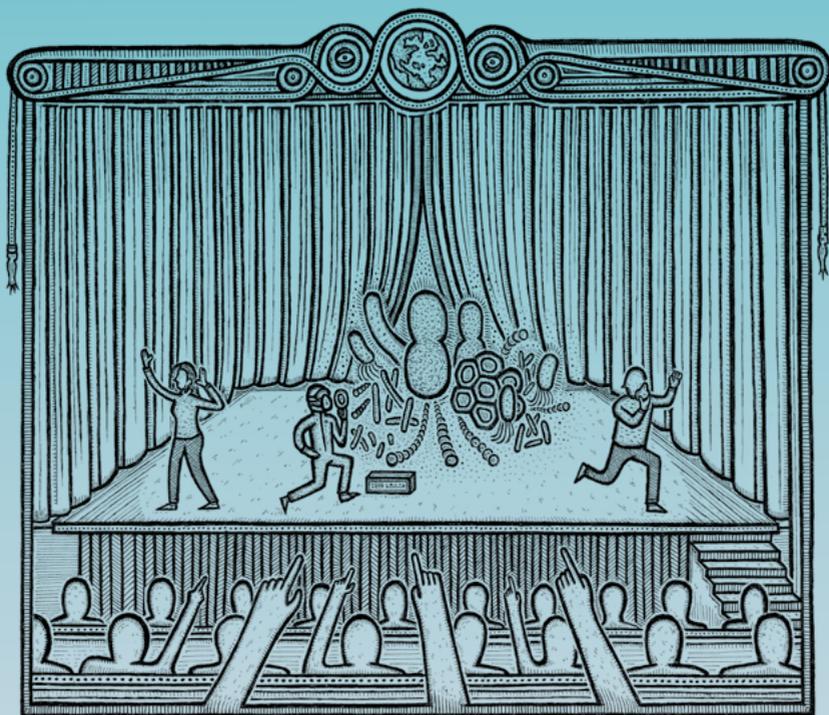


LONGITUDE PRIZE

INFECTIOUS FUTURES

STORIES OF THE POST-ANTIBIOTIC APOCALYPSE



STORIES: Madeline Ashby, A.S. Fields, Jenni Hill, Tim Maughan,
Lydia Nicholas, Michael Rathbone

COMMENTS: Brigitte Nerlich, David Kirby

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Nesta

Nesta is an innovation charity with a mission to help people and organisations bring great ideas to life.

We are dedicated to supporting ideas that can help improve all our lives, with activities ranging from early-stage investment to in-depth research and practical programmes.

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FOREWORD

“It is not difficult to make microbes resistant to penicillin.” No, this is not a warning from one of the army of doctors fighting superbugs today but, remarkably, from a speech given by Alexander Fleming in 1945, when he accepted his Nobel Prize for the discovery of penicillin.

Doctors of his generation knew all about the nightmare of the post-antibiotic era because they had witnessed first-hand the horror of the pre-antibiotic era, when a tiny cut could leave you fighting for your life; in 1930 infant mortality - deaths of children before their first birthday - stood at around one in 20; and opportunistic infections snuffed out the lives of the elderly and vulnerable.

Today we are more dependent on antibiotics than ever before in much of modern medicine, from organ donations to hip transplants, but our antibiotic arsenal is becoming increasingly ineffective with the rise of resistant microbes.

Over the years the alarm about superbugs has been sounded many times by a wide range of influential bodies, such as World Health Organisation and US Centres for Disease Control. Professor Dame Sally Davies, Chief Medical Officer and Longitude Committee member, now talks of a *“catastrophic threat”*; one that, as the Prime Minister put it, threatens to send us back *“into the dark ages of medicine”*.

In a world where we are inundated with impersonal facts and headlines routinely warn of impending doom, narrative offers a visceral way to explore an issue.

There’s meat machinery in our heads to find narratives. One can speculate that, as our ancestors evolved to live in groups, they told stories to make sense of increasingly complex social relationship and to help us make sense of threats. And today one of the biggest threats of all is that of antimicrobial resistance.

With this in mind, Nesta, an innovation charity, has invited established and emerging sci-fi writers to explore the future of antibiotic resistance to help underline the urgency of the £10 million Longitude Prize, which aims to spur

the creation of a cheap, accurate, rapid, and easy-to-use test for bacterial infections that will allow doctors and nurses to better target their treatments.

This anthology visualises a dystopian future where initiatives like the Longitude Prize have come to nothing. These stories are a meditation on the dark side of evolution. Resistance is inevitable, perhaps the most depressing implication of the revolutionary ideas of Charles Darwin. When treatment with an antibiotic begins, non-resistant bacteria are wiped out, leaving resistant cells to thrive.

As Fleming suggested, resistance dates back to the start of the antibiotic era. For example, the first resistant pneumococcus arose during the 1960s in the Trobriand Islands off New Guinea, which were visited by the Polish anthropologist Bronisław Malinowski during the First World War because they were so remote. Today the misuse of antibiotics in agriculture – to promote livestock growth – and in hospitals and by doctors drives the proliferation of drug-resistant bacteria.

Yet competition does not tell the whole story of biology. I doubt many realise that, paradoxically, one way to win the struggle for existence is to pursue the 'snuggle for existence': to cooperate. Building on the work of many others, the co-author of my last book, Martin Nowak of Harvard University, has identified at least five basic mechanisms of cooperation which gives human beings their extraordinary capacity to work together.

If we are to win this struggle for existence, and avoid the post-antibiotic apocalypse, there's no choice but to harness this extraordinary creative force. The winner of the Longitude Prize, which we hope will be announced by 2020, could be a lone inventor but will most likely be a team, where clever people assemble various technologies in unexpected ways, a collaboration of highly specialist skills splintered among many minds. Our relationships with microorganisms will also have to change: becoming smarter and more nuanced, perhaps more cooperative. By harnessing this creative force of evolution, we can stop science fiction from becoming science fact.

Roger Highfield is a member of the Longitude Committee and Director of External Affairs of the Science Museum, which has a sample of Fleming's original *Penicillium* mould. With Martin Nowak, Highfield wrote the book *SuperCooperators: Evolution, Altruism and Human Behaviour or, Why We Need Each Other to Succeed*.

INTRODUCTION

At Nesta we believe that engaging in science fiction and speculation is a powerful way to intervene in society's desires and expectations of the future. We seek to better understand how imagined futures impact our present and our preparedness for what comes next.

Visions of the future can illuminate potential paths forward. If those on offer are limited, they may lead us towards a limited set of identities, values and possible actions. If they cluster around particular concerns or desires they make those appear clearer and more compelling; even inevitable, and blind us to alternatives. Creating new visions can reveal a wider range of routes forward. When science warns us of slow, complicated, yet potentially enormous catastrophes, we need to engage with a variety of tools to effectively envisage and recognise threats and identify possibilities for change.

Nesta grapples with questions of how real and imagined futures co-construct one another in a number of ways, and seeks to support alternative perspectives. We explored the mutual influence of science fiction and innovation in our paper *Better Made Up*. We invite the public to debate, taste, feel and play out potential futures at our annual FutureFest event. We commission and support a number of narrative projects. For instance, we split the future of nanosatellites into six narratives in an attempt to demonstrate to policymakers that the ways they choose to talk about a new technology affects how it plays out in the world. With the British Council we supported a group of Nigerian creatives in their work creating and sharing films, images, music, art and narratives exploring alternative futures of Lagos.

Our society's relationship with microorganisms is going to have to change over coming decades. We will not succeed in overcoming antimicrobial resistance (AMR) by simply producing more and stronger drugs within the same environment that pressures microbes to evolve resistance. New technologies are allowing us to learn ever more about bacteria, and to negotiate a new relationship. The overall solution to AMR involves a long-

term journey towards a more intelligent, informed future. The test that the Longitude Prize will be awarded to will be a major, but by no means the only step towards that goal. We commissioned stories about a future facing up to the challenge of AMR as part of a much larger effort to publicise, educate, and enrich the conversation around AMR. To support the experiment we invited academics to comment on the project, and to respond to the stories.

Authors were asked to consider not an action hero in the explosive beginning or empty aftermath of a plague, but the subtler stories of living in a world where our antibiotics are failing: the shifts in everyday life and society, the impact on families, relationships, politics and work. They were offered a series of resources, but no one was expected to become an expert. Not all the medications, symptoms and procedures in place depicted in these futures are accurate - some that are at the time of writing may not be within weeks of publication, when a new discovery renders them obsolete. Some symptoms are drawn directly from medical case studies, some extrapolate cautiously, and a few are more loosely imagined. Many dwell more on the general fear of infection than on specific resistant strains, a reaction that most likely reflects public understanding of the issue better than depictions which more strictly adhered to specific illnesses.

As a part of the experiment, we invited comments on the use of narratives in public engagement with complex issues. David Kirby's, Brigitte Nerlich's and Matthew Clarke's essays go into more depth about the risks and opportunities of using short stories in these circumstances.

We were fortunate to receive feedback about the stories from a number of eminent contributors to the AMR cause. Their responses underlined the importance of focusing on the lived experience of AMR, rather than a specific disaster. The stories that were received most enthusiastically were those that dwelt on everyday life. Jonathan Grant, Director of the Policy Institute at King's College London and co-author of the book, *The Drugs Don't Work* enjoyed *They Want to Live Too* for its focus on 'the mundane implications of AMR' the optimistic depiction of a childhood with many positive elements marred by the frustration of not being permitted to play outside. Christopher Butler, Professor of Primary Care Health Sciences had a similar response to *Ayanda*. He appreciated that it depicted the shift of an easily solved problem into a chronic, life-changing condition, and the way that 'the infections had wider relationship and social implications without

being apocalyptic.’ Other comments celebrated stories which connected an increased risk or fear of infection with social and technological change, in which it is just one element of a widening chasm between classes, of increased surveillance and of changes in the structures of hospitals, education, work and politics.

Other comments challenged us to push for more interaction between our experts and authors. Laura Piddock, Director of Antibiotic Action, enjoyed the stories, but expressed concerns about the accuracy and prominence of the science, especially when it was unclear which (if any) infection was present. Finding a balance that brings in such accuracy, but allows authors to focus on engaging stories, experience and everyday life in the shadow of AMR is a key challenge we hope to develop on in future.

As the pace of social and technological change accelerates, it is no surprise that stories, vignettes and other speculative experiments are being used more often in decision-making processes. Such tools have great power in shaping our vision of the future, and should be investigated as they are deployed. We hope this collection forms the beginning of a project that promotes new ways of thinking about our relationship to health and medicines.

