Fuck the war

A collection of writings from Richard P. Grant

For Jenny
with love

London July 2010

Opinion

Opinion

School Daze

In Chemistry World: The Last Retort—September 2008

My first memory of being taught chemistry is being told to learn the names of all the elements, in order. A dry list of symbols and numbers, the Periodic Table was presented with no context, no clues as to its power. The whole thing seemed perfectly designed to squish a child's natural sense of wonder and inquisitiveness (and desire to make things go bang, of course).

Fortunately for me the seeds of chemical thought were planted in my mind long before I was formally taught the subject at school. In common with so many scientists, the unsung as well as Nobel laureates, I was given a chemistry set by my parents at an impressionable age.

There was a red test-tube rack, glass tubes, safety goggles, litmus paper and a dozen or more screw top vials with mysterious and not-yet effable identifiers: sulfate, cyanoferrate, carbonate, sodium, copper, potassium, all in striking combinations. I exhausted the protocols and suggestions in the (as it became) stained and dog-eared instruction booklet, and to my immense pleasure had reagents left over. My parents never did find that cat. But I was hooked—I wanted more.

Eventually of course I went to High School, where I knew I wanted to study chemistry. And ran slap bang into the wall of memorized facts and laws that were handed down as if on stone tablets. My seductive friends, the chemicals, were locked away, to be rationed and controlled by the high priests of education.

It was not until A Levels and a new school brought the hunched figure of Doc Beckett, cross-eyed and stain-fingered, into my life that I was able to rekindle my love affair with the sirens of my

youth—and more besides. Doc learned his craft in a different age. We dehydrated glycerol to make acrolein and staggered around the lab coughing. We dropped nitrogen triiodide on the floor and spent the afternoon in a purple haze of tiny explosions. I made black powder and glycerol/permanganate fuses. During a particularly recalcitrant reduction I suggested, because I was reading some ancient text, that a certain chemical might help. Doc returned with a brown bottle from a locked cupboard, 'Potassium Cyanide' written in copperplate on the label. I peeked in the cupboard once. What, I wondered, was 'uranyl acetate'?

Alas, all this came too late for most of my peers.

Chemistry is exciting. Innocuous-looking chemicals do strange and wonderful (and scary) things when mixed in the right (or wrong) combinations. Can school ever be the place for such experimentation? Done properly, neither teachers nor insurance lawyers would be willing to take it on.

Maybe by proscribing its teaching we could keep it set apart as a far, forbidden vista,

only to be approached with trepidation; when, perhaps, you are ready. How do we make the next generation want to learn chemistry?

I've started early with my own children. For my eight year old's birthday we bought her a chemistry set. It's rather simple, with few ineffable chemical names, but it was immediately The Best Present Ever. And now we're moving on: one day a few weeks ago, a tub of cupric sulfate broke in the lab.

I swept the dusty powder into a bag and brought it home. In front of her I tipped the powder into a jam jar and dissolved it in hot water. Yesterday, I broke open the jar. Her mouth formed an 'O' and she covered it with her hand, her eyes as shiny blue as the crystals.

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Opinion

The Fourth Protocol

In Chemistry World: The Last Retort—December 2008

Anyone who has any laboratory teaching experience can tell you how difficult it can be to get students to follow instructions. This is especially true if the student doesn't actually want to be there, as when medics have to do rotations through the lab. Sometimes not following instructions is only a minor annoyance; after all it's *their* degree, not yours. Of course, not following instructions can be downright dangerous: the student who spills phenol across the bench, or who carries a dewar of liquid nitrogen in the failure-prone lift, is risking more than a nasty burn or failed degree.

On the other hand, interpreting instructions creatively, or too literally, can also be a problem. Going *beyond* the rules, rather than breaking them, has its own risks.

Imagine, if you will, a high school chemistry lab. Today's experiment is to measure the evolution of hydrogen gas from the reaction of hydrochloric acid with magnesium ribbon. We will be collecting the gas, via rubber tubing, in a graduated 60ml syringe. We will record the volume of gas produced. Knowing what we started with, we can use the ideal gas law to calculate how much hydrogen we should have produced and compare it with what we actually get. The syringes will be clamped so that no one drops them. Most of the class will be using virtually indestructible plastic syringes; the rest will be using these very expensive and fragile new, glass syringes. The plunger moves more freely in these, so we should get a more accurate result.

