The Vat

A Romantic Comedy

Greg Egan

Harold's in love.

There's no hiding it. You can see it in his eyes, in the heat distribution on his skin, in the twists and whorls of his brain's magnetic field.

Mary knows he exists, all right. When she looks his way, she doesn't look through him - not quite. She notices him with a mild frown. She notices him like a splinter in her thumb, or a crease in her lab coat. She notices him like a faint odour; nothing utterly repulsive, but nothing too pleasant either.

Poor Harold was once a promising neurochemist. He discovered a brand new neurotransmitter-antagonist which could make rats lethargic and depressed.

However, while proving that injections of this substance, during or immediately after feeding, could produce an aversive association strong enough to make the creatures starve themselves to death, he accidentally jabbed himself with the needle, and soon found he was no longer able even to contemplate experiments with rats. So these days, he works on The Vat.

Harold is in charge of spermatogenesis. In truth, he doesn't have a lot to do.

The computer monitors the temperature, the pH, the concentrations of nutrients, growth factors, and waste products. Four hundred square metres of glass plate are coated with a gelatinous matrix in which spermatogonia, the stem cells, are embedded. When these cells divide, some of their daughter cells are more of the same, the others are primary spermatocytes. Each primary spermatocyte gives rise by meiosis to two secondary spermatocytes, each of which in turn divides into two spermatids. Under the influence of Sertoli cells, also embedded in the matrix, spermatids mature and shed cytoplasm to become spermatozoa.

Harold has seen all of these stages hundreds of times under the microscope, in samples taken for quality control. He ought to find the whole business utterly mundane. Sometimes, though - transfixed for a moment by the image on the screen - he says in dreamy tones of sudden recognition (to no one in particular, often to no one at all), "Yes! This is it. This is life." Staring at these specks of unthinking biochemical machinery, he grows dizzy with wonder, then numb with awe.

Then he gets on with the job.

Some nights, Harold wakes in the early hours and goes out to walk the empty streets. Why? It's the hottest summer on record, and he can't get back to sleep.

Why? Unrequited love, of course. Why? Studies of the sequence of neurological events which occur when a subject makes a self-motivated choice between hitting a button and not hitting a button have revealed that the conscious decision-making process starts milliseconds after other parts of the brain are already committed to action. "Will" isn't the cause of anything, it's an afterthought for the sake of

peace of mind. Since reading this, Harold has stopped making an effort to force his intentions to conform to his behaviour; there doesn't seem much point now in maintaining the illusion. He just walks.

Even the stillest, quietest night comes alive for Harold. He sees gas molecules spinning through the air, and photons pouring down from the stars, the way some insane medieval monk might have imagined angels and demons battling it out behind every corner and beneath every cobblestone. And the frenzy isn't confined to his surroundings; the real bedlam is inside him. He pictures it all, vividly, in garish, comic-book, computer-graphic colours: DNA being transcribed, proteins being synthesised, carbohydrates being burnt in flameless enzymatic fires.

Everybody's made up of molecules, and plenty of people know it, but nobody feels it like Harold.

Above all, he dizzily marvels at the fact that the molecules in his brain have managed, collectively, to understand themselves: his neurotransmitters are part of a system that knows what a neurotransmitter is. He can sketch the structures of the central nervous system's one hundred most important substances; he's synthesised half of them with his own hands. He's even viewed real-time images of his brain metabolising radioactively-labelled glucose, revealing which regions were most active as he watched himself thinking about watching himself think.

Harold doesn't know quite what to make of this molecular self-knowledge. He can't decide if consciousness is miraculous or meaningless; he hovers between mystical ecstasy and the purest nihilism. Sometimes he feels like a robot, raised by human parents, who's just discovered the awful truth: poring over his own circuit diagrams, horrified but enthralled; scanning a print-out of his own software, following the flow of control from subroutine to subroutine; understanding, at last, the ultimate shallowness of the deepest reasons for everything he's ever done, everything he's ever felt - and dissociating into a mist of a quadrillion purposeless, microscopic causes and effects.

This mood always passes, though, eventually.

Mary is responsible for oogenesis. Primary oocytes undergo meiotic division to yield four cells, but only one of the four is a mature ovum; the others are tiny cells known as polar bodies, and the second division is only completed if fertilisation takes place. In a massive cultured substitute for the ovarian cortex, millions of ova mature and burst from their follicles daily - no parsimonious one a month here. The Vat has no time, and no need, to ponderously mimic the stages of the human menstrual cycle; as in any good assembly line, everything is happening at once.

Harold knows exactly where Mary lives, although of course he's never been inside, and when he walks by at two in the morning, the narrow terrace house is always black and silent. He hurries past, terrified that she might be awake, and might glance out at the sound of his guilty footsteps.

He knows he ought to forget her. Sometimes he swears that he will. He sees women on the street every day whom he finds a thousand times more attractive.

Total strangers treat him with far greater kindness and respect. He knows his mere presence annoys her - and her presence evokes in him more shame and confusion than tenderness, or even lust.

His love is ridiculous. His love is a farce. Yet the persistence of his obsession doesn't surprise him at all. Evolution, he reasons, has not had time to trim human consciousness down to the most productive, most essential elements. His brain is capable of many arbitrary, even self-defeating, modes; perhaps that is the price to pay for its flexibility, perhaps there is no easy sequence of mutations which could remove such disadvantages without sacrificing much more.