RESISTANCE AND ESCAPISM: THE RISKS AND REWARDS OF DISASTER STORIES

Many of us have already come into contact with Antimicrobial Resistance (AMR) through personal experience of the effects of MSRA and other resistant infections. Many more have become aware of AMR through media stories, such as an article in the *Daily Telegraph*, entitled 'Is this antibiotic apocalypse?', which starts: "Imagine a world where a scratch would strike terror into your soul. A place where giving birth is a life-and-death experience, where every sore throat and stomach upset is potentially lethal." (Hanlon, 2013; see also Davies et al., 2013)

Given the tenor of the media coverage, it is no surprise that some of the stories presented here tend toward a Hollywood notion of the apocalyptic event, painting a picture of a world where an 'Antibiotics Crisis' has shattered the existing order in an instant.

While sudden disasters are effective at seizing attention, and provide some of the excitement which attracts us to stories, they must be used with caution. Stories which go too far in this dramatic, even escapist, direction risk desensitising the public to the already very real and very serious problem of a slow, creeping change in what diseases we can control.

For example many of these stories depict a world in which hygiene has become an all-consuming concern. We read about face-masks, hazmat suits, super-sterile isolation wards etc. as 'weapons' in what seems to be a futile fight against infection and contagion. This is also a future of social isolation and social division, with some stories exploring class-divisions between the dirty and almost dead and the clean and barely alive; between the super-hygienic rich inside and the chaotic poor outside. Hygiene is undoubtedly a major 'weapon' in the fight against AMR. But the image of the all-or-nothing disaster, in which one scratch, or one crack in the seal can kill is not the only, or even necessarily the most likely possible AMR future.

Some of the stories focus on subtler narratives. Once trivial diseases become chronic and degrading. Something as simple as a urinary tract infection becomes a major disability rather than a mere annoyance as it would be today. Others focus on interesting links between the emergence of AMR and emerging social trends, such as the tendency to live in online communities, rather than face-to-face ones, engage in e-learning and even e-health. In one story children interact only remotely in order to avoid infection. In another we see the world through the eyes of a social media savvy spin-doctor fighting virulent memes swirling around a prince with a foreign wife, mirroring the stringent quarantine his household must live under for fear of both natural or weaponised infection. Fear is still the main emotion triggered by reading these stories. It even haunts the relatively happy ending which sees a child braving the outside world on a bike: the readers of the story probably ask themselves 'but what if she falls off and grazes her knee'?

All six stories bring a world without antibiotics vividly, almost all too vividly, to life. Some of the features that make for an engaging short story might make it difficult for stories to effectively promote public engagement with the work of preventing AMR today. By focusing on single, dramatic events the short stories frame the issue as a battle, not a war: AMR is imagined as a single event that can be overcome rather than needing ongoing efforts over the long term, both big and small. The dramatic images of crisis may provoke anxiety and apathy rather than the ingenuity and inventiveness we need.

In 1998 Richard Smith, then editor of the *British Medical Journal*, warned that increasing resistance to antimicrobial agents may become health care's version of global warming (Smith, 1998), a comparison made again in 2013 by Dame Sally Davies, our Chief Medical Officer, in various news reports. It might therefore be profitable to take a closer look at climate change communication research, which has shown that appealing to fear of disaster can lead to denial and paralysis rather than positive behaviour change (Moser and Dilling, 2007). There might be a danger then that stories which depict the consequences of AMR in an overly apocalyptic way may help, rather than hinder, in bringing about the dystopian future they depict so vividly.

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Brigitte Nerlich (University of Nottingham) and Matthew Clarke (University of Cambridge)

THE GHOST OF MICROBES FUTURE

Fictional narratives like these six short stories have proven to be extremely effective at raising awareness and convincing the public that a scientific issue needs more political, financial or scientific attention.

This is especially true for complex issues where scientists believe inaction will lead to serious global consequences, which is certainly the case with antimicrobial resistance (AMR). Essentially, these fictional stories act like the *Ghost of Christmas Future* in Charles Dickens' novel *A Christmas Carol*. They present readers with bleak visions of a potential future under the threat of growing AMR, while indicating that the public has the power to see that this future does not come to pass if they begin to pay attention to this danger.

Unlike traditional forms of risk communication like pamphlets, booklets and fact sheets, fiction's ability to dramatically visualize and emotionally evoke potential disasters makes it easier for the public to conceptualize the nature of a potential threat like AMR.

Fictional stories are not constrained or restricted by a requirement to create narratives based on what has happened, so fiction can make visible for the public scientific disasters that might materialise. Yet, a fictional story's ability to raise awareness for a potential health disaster like AMR greatly depends upon the plausibility and credibility of its fictional scenario. Not only does the science need to be authentic for these fictional stories to inspire the public to modify their behaviours, the actions of the characters and institutions in these stories also need to ring true for the readers. The fictional scenarios in these six short stories about AMR all feel as if they represent possible tomorrows because their scientific and narrative elements seem authentic.

These stories do an excellent job of placing the potential impacts of AMR into their various social, political and cultural contexts. The stories reveal the range of consequences that can result from unchecked AMR running from the global to the local to the personal. Their narratives show that global leaders will not be immune to the effects of rampant AMR while at the same time

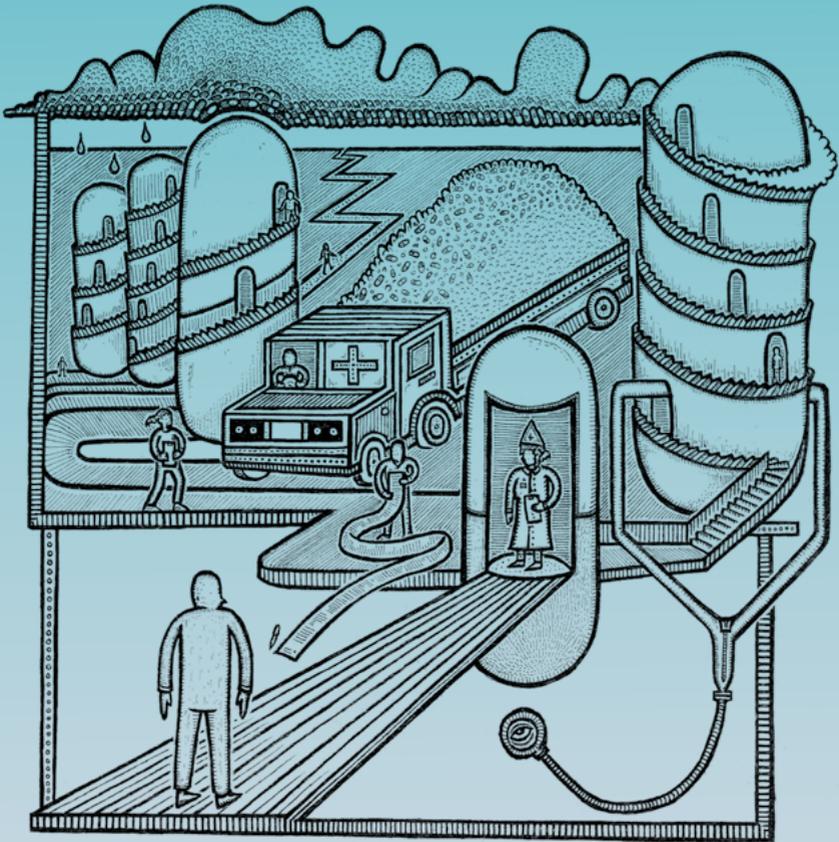
demonstrating how this health crisis will disproportionately impact the poor and disenfranchised. These stories convey individual patient's frustration with an impersonal health care system that will be made worse with the rise of AMR, but the stories also ask the reader to empathise with the health care professionals working in what is already an overburdened field. These six stories also depict the personal costs that come with an increase in AMR. The burdens of caring for perpetually sick loved ones will intensify in a world where antimicrobials are no longer effective, while the dangers of a world in which common infections may potentially kill you will severely limit our interactions with other people.

Ultimately, these stories succeed because they provide readers with an opportunity to become invested in recognisable characters who are struggling with the impacts of world in which uncontrolled AMR is no longer a possibility but represents a frightening reality.

David A. Kirby (University of Manchester)

Ayanda

A.S. Fields



IT WASN'T so much pain as a veld fire that would not go out. A never-ending slow burn. An attack. An onslaught. Like the mountains across the peninsula, which blackened at every change of season, Ayanda simmered in the heat of it.

It wasn't a new pain. Ayanda remembered, vaguely, an incident after a particularly energetic tryst at a music festival in the Karoo. That had been many years ago and all she could remember of the braided young man was his smile. The only late nights in her life now were at the agency. No music. Just deadlines.

She dispatched Anton to buy Citro-Soda at the chemist's, a concoction she had always believed her mother had used for indigestion. The internet insisted it would bring her relief.

It brought none.

Ayanda spent the night broiling in bed, getting up every half-hour to visit the bathroom. Anton sat up with her. *"Go to the doctor tomorrow. We should still have an account at the clinic. Promise me?"*

She promised.

Citro-Soda – sodium bicarbonate *urinary alkaliser used to alleviate the symptoms of urinary tract infection*

"There's blood and leukocytes in your urine," explained Doctor Pienaar as he read her results. *"So it's definitely a UTI. Have you been having unprotected sex lately?"*

Ayanda blushed. *"Not recently, a week, maybe two weeks ago. I am married,"* she added, to make it clear that she wasn't one of those girls who went around having unprotected sex for fun.

Dr Pienaar gave a quick twitch of the eyebrows and looked back at his notes. *"I'm prescribing an antibiotic called Utin. Take one after meals for two days and that should clear it up."*

"Thank you," she said, stuffing the script into her handbag. She already felt a little better after seeing the doctor. Mind over matter.

Utin-400 – norfloxacin *broad-spectrum antibiotic with antibacterial agent. Indicated for the treatment of upper and lower urinary tract infections including cystitis*

Stories of the post-antibiotic apocalypse

A week later the heat was back. A flash fire. Ayanda returned to the clinic before it consumed her.

Dr Pienaar was not overly concerned. *"Recurrences are not uncommon. The bugs are becoming more and more resistant to antibiotics. Have you had a UTI in the last few months?"*

She shook her head. *"Only once before. When I was younger."*

He nodded. *"I'll put you on a stronger course of antibiotics and we'll have your sample sent away to be cultured to see what we're dealing with. In the meantime I suggest you and your boyfriend..."*

"Husband."

"... husband, wear a condom. And when you use the toilet, try wiping towards the back to prevent the bacteria entering your system."

Ayanda blinked at the indignity of the conversation. She was not a child that needed to be told how to use the bathroom. She left without asking for a letter booking her off work.

She didn't mention her return visit to her husband, but took the antibiotic, a giant white capsule, which contained penicillin (a large orange sticker on the box informed her of this) and felt better within an hour.