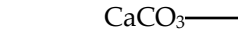
Quite why Spencer Hogg, the class clown, managed to get one of the new glass syringes was beyond me. Looking back, I suspect it was a deliberate ploy by Mr Woods to keep him interested. It

must have worked, because despite Spencer having as much aptitude for chemistry as a homeopathy practitioner, he decided, that fateful day, to take the logical next step and confirm that the product was indeed hydrogen gas. Remembering that the test for hydrogen is the generation of a pop when a lighted splint is held to the mouth of a test tube, Spencer unclamped the syringe, removed the plunger, lit a bunsen and put his lighted splint into the gas-air mixture he had just generated.

To this day I can feel that piece of glass whistle past my ear, while twenty feet away Spencer Hogg stood, pale-faced, holding empty air. That no one was hurt was nothing short of a miracle.

The same was not true for one boy, who thought he was doing exactly as he'd been told. A year after Spencer's explosive realization, we did another memorable experiment. We were told to take a certain white powder and heat it in a crucible. Then we were to tip the powder into a watch glass, hold it in the palm of our hand and add water, drop-wise. Finally we had to test the pH and work out what the starting material was.

The white powder was chalk dust, and the first reaction was calcination:



$$CaCO_3 \longrightarrow CaO + CO_2$$

Adding water formed calcium hydroxide:

$$CaO + H_2O \longrightarrow Ca(OH)_2$$

Just as we were all holding the watch glass in our palms in one classroom, there was a scream from the joint top set classroom next door. With unreasonable literal-mindedness and a startling lack of self-preservation, one boy had held the calcium oxide directly in the palm of his hand, sans watch glass. Alkali and an exothermic reaction did the rest.

I watch my students. Very carefully.

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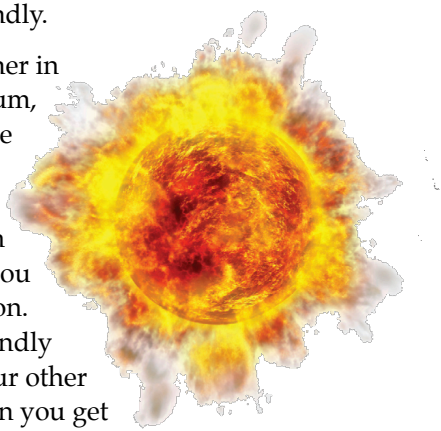
Stardust

In Chemistry World: The Last Retort—May 2009

'How do we make water?' asks my nine year-old daughter. Not, as you might have expected, 'where does water come from?' but specifically 'how do we make water?'

I thought about this, and said by the combustion of hydrogen-containing fuels, but immediately realized that this was only half an answer. How can you understand $H_2 + 1/2O_2 \rightarrow H_2O$ if you don't know what H or O are?

We started with the real basics. Back when the universe formed, I said, we only had hydrogen atoms (I lied), and drew a little circle. I said that there's more hydrogen than anything else in the universe and that hydrogen atoms are actually friendly little things and like to go around in pairs. I then said that if you squish hydrogen molecules together you can turn them into liquid, but if you do this even more they fuse and become 'helium'. I said that hydrogen atoms weigh 'one' ('one what?' she asked. Good girl), but that helium atoms are number 'two', weigh 'four', and are very unfriendly.



If you then squeeze helium together in the same way you can get beryllium, and then oxygen, which likes to be friends with two other atoms. Then, if you could mix these first atoms together in the right way in the middle of stars, I continued, you can get the other atoms, like carbon. And carbon, you see, is really friendly and likes to make friends with four other atoms, such as hydrogen, and then you get methane.

And the incredible thing is that all these atoms were made in stars right back at the beginning of the Universe, billions of years ago. And when a star dies—'That's when the sun gets bigger than the solar system and then shrinks to nothing,' she said.

Exactly. When a star dies, these new atoms are spread into space and form part of new stars, and planets, and you and me. We're made from bits of old stars.

'Wow!'

So what happens, I said, drawing butane, is if you have a molecule like this with carbons and hydrogens, and add an oxygen molecule—which is what happens when you burn things—then because oxygen is friendlier than most atoms, you break up the butane and get carbon dioxide (because oxygen is such a good friend with carbon there only needs to be two) and...water. H2O. And that's how we make it.

I said that we can break water apart: if we stick an electric current through water it splits back into hydrogen and oxygen. Her little eyes lit up, but before she could ask if we might try it, I changed the subject.