As for his own wish to be rid of this miserable, pointless love, Harold knows that this has no more power to change his feelings than it does to change the weather on Jupiter or the electron's charge-to-mass ratio; it's merely another aspect of the state of his brain. Whatever admirable progress evolution has made towards lining up intentions with behaviour to pander to the vanities of the conscious mind, has - in Harold's case, at least - been wasted. The neurological facts refuse to stay decently theoretical; the irony is that this shattering of the illusion of will, although entirely reasonable, is not by any means necessary; after all, the human brain is under no deep biochemical edict to be reasonable. The epiphenomenon of logical thought simply happens to have been more resilient, in this case, than the epiphenomenon of will; in a million other people, as familiar with the facts as Harold, the battle happens to have gone the other way.

Harold wonders, with a mixture of unease and fascination, if his reason is strong enough to move on from this conquest to the ultimate triumph of undermining itself.

When Mary's ova meet Harold's sperm, a high proportion are fertilised. Most of the sperm go to waste, but not nearly as many as are lost in vivo. The rates of polyspermy, and fertilisation by defective sperm, are consequently higher, but such abnormalities don't really matter, in The Vat.

The resulting zygotes drift, slowly, along a vast conduit. They undergo cleavage, redistributing their cytoplasm amongst more and more cells. Between four and six days after fertilisation, blastocysts form: hollow balls of cells, with a cluster at one end which is destined to become the embryo. Other cells will, in time, give rise to the protective foetal membranes.

Cultured slabs of uterine endometrium - hormonally stimulated into a swollen, receptive state, and replete with artificial blood circulated by electric pumps - are introduced into the conduit at the point where the blastocysts are ready to implant. Within days of implantation, chorionic villi - the links between the placental and "maternal" blood supply - will form, guaranteeing essential nutrition for the haemotropic development to come.

Tonight, after passing Mary's dark house - on the far side of the street, as always - Harold stops and turns back. Why? Because certain of his motor neurons fire in the necessary sequence. Why? Because sufficient excitatory signals are received at their dendrites. Why? Because of the neural topology of Harold's brain, the product of his genome, and his life history, and the way the quantum dice have fallen.

A rubbish-strewn alley leads to a back window, very slightly ajar. Harold can fit only his fingernails into the crack, and clawing the window open causes him a lot of pain, but this doesn't deter him at all.

The window leads into a damp, warm bathroom, between a toilet and a dripping shower. He fears that the sound of the dripping will betray him; it rings so loudly in his head that he believes Mary might be wakened, not by the sound itself, but by his amplified perception of it. He tightens the hot water tap with all his strength, and then the cold, but there's a leaky washer, and no amount of force is going to change that.

He tip-toes into the kitchen, opens the drawers and searches them methodically.

It's not until he has the carving knife in his hand that he reflects on his likely use for it. Part of him is shocked, but part of him is delighted; it's one thing to muse and fret like a tenth-rate philosopher, but here at last is a test for his ideas that goes beyond inconsequential speculation.

A proportion of the embryos are simply liquefied; the cell walls, and indeed all intracellular structures, are ultrasonically disrupted. The broth of chemicals this produces is then fed into a sophisticated purification system, based mainly on electrophoresis and affinity chromatography, and many valuable substances are extracted.

The remaining embryos are broken into individual cells. In theory, perhaps, almost anything can be achieved with engineered bacteria, or some modified tumour cell line, but in practice there are still many properties of healthy human tissue that can't be faked. Persuading E. coli to churn out hormones like insulin or dopamine is simple enough; turning it into a perfectly functional equivalent of an islet cell or a dopaminergic neuron - an integral part of a complicated regulatory system - is something else entirely. It's simply not economical, trying to make all that human DNA work in a foreign environment, when the real thing is available for a fraction of the cost.

Harold passes the refrigerated storerooms every morning as he arrives for work, and every evening as he departs. It's a relaxed, cheerful place; the storemen always seem to be whistling, or playing a radio loudly. Vans come and go at all hours, picking up the large, but light, containers of insulating foam in which the small, precious vials are packed. When Harold sees a crateful of the end product of his work being loaded into a van, when he sees the driver sign for the consignment, slam his door, and drive away, he says to himself aloud, nodding, "Yes! This is it. This is life."

Harold stands by Mary's bed. She's lying on her side, turned away from him. He breathes slowly - through his mouth, hoping that this is the quietest way - and thinks about the trillions of cells of her body. If he stabbed her in the heart, only the tiniest fraction of them would be killed directly by the blade - just a few million cells in her skin, her soft tissue, her heart muscles. The death of her neurons would be almost coincidental, more a product of this organism's poor design than anything else. A slime mould would easily survive similar treatment.

He stands for a while, waiting to see what he will do. Part of him - a small, vestigial subsystem with no interest whatsoever in brain physiology, the philosophy of consciousness, or even obsessive love - pleads fervently to be allowed to put down the knife and flee, but Harold pays it about as much attention as the soundtrack of a child's cartoon overheard playing on a neighbour's TV. He stands, and he waits.

Harold doesn't mourn for the brief lives he helps create; he knows they die long before the most primitive thoughts or feelings have a chance to arise, and he can't believe there's a machine up in heaven, churning out a white-robed feather-winged soul for each of these tiny clusters of cells.

Rather, he rejoices. Because The Vat says something about human life - human life of every age - that had to be said, and although today he is alone in heeding this message, he knows that in time the insights he's gained will be the common heritage of all humanity.

Harold retraces his steps. He returns the knife to its place in the kitchen. He leaves by the bathroom window, and closes it behind him.

He wanted to kill her, he muses, more than he'd ever wanted anything before. He wanted, very badly, to be free. But something in his genome, or something in his past, declared that it wasn't to be. Or perhaps the quantum dice simply happened to fall in her favour. This time.

He walks home slowly, his face uplifted to the photons flooding down from the stars, and he counts them one by one.

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