Ayanda and Anton didn't celebrate their anniversary in their usual fashion and decided to go to bed early. She showered first, because her colleague Skye, a self-professed expert on feminine hygiene, assured her that bathing was a sure way to spread germs around. *"You're practically soaking in your own filth,"* she said.

Augmentin – amoxicillin/clavulanic acid *penicillin-based antibiotic used for fighting bacterial infection in the body*

Ayanda was working late on an outdoor banner advertising the thirtieth birthday of a car dealership when she felt a cloudy sensation near her navel. She excused herself and went to the bathroom. Instead of relief, she felt the same virulent pain as before. She stopped at the chemist's on the way home for cranberry tablets. The all-knowing Skye had explained that there was something in the berries that stopped bacteria from sticking to the urethral walls.

Cranberry *herbal supplement used as a preventative for urinary tract infections*

Life became a system of prevention. Hands were washed before going to the bathroom. Both parties showered before intimacy; to save time, this often took place in the shower. Ayanda even laid down tissue on the toilet seat in the office bathroom. It was so easy to believe that someone else's negligence was the incendiary, like an inconsiderate smoker throwing a stompie out of a car window and causing devastating mountain fires. If only she could educate them on hygiene. Perhaps she and Skye could team up. They were ad people after all. They could convince anyone of anything.

Despite her efforts for a germ-free existence, Ayanda returned to the doctor's office nearly every two months when the veld fires raged anew.

She would never see Dr Pienaar again. Instead, she regularly emptied her wallet for a private gynaecologist who had her office in one of the greener suburbs.

"You're doing everything right," said Doctor Goolam with her usual exuberance, *"although I'm surprised the cranberry tablets aren't working. I'm going to prescribe a urinary antiseptic that you can take every day."*

"Macrodantin?" asked Ayanda proudly. She had done some internet research on the subject.

"No. Not Macrodantin. That's been out of stock for months. I'll prescribe something else. What it's going to do is clear the bladder and make sure nothing stays behind."

"And do I take this with the antibiotic?" Ayanda asked.

"Until you finish the course. I think we'll stick to Augmentin this time, really make sure we obliterate that infection. There's no point prescribing any of those others anymore. This bug is clearly resistant."

"And the culture we sent away?"

"I'll get my receptionist to send you the results when the lab gets back to us, but I suspect this is a nasty little sucker. Don't worry. You're in the right hands."

After a few months Dr Goolam had deflated. *"Well I tried to fix you. And I don't like losing, I'll tell you that. I suggest you see a urologist, my dear. I have the name of a fantastic doctor I refer all my patients to."*

Puromylon – nalidixic acid antiseptic used in the treatment of chronic urinary tract infections

Dr Miller reminded Ayanda of the Hollywood plastic surgeons on DSTV, all white teeth and expensive open-collared shirts.

The urologist made a small circle with his thumb and finger. *"You're emptying your bladder fine. So what I think we're dealing with here is a narrow urethra. In some people the walls are very narrow, so instead of passing through with the urine stream the germs stay behind."*

Ayanda didn't think she would ever get used to her bodily functions being spoken of so casually. She adjusted her shawl and listened.

"I suggest a small procedure – completely safe, of course – where I dilate the urethra. There'll be some bleeding but you won't have any problems after that, I promise. I'm ninety-percent sure."

Ayanda swallowed dryly. *"Surgery?"*

He beamed her a West Coast smile. *"Next week good for you? I'll have my receptionist set it up."*

Urethral dilation *a common procedure to correct urethral stricture; the surgical widening of the urethra*

"Hospital?" asked Anton. *"But what's wrong with you?"*

Ayanda tried to explain how the narrowness of her urethra was causing all her agony. He scratched his head. *"Well, if it's going to make you better. Listen, I have to run. I'm assisting on a shoot tonight."* His camera bag was lying next to the door.

"Again? Are you going to be very late?"

"Depends," he said, shouldering the bag. *"A shoot ends when it ends."*

Ayanda nodded and watched her husband slip away into the night for the second time that week.

"You'll feel some pain when you go to the toilet. But this should pass with time. We had to use a catheter so there'll be some inflammation."

Ayanda blinked through the cloud of morphine floating in her veins. There was a woman sitting on the end of her bed. *"Who are you? Where's Dr Miller?"*

The woman smiled. *"I'm Dr Reed. I was your anaesthetist. Dr Miller was called away to an emergency."*

Ayanda laughed. *"A bladder emergency. Yeah right. Can you tell me if the procedure was successful, then?"*

"Oh yes, everything was fine. Give Dr Miller a call in the week. I'm sure he wants to talk to you."

"Of course he does," said Ayanda bitterly before sinking down into bliss. A nurse appeared to let her know that they had contacted Anton to collect her. Did she need to go to the toilet?

Ayanda booked a self-catering cottage in the mountains. She told herself it was for her recovery, but really she wanted Anton to just stop leaving on pointless errands and shoots. While her husband hiked among the fynbos and took long invigorating swims in the springs, Ayanda lay in bed and read. She had brought her own bedding in case she picked up anything from the resort sheets. She also brought along a bottle of Handy-Andy to wash the toilet before she used it. Her mobility wasn't great, but she was able to join Anton for walks in the evenings to look at the millions of stars in the clear sky. They kissed, but took it no further.

"Soon," she said. *"A week or two, I promise."*

"I hope so."

On the eve of Valentine's Day, Ayanda felt a familiar cloudiness in her groin and rushed to the kitchen to drink a few glasses of water, two cranberry tablets and a Macrochantin; it had come back into stock, although numbers were limited due to demand. By lunch-time she was in pain again.

Dr Goolam was fully booked, so Ayanda found herself back under the disapproving gaze of Dr Pienaar.

"There's blood in your urine, but no leukocytes. I'm hesitant to prescribe another course of antibiotics if there isn't infection. You've been taking Augmentin quite regularly, I see. If you become resistant to this, then there's nothing else we can do for you."

"But the pain is unbearable. Can't the Macrochantin and the cranberry tablets have affected the test? This feels like every other infection I've had before."

"I don't know. I'm going to give you an anti-spasmodic. If that doesn't work I suggest you go back to the urologist. He'll be able to tell you where the blood is coming from."

Ayanda tore the prescription from his hand, hating herself for returning to this uncaring man. He was only interested in the money she paid to see him.

The anti-spasmodic was, unsurprisingly, ineffective.

On the couch, clutching a hot water bottle, Ayanda decided she didn't ever want to see another doctor.

Anton was out again: something about a party to thank the crew for all the recent shoots. She was too ill to go.

Stories of the post-antibiotic apocalypse

She pulled herself together for their Valentine's Day date at her favourite restaurant near the harbour. She wasn't well, and short-tempered from the pain. He was distracted, unhappy.

Spasmend – mephenesin-paracetamol *antispasmodic used for the treatment of an overactive bladder*

At home, reeling from the slammed door still echoing in the flat, Ayanda tore into the medicine drawer, discarding the cranberry pills and anti-spasmodics and antiseptics and the antifungals and the emergency antibiotics she had managed to score from the chemist after he'd mistakenly given her prescription back.

This was not life. She was a human, not kindling for fires that refused to go out. She would not accept a future shackled by the fear of pain.

And she refused to believe her and Anton's relationship could be so affected by her illness. Because of microscopic organisms. Because of pain.

No.

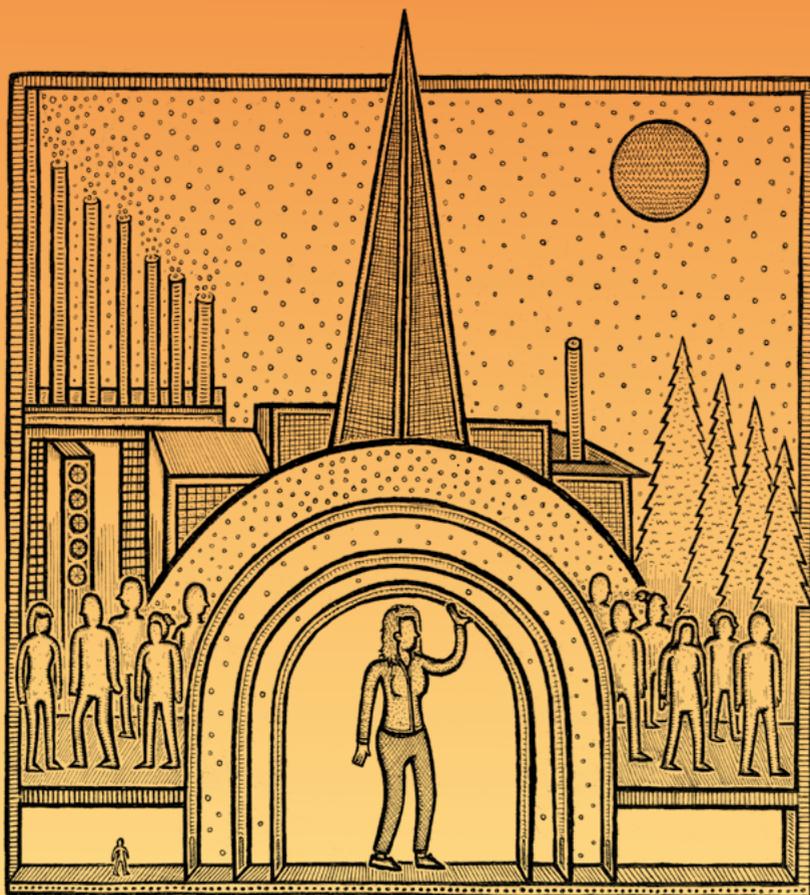
She had to believe it.

It just was not meant to be.

A.S. Fields is an author and short story writer from Cape Town, South Africa

Transmission

Tim Maughan



THE LINES snake out of the station and up Electric Avenue, so that everybody has to step over the bodies in the street, not knowing if they're dead or just sleeping, and whether that's urine or sick or blood that's matted their cardboard mattresses to the pavement. Mia's been here since before eight, easily, and the itch is getting to her, all around her neck and up past her ears to her scalp as she watches people pass – *God knows what they might be carrying* – but she can't scratch it because even with her gloves on she might break the 2ndSkin. Instead she clenches her teeth behind the breather, inhales that stale smell of rubber and the sickly, chemically menthol-perfumed antiseptic spray she used to wash it out this morning, and waits, wishing she was indoors. Always wishing she was indoors.

It's stupid hot today, of course. Too stupid hot to be stood around on Electric Avenue in a 2ndSkin stepping over might-be-dead homeless guys and waiting for a train, when she could be sat inside in front of an electric fan, drinking liquid ibuprofen and hoping it doesn't make her too constipated. She laughs silently to herself. Last day she'll have to worry about that.