I asked her if she knew what 'fission' was. I drew a uranium atom. I explained about neutrons and chain reactions and atomic bombs and nuclear power, and what happened in 1945, and as powerful as fission is; fusion—how stars get hot, how all the atoms (the H and the O and the C and everything) that make you and me and the earth and everything in it get made—is even more powerful. Each time you fuse hydrogen, I said, you get much more energy than you do from splitting uranium.

'Oh,' she said, nonchalantly, 'we've been told about fusion power. Why don't we use it?' and then I had to explain why she couldn't come into the lab and try to fuse hydrogen or make liquid helium: except it was time for school and we were running late.

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Big Country

An itinerant scientist adapts to Australia—20 July 2008

Flying into Sydney, we peered eagerly out of the grimy windows for a first glimpse of something we might recognize—the Bridge, perhaps, or the Opera House—global icons of our new home. But the Harbour City was grey, shrouded by low cloud. Summer humidity pressed in on us when we left the air-conditioned comfort of the terminal building, making breathing difficult.

It's not that we weren't seasoned travellers: from military families and merely intending to stop off in our quest for an ultimate home in New Zealand, we have been around a bit. But Australia still managed to surprise us. It is big. It doesn't hit you at first, not if you've overflown Canada or Europe, or rumbled through the night via Singapore to get there. But from the Gold Coast to Kalbarri is two and a half thousand miles: further than

Washington DC to San Francisco—or about the same as from the Channel Islands to the Urals. In the time it takes to fly from Canberra to Uluru you could be in the administrative capital of New Zealand.

We were not ready for the scattered nature of the population, even along the coast. In Europe you can travel for an hour and be in a totally new city, or visit three countries and as many different languages. But it is at least an eleven hour drive from Sydney to the next major urban centre (Canberra, skulking behind trees next to a man-made lake, hardly counts). It is twice as far again to Cairns, and you're still on the East Coast.

The sky, too, is big. Perhaps it is an illusion brought about by the intense ultraviolet, but there is a hell of a lot of it. The sky and land seem to converge asymptotically. We expected sunshine. We knew it would burn this fair-skinned European in minutes. We prepared: plenty of sun-block, mandatory hats, rash vests in the surf. And after two years I am only slightly tanned. But no one warned us to expect monsoons. We survived Australia's wettest drought. I have walked home some days unable to get any soggier. But I also feel naked if I ever leave home without sunglasses.

It gets dark quickly; there is no drawn-out dusk. Leaving the lab well after nightfall I am still amazed how hot and muggy it is. But an hour inland and the temperature suddenly plummets: away from the city lights the sea of the sky is lit from beyond, so bright it it almost hurts to look up.

Australia is hot. Swimming pools and air-conditioning are necessities, not luxuries. When the sun shines you can tell the new immigrants by how readily they nick off to the beach. In May, the weather forecaster will describe a high of 18°C as 'wintry'. But, strangely, I miss the cold, the frost on windows, the golden gown of autumn. In this crazy climate the palms and succulents ignore the seasons and the price of bananas is the only guide to the time of year. It is the English trees, the seeds planted in a faraway land, that keep the rhythm of death and new life.

We did not anticipate language problems. We expected some ribbing for being bloody Poms, had been warned to the difference between 'root' and 'route'. We knew what was meant by 'stubby', 'wowser' and 'thongs'. We expected a bit of a culture shock in moving from a small market town to a city. What we found was that the imperatives of housing, closeness to public transport and a state ('public') school landed us, after some heart-wrenching moments, in the midst of Strathfield: population 80 % Asian and 15 % Indian. We expected meat pie floaters and got kimchi.

We are strangers in this strange and wonderful land. Our two girls go to a public school—a good one, consistently scoring much higher than the state average—with a roll that is nine-tenths Asian. They are the only white girls in their classes, and love the attention. Our suburb is crowded with incredible shops, cafes, smells. It is rare to overhear a conversation in English, and in conjoined foreignness with our neighbours, we have made this our home.

The lab, like labs everywhere, is populated by a mix of cultures and nationalities. A poll last year determined that between us we spoke about twenty different languages. Occasionally, we'll launch a search for a genuine Ozzie cobber (I thought I found one once, but he turned out to be a Kiwi). The 'real' Australians are endangered, often found begging in 'The Block'—the Aboriginal heartland by Redfern Station.

