

**THE
ENGINE
MASTER
AND
THE
GENESCAPES**

Rhys Thomas

Part of

WRITING THE FUTURE

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Inspired by science fiction, entries considered how health and healthcare in the UK will look in the year 2100.

The prize was won by Elizabeth Ingram-Wallace with her story 'Opsnizing Dad', and was published along with the five other shortlisted stories in October 2017.

At a time of reflecting on where healthcare has been, a further set of longlisted stories was published in the summer of 2018 to coincide with the NHS's 70th birthday.

All of the published stories are available on the Kaleidoscope website, along with the option to buy a limited edition hard copy of the six shortlisted stories.

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**The future is...
down to us.
But we must
change**

01/07/2100

'Let's live a long time together,' says the woman's face on the screen wall of the doctor's office. She smiles and the Genescape logo fades up over her face, the green loop of the G curling around a hand, just as the face dissolves into a white background. I blink my eyes and shift my head; the ad clears. A soft voice whispers, you can go in now. I unplug my Connect from behind my ear and slip the small shell of it in my pocket.

'Jaspar,' says Max, my doctor, friend of sixty years since our days at Imperial, calibrating the arm of his bot. He's seventy-eight but looks old, dark eyes sunk into his skull. 'Shall we?'

I sit in the chair opposite his desk and he nods to the bot, a black box sitting on its aluminium trolley. Its arm extends, and bloods me.

In his bored monotone Max says, 'Do you consent to my Domaining your bloods?'

'I do.'

The robot's arm pulls back, the blood painlessly taken from my hand. Max has always been coolly professional at work, feigning disinterest. When he accepted his Nobel he hardly cracked a smile. The bot brings the vial of blood into its chest, the centrifuge spins and the blood is drawn through microtubes for scanning.

'Hows' the work?' he says.

Inside the bot some of the tubes take the bloods to be checked for discrepancies, sickness markers, but the biggest moves the blood across the quantum logic gates and the information from it is Domained, uploaded to the huge global databanks, banks of servers interconnected across infinite webways to the Domain of our species' knowledge, every single connection feeding into and away from the last, three times as many connections now as in my own humble brain. My genes are cross-referenced against other genomes from family members out across the myriad lineages, all free to access, checking and re-checking for infinitesimal differences, genetic and epigenetic alike, searching for clues for future diagnoses and possible preventions.

'Work's good. I-'

Max holds up a hand and the warmth of the room drains. He checks the monitor, swipes, re-running things.

'Jaspar-'

'Wait. Take out your Connect.' Just in case anyone is listening.

He lays it on the table.

'Your tumour markers are way too high,' he says. 'Into the scanner please.'

He injects a nano-dye (a "dye" in name alone), we wait four minutes. The results from the bot confirm my propensity for colorectal cancer. I could have

tried Genescaping it out, genome edited, but it's still an early tech, results are 50/50, long term effects are unknown and, thanks to the AVs successful scare campaign, it's not NHS funded.

'There's been an epigenetic shift here, Jaspar,' he says.

Our genomes shift by trace amounts all the time. A bad meal, a rough day, the wrong sunbeam striking at the wrong time; usually the shifts count for nothing but down there in the quantum soup balances can be tipped, a proton moved to the wrong position in the double-helix, and when the cell divides, that vital proton is in the wrong place and the coding goes awry and a mutation occurs. Cancer.

'In you go,' he says, holding open the door to the scanner's antechamber where I deposit my clothes. I'm zapped by 6th gen imaging tech. The nano-dye, tiny sonar bots branching throughout my body, helps give coverage for a near complete 3D schematic.

Re-clothed I say, 'Tell me,' to my old friend.

'The tumours are there,' he says, matter-of-factly, and immediately there is the sense of a clock ticking down. 'Metastasised?' We've both slipped into the quick fire sentences we always use when talking shop.

'In the lymph. It's going to spread soon.' He swings the screen around so I can see, zooms in on the liver. There are no tumours or spots. But he wasn't fast

enough to avoid my seeing the size of the anomalies in my bowel.