They're splitting the lines into two at the bottom of the stairs. She gets pulled out into the second, much faster line straight away, before anybody even asks to see her paperwork, just cos she's wearing the 2ndSkin and breather. Her line's faster because, well, it's Brixton. Not many people round here with green clearance and money for fresh skins. Correction: not many people round here with green clearance and money for fresh skins *who need to leave the house regularly*. Plenty round here with money, but they all got jobs where they work from home, get their kids homeschooled by bots and MOOCs, have their food delivered, and can probably print most other stuff they need.

She remembers her time in the other line, trudging out to the Amazon warehouse in Slough, where they'd strap her into a bulky hazmat suit before they'd let her fulfil any orders for the nice, clean homeworkers. Even though she had legit green status. Fully legit. Nervously, with gloved fingers, she grasps the medical clearance card in her hoody pocket.

She's never got her head round the hypocritical logic of the checkpoints. Over in the other line the commuters are being made to take off their flimsy,

greying paper face-masks, along with anything else they've wrapped around their heads, hoping for protection: scarves, bandages. This one guy is wearing some cracked old plastic swimming goggles. Off it all comes, just so the checkpoint cameras can have a look at their faces, and the NHS networks can track where everyone goes and can build their pretty, precious, pointless infection-spread models.

At the same time, here in her quick-moving queue, everyone is just getting waved through, even though their faces are completely unscannable, utterly hidden from any human or machine sight by the hermetically sealed 2ndSkin and the breather. Taking them off outside of home, breaking the seal – especially down here in this germ-pit of a tube station – would defeat the point of wearing them in the first place, so wearing one is enough that the rules do not to apply to you. Plus of course, anyone who can afford them just has to be clean anyway.

Butterflies in her stomach. She fumbles the green clearance card out of her pocket, nearly drops it, holds it up, but the TFL worker on the checkpoint barely glances at it through the scuffed plexiglass of his hazmat suit as he waves her through.

Stockwell, 9.35 am

The ride to Stockwell from Brixton used to take eight minutes, tops, her mum always tells her. Apparently it was still that quick when she was a kid. This morning it's been at least half an hour, the train constantly stopping and starting in the tunnel, automated voices telling them it's because of congestion on the line ahead. Transport for London apologises for delays to your journey, this is due to NHS medical safety checkpoints. For everyone's benefit always remember to carry your medical clearance card. Help Transport for London avoid infection snarl. Travelling without proper medical status paperwork is a crime.

The announcements seem extra clinical, extra loud in the motionless surreality of the near-empty green clearance carriage. No bodies to soak up the sound. The only passengers in here are half a dozen 2ndSkin wearers, sitting silently like posed, faceless mannequins in this season's designer fashions, unseen eyes gazing at tablets and phones sealed airtight in ziplock bags.

Mia has no screen to stare at, no notifications to check. Her phone stays in her pocket, naked and unprotected. Instead she sees her kitchen at home, the testing kit on the table, the envelope full of documents, the money, Paul

sobbing quietly in his hazmat suit, his gloved hand in hers. She hears herself calming him down; he wants to rip the suit off, to be naked with her.

—*Are you sure you really want to do this?*

nodding

—*We always said we would, right? When the time came?*

At Stockwell the doors slide open; she steps on to the platform. The other carriages, amber and red, remain closed until the green-and-cleared have disembarked. Dishevelled figures in paper face-masks and scarves, sardined inside, stare out. She glances away, vague, confused, guilty.

The tunnel leading to the Northern Line platform is full of people. Her first skin crawls. More checkpoints, more bullshit. Above her head a tiny quadcopter drone buzzes, spraying the crowd with paranoid antiseptic mist.

—*We always said we would, right? When the time came?*

She feels a tear she can't wipe away seep between two skins.

Elephant & Castle, 10.15 am

All this stopping/starting: she knows something's up, that the train shouldn't be waiting here this long.

The doors slide open again. This time two cops, all black armoured hazmat suits and SA-80 assault rifles, are standing on the platform. From somewhere behind them come muffled screams, sobbing. They order everyone out of the carriage in crackly amplified voices, saying nothing more than there's a problem with the train.

Waiting on the platform, she glances into the next carriage – amber clearance – just as the doors are closing. She sees a body splayed out on the floor, face down in a slowly growing pool of dark liquid.

Then the train, empty but for its lone passenger, slides away.

When the next one comes, God knows how many minutes later, it's packed. The doors in front of her slide open: red clearance. One of the cops tells her and the three other 2ndSkin-wearers she's been waiting with to get on. Indignant, outraged protest from blank mannequin faces. Arguing. Shoving. *Just get on and shut up.* Mia steps into the carriage, almost losing her balance as the cop pushes a complainer in. He's not happy, hammering at the now-closed doors. The women he's with are sobbing, as through smeared windows the platform slips away.

Mia keeps her head down, trying to ignore the gazes of the amber-cleared commuters, most of their eyes still visible through whatever they've wrapped round and over their heads: torn surgical masks, headscarves,

baseball caps, hoods. Even though she knows they can't see her face, she can feel their eyes. She grasps a handrail that makes her hand burn and itch, even through her gloves. She tries not to imagine whose hands have been there before, as she steadies herself against the train's shuddering.

Two more stops just two more stops

London Bridge, 10.50 am

Mia emerges into daylight, squinting through the thin 2ndSkin membrane, and fights the urge to rip off the breather and taste the air. From here the Shard doesn't so much dominate the skyline as consume it, like a giant blade has slit open the sky to reveal secret steel and glass scaffolding holding reality together.

She gets in easier and quicker than she feared. There are no lines, nobody queuing to leave or enter this hermetically sealed vertical city-within-a-city. The security here, in ornate uniforms, at least look at her clearance card and resident's pass, but they say nothing, not once questioning her authenticity. Instead they smile and motion for her to step through the body scanner. She's not carrying the kind of weapons it's looking for, and triggers nothing but green lights and soft chimes, and the guards smile again, call her by a name that isn't hers, and wish her a good day.

Through the revolving airlock and into the pristine, infection-free foyer. A sterile oasis within the city of plagues. Apart from a few residents leaving or entering, nobody wears a 2ndSkin here, safe to dress as they wish in their sanitised bubble world. Mia keeps hers on, avoiding uncaring gazes again, guilt and fear replaced this time by anger and hatred.

By the lifts she waits, awkward and self-conscious, until she can have a car to herself. She thumbs the button for the restaurant and shops level: thirty-second floor. Time to hit the brunch rush.

As the lift gently but quickly rises, she takes her phone from her pocket and affixes it to a mirrored wall. Softly, muffled by the breather, she tells it to start streaming, and begins to undress.

By the twelfth floor her hoody has come off and lies by her feet on the floor. By the sixteenth her jeans have joined it. She's removed her shoes by the twenty-first.

Between twenty-three and twenty-four she takes the breather from her mouth, and takes in lungfuls of pristine, perfumed air with a desperate relief. She coughs grey mucous spatter on the mirror, narrowly missing the phone's lens.

Stories of the post-antibiotic apocalypse

At the twenty-sixth floor she starts to rip away the 2ndSkin, starting from her head and working her way down. She tears at it slowly at first, exposing fever-damp patches of freshly shaved scalp, but then the impatience and the frustration and the fear and the hatred all get too much for her and she yells, ripping the artificial membrane away in cathartic self-violence.

By the twenty-eighth floor she stands naked in front of the mirror.

Her skin is an alien landscape, even to her: death-pale deserts split apart by the volcanic flows of engorged blood vessels. Matrices of rash, and cracked, flaking flesh spread across her chest and back like the shattered maps of dead cities. Her limbs swell and seep with unhealed bruising and infected abrasions.

For the last time, she resists the temptation to scratch, a twisted pride and anger holding back fingers that want to rip away this skin, too.

At the thirtieth floor she looks into the camera lens and speaks.

—My name is Mia Andrews. I speak for the poor and forgotten of London. I am here to represent the thousands of us that will die in this city today. I bring our suffering, our pain, our infections to those who have forsaken us. I bring our disease and our pain and our death to share with those who have sealed themselves away. I bring equality.

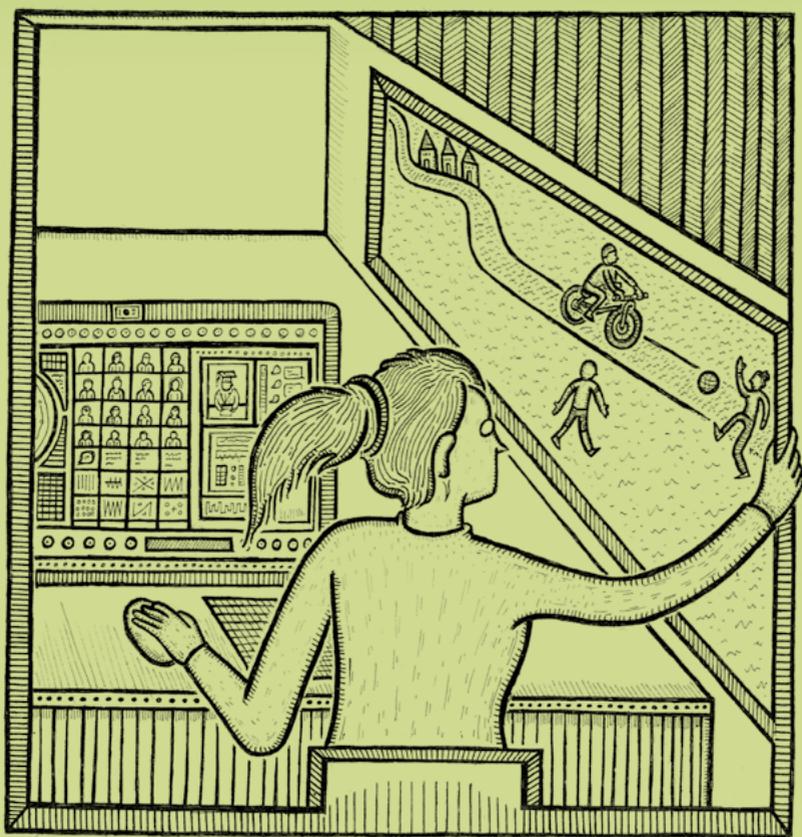
At the thirty-second floor the lift chimes, Mia turns, the doors slide open, and the crowds outside start to scream.

Tim Maughan is a British writer currently based in Brooklyn, using both fiction and non-fiction to explore issues around cities, art, class, and technology. His debut short story collection *Paintwork* received critical acclaim when released in 2011, and his story *Limited Edition* was shortlisted for the 2012 BSFA short fiction award. His non-fiction work regularly appears in a number of places, including the BBC and *New Scientist*, and he has recently given talks at Princeton School of Architecture, HASTAC in Lima, Lambeth Council in London, and Sonic Acts in Amsterdam. He sometimes makes films, too.