Sydney roads and drivers are terrible; narrow and in bad repair. Anyone used to the M40 or London traffic will find themselves mentally downshifting at the sheer incompetence of planners and motorists alike. Frugality and economy are buzz-words for early adopters—as are "defensive", "skillful" and "driving with due care and attention". We were fortunate to find a car with a manual gearbox; the V6 engine it came with is not, sadly, unusual. I hear the rain forests cry every time I open the throttle. And yet, in a country where petrol is half the price it is in Cambridge, politicians make election pledges to reduce the cost of motoring. Climate change might as well be happening on a different planet.

But at least Sydney feels like a real city. It is alive. There is rubbish on the street and queues to get into cafes, standing room only in pubs, the odour of kebab vans and the roar of people and traffic squeezed into too small a space. City lights burn into infinity, broadcasting that we are, here and now, alive and glad of it. The capital, Canberra, is a different matter entirely. The business of executive administration can not support a third of a million people, so more respectable trades (pornography and prostitution, as the old joke goes) have to be shoehorned into this artificial space. The major shopping centre is clean, civilized and aseptic. The sun-warmed pavement cafes are full, but not crowded. There is always a seat. The lazy 50 mph speed limits on wide roads make for a soporific experience, compared with the slower but more frenetic goat tracks of Sydney. Signs along the parkways inform residents how much water is in their dams and how much they are using, as if siting the capital in one of the driest regions of an arid continent was ever a good idea.

Australians, rightly, are proud of their beaches. We love them. I count them as a reward for going through with this upheaval. And there are other things I have found too: to carve a new niche has forced me to focus on what I will call, borrowing from management-speak, my core competencies. I am communicating better, writing more, concentrating on the hypothesis. Perhaps it is the isolation that pervades this vast continent: lost in the Outback you would be thrown ultimately onto your own resources for survival, resources you maybe did not know you had.

Together with the madness of the sub-tropical climate, this might explain why the strangest contrasts persist. Australia likes to consider herself progressive, but is gloriously un-PC and reactionary. Republican, but clinging to and constrained by dreams of Empire. Patriotic, yet insecure about her place in the world—disparaging of her heritage and mother country, but never quite growing up. Valuing independence, as long as it conforms. Immensely proud of sporting achievements, but lopping the tallest poppies. Boundless plains to share—but almost constitutionally intolerant. We were used to globalization, but got bananas that triple in price with the seasons.

I'm used to the humidity now. Australia is big enough to challenge your preconceptions and change your outlook. This is the land of opportunity, the Lucky Country: but it is up to you to do something about it. Arrive open-eyed and grasp the opportunities that you see—and if you don't see any, generate your own. Being different is maybe an advantage; people expect strangeness from you. As anywhere else, Australia is what you make it.

It's big enough to cope.

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http://mobility.embo.org/index.php?
Itemid=272&id=913&option=com_content&task=view

Fiction

Private Investigations

March/April 2008

A four-part story about the adventures of a very special scientist-for-hire.

Published online at http://www.lablit.com/series/9

Part I

The name's Richards; Nick Richards. What they call me is another matter. This is my office. Find a seat—just move those papers onto the floor. Whisky? It's all I drink at this time of day. Any time of day. There might be some coffee somewhere. Gives me the shakes. Try above the sink.

I don't get many visitors these days—the odd debt collector or jilted broad maybe, but I don't do that sort of work anymore. I kinda got a reputation, and people don't like that. I guess you could say I work for the Government—a public investigator.

That? Oh, that's my piece. A Gilson P10, since you ask. Never leave home without it. Yeah, some guys call it a broad's pipette, but I prefer it to the larger models. More precise. Less messy, too; ever see a grad student with a P5000? Scares the crap out of me, and I've been around the hotblock once or twice.

You want my story, or are you just going to admire the equipment? Yeah, you can have your back to the door. I prefer a wall behind me.

It started about six years ago. I came to the city looking for work. I'd heard these guys were doing some nuclear trafficking. This was before I knew about the Germans—oh, I knew about him all right, with his Nobel Prize and armies of post-docs, but I figured he was well out of it.

So this guy comes up to me, thinks I'm crazy at first, says he may have a job for me. It's not like anything I've touched before, but it sounds interesting. I used to like 'interesting'; now I prefer a quiet life.