‘You have to keep me alive,’ I say. ‘For a year. I need a year.’

The cancer will spread to the liver first, but has also hi-jacked the lymph, a transport system to other parts of my body.

‘I’d go for a transplant.’

‘If it’s in the lymph nodes, the chance of recurrence is high. I can’t afford the time.’ Or the risk, I think. Even with robots surgery still holds a risk, which I can’t take.

‘I need a Stopper.’

Max shrugs. ‘Sure.’

He won the Nobel for his Stopper. Cancer is uncontrolled cell division. Cell division occurs when an enzyme called DNA polymerase cuts a double-helix “ladder” in two, allowing each half to re-grow the side it’s lost; from one comes two. Max developed a strong enzyme inhibitor that stops DNA polymerase. He also found a way of marking the cancer cells from the healthy cells next door. As with engineering so with medicine and his patented technique remains a secret, though drunkenly he once said he’d found a smart-dye that measures tiny changes in electrical discharges from the mitochondria powerplants that run each cell; these changes occur only in cancer

cells. The point is; it works and revolutionised the way we treat cancer. It stops the tumours growing and it's going to be the thing that saves my life, isn't it? Not always. Its success rate is 98%.

Max turns to me. 'I'm taking you for dinner.' He isn't usually compassionate, not outwardly so. It's funny. I don't feel terror. I don't feel sadness. All I can think about is the Engine.

~

At dinner, Max holds forth.

'Do you think politics could have done what the tech companies did at the beginning of the last century? You think governments could have combated climate change, energy, starvation, the way we did? They were terrified of automation, thought it would steal jobs. Nobody thought to split those jobs in half so everybody had work, and lead these wonderful lives we now have. It was tech companies that started the three-day-week movement, they were the ones who originated the fifty-year policies that were always the only solution.'

'What's your point?'

'My point is – why is everyone so scared of technology? Every single thing we have has been born of the scientific method yet people never see it. How do they think we came to live a hundred-plus

years with twelve billion people and nobody starving? People used to burn GM crops, the same crops that saved the lives of half the planet and saved the soil. Same with the digitisation of money; we'd never have had the Fair Tax System without it, flooding the economy with all that capital, giving us the amazing NHS we have now. Big data. People were scared of that too, but it was always going to be the answer, especially with medicine. At the start of the last century nobody knew the best doctors of the future would be just as confident with code as physiology or pharmacology.'

The low light of the restaurant puts him half in shadow.

'Look at us here, two crusty old Nobel winners discussing philosophy.'

I remember a cold winter morning we shared on the banks of Lake Mälaren in 2062, clutching espressos and talking about our newborn children.

'I don't think we're that old,' I say.

Max pauses. 'You're very ill, Jaspar. You work too hard, and it's too much. You lost your wife because of work, I don't want you to lose yourself. You need to stop.'

'I can't stop.'

'How do you think people will react to your "Engine" when you go public?'

'You were just castigating those people for being afraid of progress.'

'But you're my friend. And it's not just the public. If what you're telling me is correct then big pharma are going to be very angry with you. The end of medicine...'

'Not the end. The beginning.'

'You are messing with dark forces. Money at that level...'

'We can't be scared,' I say.

'Jaspar. Your ambition is blinding you.'

I think of my son who died, of Jenny who left me in the wake of it.

'It's not ambition,' I say. 'It's hope.'

Max shakes his head.

'Hope is the element with which we steel our fortitude,' he says.

~

Before home I go to my lab to check the mouse. It used to have large tumours running along the length of its spine. I put them there. Two months ago it was lying on its side, tongue lolling out its mouth. Now, it's sitting up. I check the cables in the base of the skull and its abdomen, both of which lead to a small black box on the floor of the cage, a quantum computer. The Engine. I bring my face to the cage and the mouse hops up,

putting his paws on the bars. 'Look at you,' I say. 'Will you just look at you.'

Then I stare along the line of hundreds of cages. Every one contains a mouse that was sick. Cancer, viruses, bacterial infections. A hundred and fifty-four illness, nine hundred and twenty-four mice. And yet, none of them are ill anymore.