You can find him at timmaughanbooks.com

They Want to Live Too

Jenni Hill



SHE FOUND the girl in the attic. Her name was Ruby.

Gran had asked Yuki to put some of dad's books into storage upstairs. They needed the space, now that Yuki was getting taller, and Gran had to rely on her walking cane more and more.

The attic was full of fascinating things. Mum's clothes, the floral smell and soft feel of them the closest she had ever felt to the woman who died bringing her into the world. A dust-covered tent, deck chairs and camping stove promised holidays Yuki would never go on. Hockey sticks, footballs, rainbow-painted roller-skates: these had been consigned to the attic for being too dangerous for little girls to play with, even though some of the kids from the estate played football outside her window now and then – kids Gran disapproved of. Dad's old bike was there too, forbidden for the same reason. It was too easy to take a fall, open a wound.

Once, when she was very young, Yuki had asked Gran why everything seemed so much more dangerous now than it clearly used to be. She hadn't yet been taught in school about the Antibiotics Crisis, but the ease with which children in old stories recovered from illness, and the careless way they played, seemed to suggest something was amiss. Gran explained that bacteria, these tiny wriggly creatures that caused infections, too small for the eye to see, had once been fought with antibiotics. But the medicines had been used too much, or too recklessly (Yuki wasn't sure she understood that part) and the infections had evolved. With each new strain of antibiotics, the infections had changed too.

"Why do they do that?" she'd asked, imagining these tiny organisms growing extra heads, or new limbs, to fight off human medicine.

Gran looked thoughtful. *"I suppose they want to live too, as much as we do."*

She had climbed on the bike in the attic, experimentally, a few years ago. The way it wobbled had knocked over a box of cutlery, the clatter bringing Gran, suffering from arthritis even then, following her up the ladder. The scolding had lasted for a week. Gran had taken away her gaming password for the same length of time, but Yuki remembered thinking that playing Night-Rider 3000 on-line didn't quite compare to the feeling when her feet had left the floor to rest on those turning pedals.

Yuki was not allowed to bring the footballs, roller-skates or bike down from the attic, but this time she was allowed to bring down an ancient, battered PC computer. Yuki spotted it under a pair of curtains, thinking it looked cool in a clunky, retro sort of way, and begged Gran to let her

restore it. Gran had no objections to an activity that Yuki could pursue in her room, and which might help her get ahead in Tech Studies.

If Yuki hadn't seen the PC there under the moth-eaten fabric, she might never have met Ruby.

She told Becca and Matt about the PC during class. 'Class' took place in Yuki's bedroom, where she logged in remotely to the expensive private academy that Dad's life insurance paid for. The teacher, droning away on the screen above their chat log, had turned off chat during lessons, but the latest version of the software had been hacked by a girl in Class Five and the whole school now had a jailbroken copy.

Yuki ducked off webcam for a moment and snapped a picture for Becca and Matt of the PC lying on her cartoon bedspread, grey and inert. Matt typed "Awesome!" and Becca sent a link to a podcast called Restore/Recycle. After they'd all logged out of school that night, Matt and Becky watched on their webcams as she took the PC apart, and they looked up replacement parts for her on auction sites, which she bought and paid for with pocket money.

The final part she ordered, an old-fashioned LED screen, was too big to fit into the front door grocery hatch. Gran kept a close watch on her when she opened the door to the masked delivery man, and Yuki wished she didn't know why. She thanked him, closed the door, and wiped the parcel down with anti-bacterials. She thought about Dad and that last, fateful time he had opened this door.

They'd worn masks too; she remembered that much. Impersonating delivery men, who, like rubbish men and doctors, wore white surgical masks for the brave work of going door-to-door. Those masks had also helped protect their identity. They were never caught.

Yuki remembered how they'd plucked her right from her dad's arms. One holding Dad back, one bundling her toward the van. Dad knocked the first man to the ground, where he cracked his head on the bricks laid about the front garden. The other pulled out a gun. Gunshot wounds were usually lethal even pre-Crisis. Now they were a death sentence.

There'd been so much blood. The men must have panicked, because they'd left her there crying next to Dad, the blood soaking through his white T shirt, red as the pansies in the flower beds.

She remembered that clearly. Though she'd been only a few years old, she hoped she'd have remembered Dad too. Hoped she would have remembered her real father, if those men had sold her to another set of parents – a couple too scared and too rich to go through the risk of a

biological pregnancy to expand their family, or who had perhaps lost a baby or two to disease.

Older children weren't as prized by childsnatchers, but Gran still looked relieved after she closed the door.

Yuki took the LED screen to her room and connected the power. It was weird, seeing the screen boot up in 2D, no wall-holograms, touchscreen or motion-recognition to be seen.

She actually found it quite dull, until she found Ruby. The machine was slow, it kept trying to install anti-virus software and system updates that weren't there, and most of the files on it were boring: old spreadsheets she could make neither head nor tail of, homework, timetables, software instruction manuals...

Then she found Ruby Yang.

Ruby was beautiful. Ruby was funny. Ruby had been something called a video blogger.

Ruby's blogging was saved to the hard drive, and there were videos about fashion, netball, make-up tips, videos of her shopping with her friends and playing football in muddy white trainers with boys at the park. Even something called parkour, which Yuki researched and which sounded incredibly, foolishly dangerous. But fun.

Ruby was, Yuki decided almost instantly, absolutely perfect. She didn't fancy Ruby, it wasn't that. (Yuki was twelve, and had not yet decided whether she liked girls or boys or both; and if she did like girls, she thought she would like them like the tall and red-haired Katherine in Class Six, not Ruby.) But Ruby's laugh and her voice and her energy showed Yuki something she wanted. She wanted to be Ruby.

She ordered some cherry red lipstick, like Ruby wore, and slicked it on for school the day it arrived. Almost immediately after logging in she got told off for wearing make-up to class, and had to run past Gran to the bathroom to wipe it all off.

When she got back, she saw a message from Becca saying how great it had looked, so she sent her one of Ruby's video files in reply. Becca shared it with Matt, typing out a transcript of the words in the video; like four other kids in their class, Matt had been rendered deaf by a childhood ear infection.

The next day, Becca was wearing lipstick and Matt pulled up his sleeve to show a bird tattoo, in imitation of Ruby. Nobody, even adults, risked tattoos anymore, so Matt must have used ink or a temporary tattoo, it was

hard to tell on camera. Yuki shared more videos with them, and when others in maths class asked about Matt's tattoo, he shared the videos with them. Everyone loved them. The video of Ruby with her shiny red bike – where she had attached a GoPro camera to her head and zoomed down a massive hill in the park – was a particular favourite.

That week, older kids, even red-haired Katherine in Class Six, were messaging Yuki about Ruby. She found more and more videos on the old PC, and shared them with the school. She felt so popular, pleased to be sharing Ruby with the world. She wondered if Ruby had ever shared her videos, but if she had they must have been taken down, as she couldn't find them anywhere on-line.

Later that week, Yuki asked Gran about Dad's bike again. It was green, not red like Ruby's, and it didn't have a basket with three yellow daisies on the front, but Yuki still thought it was pretty fine. One video on Dad's bike and she'd be the envy of everyone.

Gran said no.

When the entire class were wearing red lipstick, even one or two of the boys, the teachers mostly gave up complaining.

Ruby's videos had struck a chord with the school. Becca, who was good with words and did well in English class, said it must be Ruby's exuberance, her sense of adventure, the way she seemed to embody something missing from their lives. Becca also used the phrase *joie de vivre*, which Yuki secretly thought was pretentious, and had to look up.

As fine as it would have been to make a video on Dad's bike, someone else got there first. People were making and sharing their own Ruby-like videos. She even saw one boy from her school go past her window on a bike he'd found from somewhere. It had a basket with three improvised paper daisies on it.

One evening, after another argument about Dad's bike, Gran and Yuki were unpacking groceries in stony silence – antibacterial soap, anti-bacterial washing up liquid, vitamin D supplements, vegetables double-wrapped in plastic, and meat with strict cooking instructions (HEAT TO 95°C OR HIGHER TO KILL BACTERIA) emblazoned in red lettering across the packaging – when she caught Gran looking at her thoughtfully.

"I used to wear my hair like that, you know." Yuki had plaited her long black hair around her crown, as Ruby did with her own black hair. Yuki felt lucky to have hair the same colour as Ruby. *"Funny how fashions come and go."*

"What else did you used to wear?"

"Oh, you know. Lots of denim. Short skirts. Huge earphones, like you wouldn't believe!" Gran held her fists to her ears in imitation, and Yuki giggled. *"We had the small ones back then, of course, but the bigger ones were fashionable, so we wore them."* After their quarrel, Gran seemed relieved to have found a neutral subject for conversation.

Once they had eaten dinner and Yuki was upstairs, ostensibly doing her homework, Gran knocked on her door. She came in with a mug of hot chocolate for Yuki and a plastic jewellery box.

"I brought you some of my old things, I thought you might like to see—"

Gran stopped suddenly, staring at the images projected on the wall screens. Yuki had been checking out the fansite Matt had made for Ruby's videos.

Multiple moving images of Ruby looked back at them both from the bedroom walls, smiling, running, playing outside and laughing, always laughing, the sunlight shining in her hair.

Gran dropped the hot chocolate. She dropped the jewellery box too — a stick of cherry red lipstick rolled across the floor towards Yuki.

Gran was crying.

"We'll get you on that bike," she promised.

The two of them restored the bike, removing rust and oiling the brakes until Gran was sure it was safe. As safe as it was ever going to be. Though Yuki had no idea how to ride, enough kids in the area were now out on their own restored bicycles, and happy to teach her.

As a vlogger, Gran had made up the name 'Ruby' because it sounded glamorous. (Yuki agreed.) She'd used her maiden name, Yang, and her granddaughter had never suspected that Gran could be the same person her peers were turning into a reborn idol, not until her tearful confession that night, as they'd mopped up hot chocolate on Yuki's bedroom floor.