"Long time no see," he says, and I wonder what he knows. "I'm Bruce." He takes me to his office.

"Nuclear trafficking?" I say. "Isn't that illegal?" I don't believe in messing around—get to the point. But he doesn't look the type to scare easy, and he laughs.

"No worries," he says. "Government work."

I figure he's spinning a line, but I play along.

"High risk, but big rewards," he adds. "You could be famous."

I laugh with him, keeping one eye on the door. Fame's all right, but it doesn't pay the bills—take it from me.

Tap, kettle. I'm sure you can work it out.

He shows me his operation. I tag along, toe the line. He takes me to meet his crew. Usual suspects: the quiet, smart one; the fixer; the sassy broad. Didn't look like Government types, but that's the game, see?

The quiet one's just sitting there at his desk. He's working on something—I can't tell what. The fixer is in a corner, his back to us. There's some kind of tension in the air, but it's too early to tell the score.

I check out the broad—and she's sizing me up. Redhead. Eyes like emeralds, skin like silk; attitude like nitroglycerin. I figure when she gets upset people get hit by shrapnel. The type who could break your heart, or maybe your legs. One to watch. Preferably from a safe distance—like the next county.

No, I haven't got any milk. You'd better learn to like it black. There's a mug on the drainer.

Bruce says he wants to offer me the case, but it's not his decision.

"You have to see Mr Big."

I figure this is it. If it's going to blow up in my face, it's going to be now. I didn't know what I was walking into, and if I knew then what I know now you know I would have turned and run. But it was all unknown. I knew it was unknown; but that's all I did know.

We take the elevator to the top floor. I slip my hand into my pocket and slide the safety on my piece. I was taking no chances.

I'm shown into a spacious office, with a single bulb hanging from the ceiling. There is a wide but low mahogany desk, and a single chair in the middle of the room, the light reflecting dully from its edges.

"Mr Big?"

A figure emerges from the shadows and sits on the edge of the desk, legs dangling. His legs, not the desk's.

I case the room, but as far as I can see, which isn't very, it looks clean. Dusty maybe, but clean. I check out Mr Big. White hair, Scottish accent; east coast. One eye seems squashed—a sporting accident, I find out later.

"You can call me Dick. Pleashe, shit down."

I sink into the worn leather, not yet relaxing—keeping one hand on my piece.

"Sho you want to work for the British Government, Dr Richardsh? For the MRC? Are you shure about thish?"

No, my teeth are fine thanks; that's how he talked. Can I go on? Thank you.

I parry the question, backhanding it across the desk: "What can the British Government do for me?"

He rallies quickly, volleying back to the baseline.

"Opportunitiesh, Dr Richardsh. Contactsh, connectionsh, your name whishpered abroad in high plashesh."

"I have a lot to offer, Mr Bi—Dick." My reply drops in front of him, and I see the spark of victory in his good eye. Luckily, I catch sight of a book of matches and kick it towards my seat. He moves in for the kill, but I'm ready for him: "If the prishe, sorry, price is right."

I drop my arm over the side of the chair and palm the matches.

"The jobsh yoursh, Dr Richardsh. Don't let ush down."

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Part II

Am I boring you yet?

Mr Big took me round the joint, filled me in. I emptied myself and came back. It was a smooth operation he ran. You know those four-bladed razors they do? That kind of smooth. Smoother. It could get your phone number at a party and you wouldn't even know it.

The main business is PhDs. You ever see a PhD being made? It's not pretty. You take a kid, still spotty, put him through three or four years of hell, end up with a machine. Do it right and you can squeeze the life out of him.

Yeah, they're exploited, but that's how it is. They do all the dirty work, all the cases no one wants; desperate, see? They'll do anything to get that piece of paper. The Government knows, of course – they even pay us to do it. Slave labour, really.

But it's all a front. The real work is tracking down proteins. Who they're with, where they're going, what they do when they get there. Dangerous work, dirty work.

Come over, look at this. Those dots, these patterns – mean anything to you?

No, they don't mean anything to me either. Damn. But you learn here, and learn fast. You have to, otherwise you're out; no job, no money and one dark night you just…disappear. Not good to have failures running around on the street, scares the punters.

Oh, no: no one dies, as such. I think they get recruited into Admin, which is the same thing. The Government? As long as we keep churning out the PhDs they don't look twice, don't care.