~

I remember the first time I saved a life. A little girl called Jasmin; that feeling when I looked into her eyes. Across the decades medicine might change but that feeling does not.

~

02/07/2100

Max is wearing his white coat and a tie. Outcomes are better if the doctor wears a tie. Outcomes improve when a patient uses branded painkillers over generic ones. The reason is the placebo effect, the unlocking of our internal pharmacies and drug delivery systems. Mind over matter. Finding the key to that lock will move medicine into a new era. But we can't do it. The answer lies in our brains but our brains are not powerful enough to fashion the keys. We do not have enough neural connections. Yet...

Max has printed my Stopper pill using the 3D printer in the corner, above it the same bank of molecule stores attached through thousands of draw-down tubes that I have in my own lab, connected to the black boxes of the Engines.

‘Do you really think big pharma will come after me?’

Max puts his feet up on his desk, his shoes as shiny now as when he was a young man of fifty.

‘How close are you?’ he says. ‘With the Engine.’

‘I want to go to trial but...’

‘You don’t want to let the cat out of the bag.’

When I go to human trials the whole world will know. I’ve been working on this for a decade – one of the perks of winning the Nobel is the licence do anything – and haven’t published a thing. There is a twinge of regret now – if I die my work will be lost. The public have to know eventually but things are going to slow right down when it happens. The 3 Ps: Permits, protests, people. And the last thing I have now is time. I wash down the Stopper with a glass of water.

~

16/07/2100

Since I collapsed in the street I’ve only been to my lab once. I collected everything I needed to work, and travelled to Max’s weekend home in the countryside.

Nobody knows I'm here, and that's how it's got to be. It's Friday night and I hear the car roll over the gravel. When he comes in I know immediately something is wrong. I look at him, he shakes his head.

'The Stopper isn't working.'

I sit there a moment.

'The cancer is accelerating quickly. We need to operate.'

'No. I'm too close.'

'Shit, Jaspar, will you just forget about your damned Engine for a second. You have to let me save you. There'll be time after the operation.'

I close my eyes in resignation. I'm not going to finish before this thing gets me.

'I need to speak,' I say.

~

20/07/2100

In the orangery at the back of the house a squirrel darts up the trunk of a silver birch. Isherwood, the medical journalist Max's set me up with, sits in the comfortable chair opposite. I insist on removing Connects so she is recording with an old school dicatphone as I tell her everything.

The Engine is the name for the small black box that was jacked into the mouse, a quantum computer with an interface that accesses the thalamus, the entryway for consciousness. The idea is simple: If the matter of the brain is the substrate on which consciousness forms, the Engine is an expansion of that, a second substrate. I am merely increasing the number of connections.

‘Why?’ she says.

I take a breath. ‘When somebody has a car crash they are able to manufacture morphine instinctively. This is observed. The Engine is a way of unlocking that process, and using it to create medicine for *all* sicknesses.’

‘You’re talking about the placebo effect.’ Pause. ‘You’ve unlocked the placebo effect.’

‘I have.’

‘Using the mind to cure the body.’

It’s not that simple of course. You can’t give a mouse cancer, jack it in, and persuade it to cure itself. It doesn’t know what cancer is.

‘That’s why you code the information needed to clear the tumours into the Engine. It’s pre-programmed. The data then uploads to the brain. The consciousness - combined with the augmented consciousness provided by the quantum computer - does its work and... the tumours go away.’

'I've cured hundreds of mice. Of nearly every disease we have a profile for.'

'My god.'

I tell her the Engine is connected to draw-down molecules in case the body needs them, amino acids and simple proteins the body can reconstitute. 'They enter through nanobot delivery to bone marrow stem cells. But here's the thing – the body doesn't usually need them. Everything is already available internally.'

And then, over the course of two days, I give her all my findings.

~

28/07/2100

The jaundice has started. Ordinarily it wouldn't happen this fast but the body still holds its mysteries. The cancer has spread to my liver - tumours are pushing down on the bile duct. The countdown clock has almost run down.