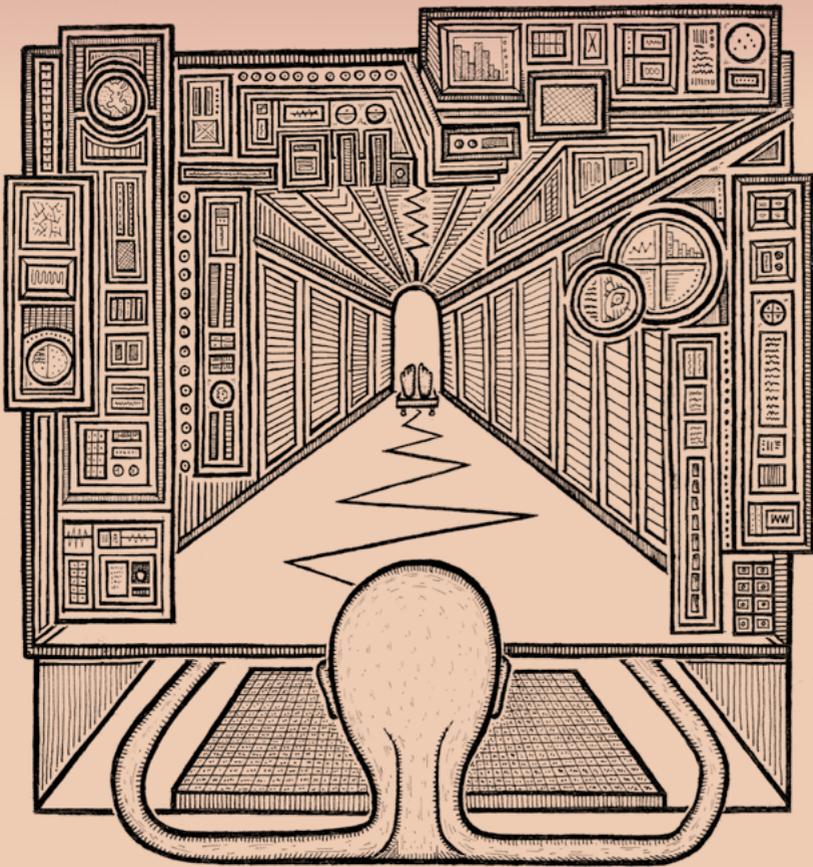
Dad's green spray paint wouldn't come off the once-red bike, but Yuki liked the reminder that he'd ridden it too.

Yuki never told anyone about Ruby's true identity, even when Gran found the basket with the three yellow daisies and strapped it proudly to the handlebars. As Yuki shakily pedalled unassisted for the first time, she looked back to see Gran waving proudly from the door.

Jenni Hill is an author and science fiction editor from London. She has published many short stories and is working on a fantasy novel. She lives in a house filled with too many books.

Causes

Lydia Nicholas



CORRIDORS FALL into the distance, to the left and to the right of you. Smooth white floors curve into smooth white walls curve into bright white ceilings and unbroken strips of white light, dimmed in mockery of the night. The strip-lit hall leaves no dark angles for any dirt to stick to or exhausted gaze to rest on. By about four a.m., your aching brain can't hold on any longer to the corridor's shape. It splits into polygons of white-greys and grey-whites that spin and morph in bland, repeating patterns, like a middle-manager's kaleidoscope. The pieces spin and come together into other forms, other corridors.

Fighting nausea, you slump back in your smooth, white chair. There's no grip or give in the wipe-clean white plastic ice-cream scoop of a seat. Your bum shoots forward and the back of your skull slams against the rim of the backrest. Ow. Dig your heels in and push yourself back up before you're seen slumped like a fool. A great image this would be to get out. Nationalist and Progressive extremists finally unite in common cause against the idiot woman left watching hospital halls for them who can't even use a chair. You could be a meme.

You peer around for photographers, spy drones, anything.

Nothing.

Looking over your shoulder, through the soundproofed, frosted glass wall, you see the blurred, incomprehensible bustling of white coats and medical equipment.

Keeping an eye out: that's your only job tonight. And it's a job rendered irrelevant by the security staff on every hospital entrance, the scanners and beepers on every person and system throughout the palace complex. All the other comms staff will be on the net where they are actually useful, monitoring and manipulating rumours. Who did this? Why? Was it Nationalist terrorists shrieking for closed borders and quarantines, raging against the prince's foreign wife? Was it Progressives demanding the opening of everything for all, never mind the cost and contagion? Or foreign agents, religious extremists, corporate interests, individual attention-seekers? Who slipped a contagion past the palace quarantine? Comms will be playing the news-wires like a string band. That is where you belong. You can't even get Twitter here.

But an heir to the throne, even an unconscious one, must have his attendants. This long night must surely be a hazing thing – a dull, head pounding, hallucinatory threshold to your new life. Maybe your new colleagues each have their own nightmares of twenty-hour stints spent in these corridors. Hours left clueless about how serious this particular attack on His Highnesses' body might be. Hours spent wondering how many rounds of what exhausting, speculative treatments, how many hours or days of waiting, how much chopping and cauterising the royal flesh will take before the crisis is passed. You remember another long wait in another long, white corridor. For an instant those crowds – the screaming children and the shouting, shoving queues – smear the wipe-clean halls with old terror. You hear the ghost of a quiet, ceaseless cough.

Blink. Breathe. There is only silence here.

The first thing they do, once they've shown you the toilets and cafeteria and living quarters – which comes after the shaving and dousing and burning, which comes after the month-long quarantine with its endless swabs and petri-dish smears, which comes after the interviews, the background searches, the Q&A sessions spent in EEGs and MRIs and fitted with GSR bands – the first thing they do once you've reached your desk, and it's all become actually, really, real, is they hand you a fresh new phone that's already ringing.

You answer. *"Hello,"* you say, pitched carefully for the mentor in front of you, and any interested new cubicle-mates. You use an accent your mother would have sneered at – a recognisable regional tint to the vowels to indicate pride and sincerity; consonants clear as crystal. K-lear, K-rys-tal, to hint at years in the right schools. They can tell it's a cover, of course, of course. But perhaps they don't know you know they know.

He answers. Actually him. Him himself. *"Good afternoon and welcome to the palace. I trust the introduction processes passed without complication, and your accommodation is satisfactory."*

Your turn. You feel every molecule of breeze flowing over your freshly buzz-cut scalp. *"Yes, everything is great"*. No, that isn't right. You can't speak to the third-in-line-to-the-throne in monosyllables. *"Exceptional. The accommodation is exceptional. I am of course most excited about those facilities which will permit me to use and develop my skills in order to meet the challenges of this new role."*

It ends soon. An invitation to the new starters' tea on the lawns. The family will be there. The. Family. Him. Her. Them. A colleague lets you know

that you can take out a loan against your first pay to purchase suitable attire. “Attire”, wow, you’ve only ever owned “clothes” before.

Them, though. Him. Her: the brilliant Indonesian human-rights-lawyer wife, and the children whose mixed ethnicity features in about half the death threats you had to sort and tag in the early rounds of interviews. You think it will be strange to meet people in the flesh after you’ve read so many descriptions of the ways they’ll die.

When you work, you feel like a surgeon, palpating the swollen mass of social media’s rage. With sensitive algorithms, you test and categorise the swelling, and identify those pustules just about to burst. You’re there to trace the root cause of the trauma.

This cluster of interconnections looks like private-clinic profiteers are engineering a “grass-roots” protest to the opening of a new hospital. That surge, related to an outbreak of gastroenteritis in Liverpool – the families’ howls of grief and rage echo each other a little too closely. So: triangulate the location of relatives’ deaths, the threateners’ addresses and social networks. Identify the locations the activist most likely used to hand out the pamphlet. Reconstruct elements of its likely contents. Recommend which camera-feeds to pull. They’d been impressed with that one. A thousand applicants for every opening here and you made it. You actually made it.

Those first few days, you thrilled at the work, grappling with models and tools better than any you got to play with outside. Your cubicle neighbour made obscure jokes about structuring database queries and you laughed, you really laughed, and no one glared or snarled for an explanation. You leant back from your second-floor desk, sipping the best coffee of your life, and watched through a real open window, feeling the unfiltered breeze, as staff flowed past below.

Of course there are patterns to see there, too. The old guard press in close, valuing privacy, flaunting their confidence in the palace’s clean system with touches and whispers. Newer staff back away, unconsciously attempting to maintain the wider personal space they learned to acquire outside – the cough’s distance enforced in all nurseries. Old and new staff attempting conversation slide backwards in an unconscious comedy of mismatched manners. Lean in, step back, lean in, step back... and pirouette, and – tap.

You sipped extraordinary espresso and watched the strange palace dance. You are the very newest of the staff here, but you are skilled at spotting and following subtle rules. You are used to mimicry, observing the flow from the outside. “*Little changeling*”, your mother called you, from childhood, for the dark hair and eyes which set you apart from your sisters. The name stuck, though the tone she used changed over the years.

Blink.

Someone is running up the right-hand corridor. You've been awake over twenty hours and the wipe-clean corridor is so featureless that, for a long moment, you have the horrendous sensation that the white-coated man with a suitcase handcuffed to his wrist is running on the spot and growing, bulging in spurts, filling your field of vision. This image is familiar. You think you know the message he is bringing and you don't want to hear it, you don't, you don't.

But then you are standing up and have got yourself together: *"ID?"*

He rolls his eyes and fumbles one-handed to a lanyard. The ID card dances with fraud-resistant holograms. His hand is shaking as he holds it out to scan. Exhausted.

You smile. *"Any clues as to who's behind it?"*

"You think they'd tell me?"

"I haven't seen anyone or heard any news in hours. Come on, I'm a comms tech. Radio silence is killing me. What are they saying?"

The glass wall is slowly sliding back to reveal an airlock. He steps through as soon as the crack is wide enough. *"Official line is still exhaustion. Outside, I don't know. There's a lot of noise. I'm not much of a news person."*

This is impossible for you to understand, as though the man had denied he breathed oxygen. He sees it in your face. *"So there's a whole thing about it being an inside job, he's getting too political, the princess treading on too many important toes. The Progs are acting outrage—"*

The glass screen slides back into place; the silence is instant. You see a helpless, exaggerated shrug through the frosted glass. Inside job? Damn it, comms must be on fire. The urge to swipe open your news feeds is physically painful. The filters you would run! Oh, the material you could scrape concerning, the factions' accusations, categorised by place, affiliation... Those are publishable papers, right there, and all of it slipping away while you sit here, helpless. You lean back in your seat – cautiously – and stare at the ceiling lights until their white spots dance in your eyes.

Blink. Breathe.

You've had only a week to enjoy your new living quarters. A small, single room. A bathroom with the strict washing routine and symptom-reporting regulations printed directly onto one smooth wall. On the other hand, there are those bright prints you chose, fabrics and rugs, and a window looking

onto the complex's private park where children play. If you do well, there are larger rooms, apartments, secondments in other comms teams and other complexes. You will do well.

A small set of trinkets on your desk. The wobbly clay elephant your younger sister made for you when you first left the city to study. Its four feet refuse to touch the ground together, and it trembles at the slightest disturbance – your movement, the building's, the city's. Sometimes you hover your hand over it and feel it thrum with something like life. A mechanical clock from your mother; its tick is a comfort, its cautiously classic design a reminder of the gulf across which the two of you tried to connect. A fluffy bear from your older sister feels strange to the touch after its cavity search on the way through quarantine. The last photo of you and your sisters as a three, together.