No, you won't have seen this place in the papers, or on television. When the press want an interview we hire a warehouse someplace, find an out-of-work actor, give him – or more likely her, if she looks good – the script and pay them to shut up.

But it works, see? Occasionally we announce that we've discovered something important, the press crawl all over us, and the Minister gives us some more money. Best thing is when we can buy a Nobel Prize. The payoff is big. Very big. Bigger than

the Bank of England big. All the money comes back, one way or another.

You're joking. But then, I thought the operation was clean too, when I started. Plenty of others like this around the world, no one thinks this place is different. I don't think they think that. I think I'd know if they thought that.

Mr Big said nothing about it. He showed me the labs, the rows of white coats, the equipment. Then I was in, working for Bruce on my first case. The broad gave me a hard time at first, but she warmed to me. Blast furnace warm. I got third degree burns in five minutes.

"Hey Richards," she said two weeks later, "you look new here."

She was smart, as well as sassy. I shrugged. I didn't want to give too much away. She blew smoke in my face. I emptied a fire extinguisher at her.

"You put my fire out, babe. You've got balls." She winked, dropped the matches and walked away. My eyes were watering. She was fast, as well as smart. The others pretended not to notice. I looked, and they weren't looking. They looked as if they weren't looking, so I knew they were looking.

I followed the broad out of the room.

"What's your name, sweetheart?" I asked.

"What's in a name, babe?"

"Letters, for one. Sometimes those funny accent things, if it's a French name."

"You're a funny man, Richards. You'd better watch your back."

I twisted around. "That's going to be difficult, sweetheart. I could use some help."

She moved closer and whispered in my ear:

"They're on to Bruce."

I grimaced. "You're standing on my foot," I said.

She backed off. I followed. She backed up further. I followed again. I had no choice – my shoelace was caught in her hobnail boots.

Luckily I had a book of matches. I tore one out and set fire to the lace.

Outside, after the fire department had damped down and left, she came back over.

"Smart move, Richards. Destroy the evidence. I like your style." She put her hand in my pocket and kissed me on the cheek.

As she walked away, I felt in my pocket. I pulled out a half-eaten cream doughnut. I figured she must be sweet on me. I could have caught up with her easily enough, but finished the doughnut instead.

She turned around and came back.

"Sorry, I meant to give you this." She pushed a folded paper into my hand and walked away again. It's not often a beautiful woman leaves you twice in one day. I felt like my heart would break, but it was just indigestion. I never did find out her name, but it didn't matter after that; I never saw her again.

Back upstairs I scraped the cream off the paper and unfolded it. I read it through, twice. Then I turned the paper upside-down and read it again. It didn't look any better:

> *Richards. I'm writing this quickly because I know you won't have much time to read it. Do not trust the Germans.*
> *With love,*
>
> *The Sassy Redhead*
> *xxxx*
> *PS Your fly is undone.*

I looked down, which meant I didn't see the ape detach from the shadows and lay me out with a monkey wrench. Everything went dark.

When I came to, my head hurt. My back felt like a Prussian marching band had lost the key to the town hall and had been trying to keep warm by marching up and down my spine. While

playing Wagner. Bright lights swam across my vision. I couldn't move my arm. The ape was still standing on it.

"Just a message from the Germans, Richards." he growled. "Don't get any more funny ideas."

I tried to answer, but fireworks went off. The ape reached over and closed the window.

"Sorry about that," he said. "It must be Guy Fawkes' Night." He left the room. Two minutes later he was back.

"Um, how do I get out?"

"Down the stairs, to the left."

"Thanks."

Over the next few weeks I puzzled over things in my mind. Who were the Germans? Why didn't they like my jokes? Where was Bruce? Why were we celebrating Guy Fawkes' Night in July?

Bruce had gone missing just after the fire alarm. No one knew where, or why. That's why it's called 'missing'. I called the local flatfoots. They said he was missing too. I checked his office, his bench, looking for some clues, or even a book of matches. The trail went cold. So had my coffee.

Then I found a half-completed experiment. Two tubes, labelled, in the lab fridge. I read the labels and had an idea. It was a wild idea. It was a mad idea. It was the kind of idea that would either get you a medal or a posthumous court martial.

It got me the position of Principle Investigator. And then all the proteins went missing.

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Part III

Do you know what a post-doc is?

