collusion with military agendas even while officially outlawed as a research area, molecular biology in the Soviet Union by the time of genomics expresses a fusion of environmental and genetic accounts of human cultivation, vying between two constructions of time: the immediacy of DNA and the longer-term temporality of development. *Roadside Picnic* and 'Another's Memory' are two of a number of science fiction texts from the Thaw period that register anxieties around the status of national culture – and the suppression of bad memories – as the Soviet Union's global power started to wane. What good was the cultivation of new Soviet subjects when Communist dreamworlds were passing away? To whom, and for what purpose, would this subject have relevance? And on the other side, how could Western biotechnological infrastructure offer a solution, when this involves the disappearance of subjects – and collective organization – into masses of data? It is to this question of memory, data and subjectivity that I turn in the following chapter, in a discussion of memoirs of the Human Genome Project and the generation of fresh fears about the annihilation of memory (and lives) deemed irrelevant or superfluous to the dreamworlds of futures free from disease, even death, that some of its key protagonists purported to offer.