Your mother smashed the frame of the copy you gave her when you said you were leaving. Why don't you think about anyone else? Why don't you think about what she's already lost? (Your older sister fed her son in silence.) You explained – what? That you really believed in the royal couple's campaigns for more and better hospitals; for better care, even in losing battles? That you wanted an end to those isolation 'wards' – the cells stacked three-high in long rooms they won't let you see, even if you're family, even if you push past the doctors, howling, and get a glimpse of endless honeycomb doors before the floor turns beneath you and you fall into security's arms.

You mother curled her lip at the idea. That you, of all people, would accept as truth a story that made some sense of it all! A romantic story of a quiet prince courting a brilliant, radical lawyer across a political carousel of fundraisers and awards and debates, and on into the centre of these burning, populist causes! That you, of all people, had found a place for yourself in that story!

Or did you explain that you were good at what you did? That you could do good with that story, do good in that story, spin though it might be? Or did you just say that you're ambitious? What is wrong with being ambitious? Yes you wanted more, what on Earth is wrong with that?

Don't come back, she said. I don't intend to, you said.

Blink. Breathe.

You stare at the ceiling. Nothing so complete as an idea emerges. Half-made theories. Factions and motives and means go spinning through your mind. Pointless.

Your nephew – you'll send him something from the elegant palace complex shops when this is over. An educational toy your mother and sister won't deny him, even coming from you. Or you could set up an emergency medical fund for him. They can't object to that. Maybe they'll let him send you a note.

The frosted glass wall slides back. You jump to your feet. A woman pops out of the crack, a cork from champagne, fleeing down the hall.

"Hey—"

She keeps running. You barely saw her face – were those tears?

"Let her go." You see a man in the airlock. "We buzzed head office the details, but they always want direct confirmation."

"You identified it? You know who did it?" You've been thinking. "Was it Progs framing Nationalists? They know there's enough sympathy for the family right now that any attack will come over as crude, and they've got some skilled tacticians in the youth wing. I can see them going for that angle." He looks at you strangely: you've misread something. "Not a big player? Some lone nutter got slow-acting spores on a gift for the five-year-old's birthday party? Awful, but it'll play well." You are so tired. You can't parse his silence. "Just tell me, why they—"

"You don't understand. That doesn't matter."

"Of course it matters."

The man explodes. "You think you have a job chasing conspiracies any more, you idiot? He's dead."

The world slips gently out of its orbit; a slipped digit, a shift in weight. The taut equation that held it on course for so long degrades into an inexorable death spiral.

"Just a stubbed toe, and staph cellulitis, and then sepsis. We can't even find the break in the skin. Under the nail, we think. If there is a break. We don't know." He looks around, as if he can see what you can: that the corridor is flying apart in bright white shards, falling into the sky. Quieter, staring at his hands: "We don't know."

Someone is sobbing. Something is broken. You wrench at the space, try to force it back into the right place, the right time. When you bring the pieces together, you find that it is you.

Lydia Nicholas is an anthropologist focused on biotechnology, medical and digital culture who draws on narratives and design as research methods. She works in Nesta's Collective Intelligence team

Sting

Madeline Ashby



“YOU’RE FAT,” his mother said. She was wearing her pink tweed suit today, with a giant set of Thatcher pearls. “You’re just as fat and sad as your dad was, at the end.”

“You should have told us, before you went on your trip,” his physician said. His physician had yet to meet his eye. Had she ever looked Gregor in the eye, though? Really, in all the years she’d been Gregor’s doctor, had that ever happened? *“Mosquitos, you know. We would have warned you.”*

He’d felt it. The mosquito bite. It wasn’t a bite so much as a sting, though, a needle sliding down past barriers of sweat and sunblock and dermis to get at the sweet nectar blushing up underneath. He felt it and it was like all stings, like getting picked last at a game, like showing up late for an interview, like watching his ex-wife announce her engagement to another man to her gaggle of online *“friends”*.

“How could you do this?” his mother asked. *“How could you let this happen? No wonder she left.”*

“How are you feeling?” the physician asked. *“Any issues?”*

Gregor didn’t know how to answer that. Of course he had issues. The fever, of course. The pain. He had never really felt the implant before. Not until now. Now it felt like something nesting inside of him. It throbbed with life like a new heart, just an inch or two below his clavicle, and every time it pulsed he felt sweat roll free of his forehead like drops of rain streaking down the windows of a moving car.

“He has plenty of issues,” his mother said.

“Sometimes there are hallucinations,” the doctor reminded him. *“Are you experiencing anything like that?”*

“It’s this job of yours,” his mother said. *“I told you. I told you when they offered it to you, there weren’t enough sick days, you’d be forced to work while you were ill, and you’re always ill, because you’re so fat.”*

The implant was supposed to help with that. Deep brain stimulation, they said. It worked for people with epilepsy, and there was evidence it worked on depression. And the depression was why he ate so much. They were certain of it.

“If we can change your mind, we can change your body,” they said.

“I’m not so sure,” Gregor said.

The doctor frowned, and now she met Gregor’s eyes. It was just for a moment, though. She jotted something down on his display and he said something nice and then she was gone. After that a nurse came and changed something in the sacs – Gregor felt like a hamster with a big bottle

of saline hanging just outside the cage of his bed – and Gregor slept.

When he awoke, the room was full of robots.

They were the big cuddly kind, made of special silicone, coated like condoms in anti-evo agent. They floated into the room like clouds of meringue, and like any dessert left out in the open air, they were surrounded by bees.

"We have a solution," the robots said. There were two of them. He couldn't tell which one was doing the talking. *"Pun intended,"* they added.

"You see?" his mother asked. She moved so quickly now. More quickly than she ever had when she was alive. Like a monster in a dream. You could run as fast as you could and she would always be there, just behind you. *"They won't even touch you with their own hands. That's how disgusting you are."*

"We're going to insulate your implant with a nano-silver infusion," the robots said. *"It's both a barrier and an anti-bacterial agent. The silver is so concentrated that nothing can grow there. And it'll form a wall around the implant. The infection is spreading like a wildfire. We'll seal the implant completely, and starve the local infection of any oxygen or nutrients. Then we'll run the rest of your blood through a dialysis unit and hope for the best. Okay?"*

"Oh, naturally." The thing that was his mother rolled its eyes. *"Of course that will work."*

"We just need you to sign this," the robots said.

His hands wouldn't move.

"You're too swollen, of course," the robots said. *"Blink once for yes and twice for no."*

He squeezed his eyes shut. *"Pathetic,"* his mother whispered.

The bees hummed around him. They danced and spiralled, spinning down and down and down, ever closer to the thudding centre of pain under his skin. They landed on him and he screamed. Pain shivered through his nerves. He was going to die here. He saw that now. It was why his mother was here. She was here to take him away.

The bees hummed. He smelled burning. And then something putrid filled the room. A sick, awful smell of sweet rot. His rot. His death. It rose in the air, thick and foul, so close he could taste it. He wondered suddenly if the tiny drone bees could lay eggs inside him like flies did. Why not? Bio-mimicry was hot now. Why not push it a little further? Why not just let him incubate little robot maggots, let them chew away at his dying flesh until there was nothing left?

"Quiet down," one of the robots said. Its rubbery gripper closed over his hand. Its skin squeaked. Its face made a sad blue emoticon. *"We can't help you if you keep thrashing around like that."*

The bees hissed. Icy froth spread across his wound. The pulsing died. Perhaps this was dying, too. It felt as merciful as death. His mother looked at the cloud of vapour rising from his wound, sniffed, and shuffled away. He blinked. She was gone. She had been gone two years, now. He had picked out that terrible pink tweed for her at the funeral parlour because he knew she had hated it.

"I'm really sick, aren't I?" he asked.

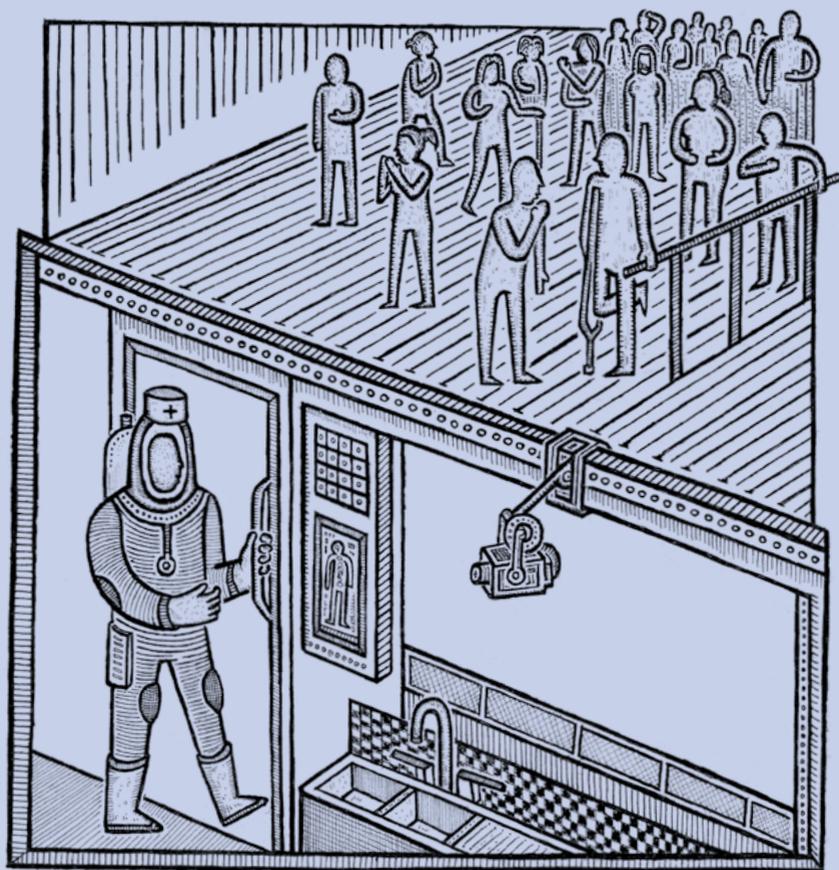
"Yes," one of the robots said. Gregor recognised his physician's voice. *"But we're doing our best. If you keep fighting, we will, too. Can you do that?"*

Panting, he nodded. And then, finally, there was rest.

Madeline Ashby is a science fiction writer and futurist living in Toronto. She has worked with organizations like Intel Labs, the Institute for the Future, SciFutures, Data & Society, and others. She is a columnist with the *Ottawa Citizen*, and the author of the *Machine Dynasty* series from Angry Robot Books. Her novel *Company Town* will be available next winter from Tor Books. You can find her at www.madelineashby.com or on Twitter @MadelineAshby.