They're what you get if a student survives a PhD. They cost more, but they get more done. They're already trained, they know the system, they don't have terminal conversations with chemicals so often. And they know it's too late to get a real job,

so they have to work hard, to chase the dream of their own lab. Sometimes you see them, late at night, trying to complete an experiment for the fifteenth time or simply stealing reagents from other labs.

We had some post-docs in our lab. I was one once. They came from all over the world; Japan, Germany, Australia, Scunthorpe. The Japanese one was smart, really sharp. Smarter than a Saville Row suit. So sharp you could slice bacon with him. Used to work all night, and most of the day. No one knew where he came from, and he didn't have any family here. Some said he escaped from a Japanese game show, and was on the run, preparing for the day when a hit squad of specially trained ninjas would drag him back to Takeshi's Castle. Others said there was a girl, and that he joined the MRC to forget.

There's always a broad. But you never forget.

It didn't matter to me, or to the rest of us. He worked, he worked hard, and you could rely on him to get the job done, no matter what, who, how dirty or for how much. And that's why Bruce was trying to clone him.

He'd been working on it alone, but I figured a job like that needed real muscle. I went to see Mr Big again. I told him I wanted fifty greenbacks a day, plus expenses, on top of my retainer. He said, "Shure." I said I needed a state of the art cloning facility. He said "It'sh yoursh." He said "Anything elshe?" I said "No." He promoted me.

As I went home I realized I never said what I wanted to do. But he seemed to know. I figured he knew about Bruce's experiments. I figured that if Mr Big knew, then the Germans knew, and they knew he knew, and he knew that they knew he knew, and they didn't like it. I knew that. And they still didn't have a sense of humour. My head was spinning, which is how I noticed I'd picked up a tail.

I turned into Downing Street, and watched him follow. I swerved to avoid a pedestrian and turned up Corn Exchange. I took the next left, then left and left again. The lights turned amber as I approached St Andrew's. I accelerated and turned

right, tyres squealing on the tarmac. He shot through on red. I pulled an illegal U-turn and sped up Emmanuel, then down Parkside. As I passed the cop shop I checked over my shoulder; he was still following. I mounted the kerb, scattering pigeons and lovers like dandelion clocks, and tore across Parker's Piece, wheels leaving muddy furrows in the grass.

At the lights I went diagonally across the road. There was a squeal of brakes and a crunch behind me, but I turned up Lensfield and then across the Chemistry car park without slowing down. Coming out on Trumpington Road I checked behind, but I had shaken my tail. I was shaken too, so I dumped my bicycle and caught a bus back to the lab.

I could never go home again, so I started sleeping in the dark room, eating in the canteen. It was hell, and I was the damned. I worked on the cloning project. It was a bit below my usual rate for experiments, but I figured it would be worth the effort; a loss-leader. I just had to keep the experiments quiet – stop the Germans finding out any more, keep an eye on Mr Big and supervise the rest of the lab.

I was running out of eyes. Luckily, I found a book of matches, and slipped it into my lab coat pocket.

One morning I found the quiet one and the fixer whispering in my office. I could tell from their faces that something was wrong. The smashed equipment and torn papers gave me another clue. Someone had rifled through my drawers, and it looked like it wasn't a sniper. It looked like someone had machine-gunned my office, and then called in an air strike.

The quiet one said something. I asked him to speak a bit louder.

"They took everything, Chief."

"Everything?"

"Everything."

He was lying. They had left my desk and the filing cabinet.

"What sort of everything?"

"All the proteins, Chief."

"Stop calling me Chief. You're not cowboys and I'm not an Indian."

"Sure thing, chief."

"That's better."

The fixer turned to me. "They took every protein we're working on. And that's not all." He handed me a piece of paper. I checked for doughnuts, but it was clean.

"This paper's blank!"

"Other side, chief."

I turned the paper over. I looked at the fixer. He looked at me. I looked at the quiet one. He looked at the fixer. The fixer looked at the quiet one, and they both looked at me. I looked at the paper again.

"But that's impossible. It's like they never existed."

"All the databases say the same thing, chief. All the proteins we're working on, it's like they never existed."

"I just said that."

The fixer frowned. "We both said it. That can only mean one thing."

"What?"

"It's like they never existed."

The quiet one said something, but we didn't hear him. The fixer leaned against the wall.

Then everything went dark.

"Sorry about that, chief." The fixer took his hand off the switch and the lights came back on.