In the middle of the sleepless night I pick up my pen and write to Jenny. I tell her how sorry I am. How I love her still. She is the love of my life and the best person I've ever met. The screen glows in the dark room.

I will never stop loving you.

~

29/07/2100

Max and I travel to the private hospital where he consults two days a week. That's one thing that's always separated us; his capitalist bent. As long as there's healthcare there'll always be *better* healthcare. I'm so ill the chance of mortality has increased significantly and with the cancer in my lymph nodes, it will almost certainly come back. I'm done for.

I lie in bed, my newly 3D-printed liver and bowel waiting in a temperature-controlled box at my bedside. On the wall is a painting of a green lizard with a red stripe running up its back. Next to it a screen shows the green loop of the G curl around a hand. I sit up. I didn't know Genescape had bought this hospital. Suddenly, there is a dryness at the back of my throat.

I throw off my sheets and go to the computer, get into my records. All the details are there but the dates are wrong. I was diagnosed a month ago but these are saying I'm eight months in.

I key my NHS ID to check something else. By law data is available to all doctors for every bed in the whole healthcare system, NHS and private. Why am I not scheduled to be operated on today? I go to the temperature-controlled box. Next to it is the equipment for my anaesthetic. I open the box and my heart freezes. The door hisses open.

‘Jaspar?’ says Max’s voice. ‘Why are you out of bed?’

The box is empty. There are no organs.

‘We were supposed to be friends,’ I say. ‘I thought you were saving me.’ I turn to him. ‘But you were killing me.’

There is a moment.

‘I tried telling you to stop.’

I miss a breath.

‘You were always too ideological, Jaspar. You never did have a head for business.’

‘You gave me cancer...’

‘We couldn’t just kill you. How would that look?’ he says, coolly. ‘It’s not the tech, Jaspar. It never was. It’s the people. It’s always the people.’

I close my eyes. Max has all of my work, I gave it to him willingly, to a woman claiming to be a journalist. And now he’s going to kill me and no-one will ever know. He approaches cautiously, lifts the NeedleZap.

‘You have selected assisted dying. You do realise nothing will save you now anyway; the cancer’s too far gone. In a way this is the least painful route you have into death. I’ll anaesthetise you first; you won’t suffer.’

Quickly, he pushes me backwards and I fall on to the bed. In my weakened state he is too strong. He plunges the anaesthetic into my neck. Everything I’ve

done... All lost. I feel... sleepy as the room... shifts
and the air changes. The door opens and I see... just
before sleep... a form in the doorway. My letter. She...
did come. The... love... of my... life. I reach up my
hand... to her...

Her voice.

What's going on? Max, what are you doing?

~

07/08/2100

I sit in a light, sunny room. I am listening to the London Philharmonic playing The Beatles. She saved my life and now she is holding my hand. I take the jack, connect it to the black box and think of what is about to happen. Outside a robin lands on the branch of the apple tree. I wonder how this will feel, all the new connections, a new way of thinking. The human brain is the most precious thing in the known universe. Jenny smiles, I close my eyes, think of our son. Nobody need lose a loved one too soon. I plug myself into the Engine. Here it comes. I shunt, this feels... like a... wow... a *symphony*. The world opens up before me, and I focus... on life.

About the author

I'm the author of three novels, the most recent of which is *The Unlikely Heroics of Sam Holloway*, which is out now in eBook, and which will be published in paperback in August 2018 through Wildfire Books.

In the day time I work in the Research and Engagement Team at Cardiff University's School of Pharmacy and Pharmaceutical Sciences, helping the incredible researchers get the word out about their cutting edge science.

I live in Cardiff with my partner and three cats and I'm passionate about public engagement in science.

Inspiration

I chose to write my story because I find the placebo effect absolutely fascinating. It's an observed phenomenon and yet nobody understands it. To me, it seems like a whole new field of medicine waiting to happen. Its potential could be massive, or non-existent. It lies in that most exciting area of science: the unknown.

Writing the future

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