Night Shift

Michael Rathbone



TB EPIDEMIC linked to immigration policy.

The newspapers are predictable. Gleeful reports of human misery interspersed with the latest miracle 'cures'. Two Executed for Public Health Endangerment. Turn the page and Turmeric Saved My Life. There's also a mandatory government 'good news' story every day where they tell us about how much more money they've devoted to each epidemic. More beds, more police, new equipment... A shiny new protective suit catches my eye. It's gleaming white, lightweight, has a helmet with integrated face-shield. I sigh. I don't need to tell you exactly how many of these innovations actually filter down to a small hospital in the suburbs. There's also a story about the new infectious diseases hospital they've built. Considering the lack of treatment options I can't imagine their discharge rate is very high.

I walk through the doors marked 'Staff Only' to the Emergency Department, dropping the paper into the rubbish bin. The staff accommodation is only two hundred metres behind me. They call it temporary, but thanks to the gradual loss of personnel I haven't been home in nearly a week. A few more desertions and I suspect the hospital will close. It might actually be a relief. Not that I have much to go home to. My wife took our little boy to her parents' house. She said it wasn't safe for me to work at the hospital and spend time with him. She's probably right.

I hand my ID card over to the masked security guard on gate duty tonight. He swipes it, confirming my identity, job and the outcome of my last medical check-up. It's at this point I always feel nervous. I know exactly what information my card contains, but masked men carrying guns frighten me. He unlocks the door.

The control centre of the Emergency Department is sealed against the 'shop floor'. I check in with Sarah, the nursing lead, and Geoff, the administrator. Sarah is monitoring the screens for incoming patients while Geoff assigns cubicles and takes calls from ambulances. My bag goes into a locker, and I attach my communicator and insert an earbud, freshly decontaminated. It's still slightly damp. A quick look at the rota for today shows I'm in Majors. That's a relief. Infections means I have to dress up head-to-toe in personal protective equipment. You can stomach it for three or four hours, maybe a bit longer, but by then you're completely exhausted, dehydrated and prone to making mistakes. The average length of time we spend in there is six hours.

Majors is crammed full of patients. The waiting room is overflowing with sick people wearing surgical masks. If the triage team have done their job right then the masks are unnecessary, but we're all tired and things get

Stories of the post-antibiotic apocalypse

missed. I sort through the usual head injuries and chest pains, discharging some and referring others. One teenager has appendicitis. She'll probably die. I refer her to surgery and move on.

Nearly halfway through my shift, my earbud beeps.

"ED registrar here."

It's the administrator. *"Sorry mate, got to reassign you. Police just dragged a mother and son to Infections. Raj says he's off if they don't send someone else to help out."*

Shit. *"No probs, Geoff, see you in five."* I scan the computer screen to check there's nothing the juniors can't handle, broadcast a quick message to let them know what's happening, and return to base.

Infections is a specially built area consisting of twenty rooms off a long central corridor with a reception desk and nurses' station at the end. People with communicable diseases get put here while they wait for a bed on the ward. The ventilation provides each room with negative air pressure. In the case of airborne infections, droplets cannot escape into the corridor. There are only two entrances to the unit: one just adjacent to the Emergency Department where the patients arrive and one attached to the department itself. I approach an anteroom near the departmental entrance and begin the familiar but tiring ritual.

Our personal protective equipment has to go on and come off in a particular order. We start in scrubs then put on the first pair of gloves, a thin jumpsuit, boot covers which hook onto the jumpsuit, combination facemask and respirator, then a gown and another pair of gloves which hook onto the gown. The gown and second pair of gloves are replaced after each patient.

I message Raj to tell him I'm here and head straight to cubicle nine. A police officer is standing by the door in a black protective suit. I'm relieved to see her gun holstered. The mask amplifies her voice.

"Picked up a kid living above a newsagent's. No ID. I was going to run him down to station but heard coughing from the bedroom. Turns out it's Mum hacking up blood."

"Does the boy have any symptoms?"

"How the hell should I know? I'm not a doctor."

"Did you keep them separated?"

"Course I bloody didn't. There's not room in the van."

"Right. Thanks."

"You know what I think? I think they don't deserve medical treatment. Bringing their filthy foreign diseases..."

An emaciated middle-aged woman is lying in the room's only bed, and a young boy sits on the floor, as far away as possible. He can't be more than ten. I address the woman. *"I need to ask you a few questions."*

"Please," she pleads. *"Take him away. My brother will look after him."*

"First let me examine you."

I perform a stuttering examination, the protective gear making my movements clumsy. The electronic stethoscope transmits her rapid breathing. Reduced breath sounds in the upper lobe of the left lung. Percussing the area produces a dull thud. I take blood from both, thank them and leave the room.

I call the control room. *"Geoff. The mum probably has TB. We've got to get the boy out of here."*

"No can do. There's literally nowhere to put him."

"If it's TB there's a chance he hasn't caught it. If I leave him here it's basically murder."

"And if you let a kid with TB back into the general population, it's mass murder."

He's right.

"How soon before I can get one of the others to a bed on the ward?"

"Not sure, I'll put you onto the infectious disease registrar."

There is a beeping as I'm put on hold.

"ID registrar." The answering voice sounds exhausted.

"Gerry, it's Ash."

"Sorry Ash, but now is not a great time. We've had two arrests. Neither of them survived."

"This is urgent." I explain the situation.

There is a brief silence when I've finished. *"Ash, there are no beds."*

"Sounds like two just came free." I know I sound callous.

She snaps back at me: *"Yes, in theory. But they need a complete clean. Both patients had vomiting and diarrhoea. The cleaners are working on a skeleton rota just like everyone else."*

She cuts communication.

As I stand there desperately trying to think of a solution, my earbud chirps.

"Ash?" It's Raj. He's out of breath.

"Yeah?"

"Do not enter cubicle fifteen. Some bastard getting aggressive. Currently he's trying to kick the door in. Fortunately he's so drunk he keeps missing."

"What's he got?"

Stories of the post-antibiotic apocalypse

"Damned if I know. Triage sent him here because he has a slight temperature." I can hear the contempt in his voice.

"Thanks for the warning. Oh... no." My earbud beeps three times. *"They're calling me back – better go."*

After the lengthy decontamination process I am not in the best of moods. Two of our visitors are dressed in normal police-issue protective equipment. One is wearing a brilliant white protective suit, closely fitted, fully masked. I remember it from the newspaper. Vague unease compels me to open a channel to Raj. A witness might be useful. The suit's owner turns to me.

"Hello, Doctor...?" The voice is pleasant, relaxed, with a cultured accent.

"Ashcroft," I reply. *"Who are you?"*

"I'm from the Department of Health. We believe you may have a new case of tuberculosis."

"I'm sorry, but I can't just give you patient information without some identification." My earbud emits the sound of quiet breathing. Raj is listening.

A sigh: *"Doctor Ashcroft. If you'd read the latest Department of Health bulletin you'd know that I am under no obligation to disclose any information. I'm here to see patients with probable tuberculosis. If I agree with your findings, I will be removing them to St Damien's Infirmary for Communicable Diseases."*

"I'm not sure the child has it yet."

"You know as well as I do that a lack of symptoms does not mean he's not infected." He turns away. *"Your cooperation is not required. My associates can bring them."*

"Doctor?" Sister Sarah approaches us.

"Yes?"

"The posh doctor, I mean."

"What is it, my dear?" He turns his masked face towards her, practically oozing upper-class charm.

Despite my fury I admire the way Sarah resists the temptation to kick him in the testicles. She smiles ingratiatingly. *"Well, I've got a patient in Majors, and I'm worried that she might have TB, too. I'd really appreciate an expert opinion before I move her to Infections."*

"Of course I'll help." Turning to me, his voice becomes harder. *"Prepare the patients for transfer."*

As they depart, Sarah gives me a meaningful glare. I walk over to Geoff at the control desk.

He lets out his breath in a sigh. *"Alright."*

"I didn't say anything."

"You don't need to – I was listening. We can't let them take the kid. We need a distraction."

I pause to think.

"What about the drunk guy in fifteen?"

Geoff grimaces.

I squeeze his shoulder. *"Are you getting this Raj?"*

"Loud and clear. What's the plan?"

"We can hide him in staff accommodation until his blood tests are back."

"Are you sure?"

"Yes – give him a mask. Plenty of empty rooms."

He is silent for a moment. *"Alright. Wait for my signal, okay?"*

"Okay." I look at the clock. "Be quick, I'm not sure how long Sarah is going to be able to distract this prick."

Geoff brings up the security controls. He can cut the power to the lock from here. With any luck the rampaging drunk will distract the lone security guard. We wait in tense silence.

Finally, the communicator on the desk chimes. It's Raj.

"Cancel the plan."

"What? Why?"

"The boy's spiking a temperature, Ash."

My stomach lurches. *"No."*

"It's too late. I'm sorry." He closes the channel.

Mindlessly running to the Infections anteroom, I barely register Geoff's cry of frustration and the sound of some piece of office equipment hitting the wall. I sag to the floor outside the door separating me from the infected.

I don't know how long I've been there when I realise the man in white is sitting next to me. He breaks the silence.

"Do you think I'm a bad person, Dr Ashcroft?"

I don't trust myself to reply.

"The world has changed." He continues, "Once, doctors could promise patients that their wellbeing was the only concern. Now our primary duty is to those who aren't our patients. How many people could this boy have infected? How many would die after infecting their friends, loved ones, and worst of all, people they didn't even know?"

"So you send them to a death camp."

The bastard actually laughs. *"Rather melodramatic."* He is serious again. *"I could have you and your nurse arrested for public health endangerment. If you had succeeded in getting the boy out."*

"He was infected."

"Of course he was."

His calm, confident tone infuriates me and I look directly into the mask. *"How many of your patients survive?"*

The visor reflects my image so that I am staring into my own eyes. *"None."*

It is much later when I step into the dawn's weak light. The clouds are grey and a light drizzle chills my exposed skin. The boy and his mother are gone. Gone to a hospital with no discharge lounge.

Someone has dropped this morning's newspaper on the tarmac. More arrests, more deaths, more false hope. Another day in hell. I walk slowly towards my temporary home. I need to rest so I can do the same again tomorrow. The rain continues to fall and I know, deep down, that it will never end.

Michael Rathbone is a practicing doctor and now a published author. Currently he works as a histopathology registrar at St Thomas' Hospital, writing in his spare time. He has had a varied academic career accumulating degrees in medicine and English. Michael's interests include genre fiction, pathology and medical education. He lives in East London with his wife and pet skeleton, Archie.

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