I went over and pulled the files on everyone who might have the balls to pull off something like this. A name caught my eye and hit me with the force of the 8:27 from King's Cross.

"There's only one person with the power to pull off something of this size," I said, my mind reeling from the shock of being hit by a train.

"What?"

"I think you mean, 'Who?'"

"Yes, sorry. Who?" At least he had the grace to look embarrassed.

"Three guesses."

"The Germans?"

"They've got the muscle, but they don't have the gall. Or the sense of humour."

"You don't mean –?"

"Yes, I do." I left the office. I never did find out their names, but it didn't matter; I never saw them again.

But now I knew who was behind all this: who ran the PhD program, who disappeared Bruce, who stole the proteins. And I knew where his office was.

****

Part IV

You think you know someone. You work with him, go to the bar, play tennis with him, get inside his head, understand him. But you can never know another man. There are always secrets, always things he's not telling you, maybe even things he doesn't know himself.

I thought I knew Mr Big. I knew his name, where his office was, where his kid went to school, what his pet dog was called.

'Walter', actually. One of those little dachshund things, looked like some lowlife had cut its legs off. Used to 'yip!' on frosty mornings and cobblestones.

Yes, I thought I knew Mr Big. But as I crept along the corridor I realized he was a closed book to me. One of those small books with even smaller writing, probably written in Italian – or German.

I was ready for a fight, and I knew I was going to get it. I kicked open Mr Big's door, and it slammed back in my face. I pushed against it with my shoulder, ripping the hinges away from the wall. As I fell into the room a sixth sense made me duck, and I heard a click and a whoosh as his Gilson went off. The tip ricocheted and hit the light bulb. I dived to the floor in a shower of glass. Everything went dark. I heard Big breathing in the corner.

"I thought you'd come, Dr Richardsh."

Click.

I scrambled across the floor to the desk.

Whoosh.

Something stuck into the floor behind me. His aim was good, but I was faster. I reached in my lab-coat pocket for my piece. *Damn*! – it had fallen out. I felt for it on the floor, in the remains of the broken light bulb. All I got for my trouble was splinters.

"Shit shtill, damn you!"

"I know what you've been up to, Mr Big. I have detailed files."

"You're good, Richardsh. I knew that when I hired you. But are you good enough?"

I stuck my hand back into my pocket, searching for something, anything. Luckily I found a book of matches. My fingers curled around it, pulled off a single match.

"You can't hide forever, Richardsh."

Click.

I put out my other hand and found a leg. It was attached to the desk. I braced myself against it.

"I don't have to."

I struck the match and flicked it across the room. I heard Mr Big swivel in his chair, imagined his Gilson swinging around, following the light. I pushed up, tipping the desk over. I caught a

glimpse of the matchlight flickering in his good eye, the Gilson pointing the wrong way, a stack of papers fluttering to the floor.

Big stood up, dropping his piece and bringing up a squash racquet. I hit him with a left hook, ducking as the racquet came round. He staggered back and I jabbed, once, twice.

"Give it up, Big. I've got the weight, the agility, and three manuscripts in PNAS."

"You don't get it, do you? How dishappointing." He swung the racquet again, and everything went dark: the match had gone out.

I jumped back, the draught from the racquet on my face. I charged forward, pushing Big against the wall and winding him. I punched him in the jaw and he dropped to the ground.

"It's over, Big. The authorities can deal with this." I dragged him by the collar into the corridor. His breathing was fast and shallow.

"You think you've won, Richardsh."

I thought I had.

He knew I thought I had. I knew he knew I thought I had. I knew that, but suddenly I wasn't sure. An icy hand gripped my heart, a cold, icy hand with popsicle fingers. Then I realized what had been bugging me, the little niggle of a suspicion of doubt, the squishiness that lets you know you've trodden in something nasty and spread it all over the carpet.

I let go of his collar and stood back, breathing heavily.

"Who's 'we', Big? It's not just you, is it? I knew you enjoyed Wagner, but I hadn't realized you had no sense of humour."

There was a low, rasping sound: Big was trying to laugh.

"Sho you gueshed? Thish phony acshent didn't put you off the trail? You are good, Richardsh."

"I've suspected for a while, Herr Dick. Why do you keep the accent?"

He shrugged. "Habit. Can't get rid of it now. Do you know what itsh like, every day, to live a lie, to shit in thish offish – that'sh a nashty cough you have there, Richardsh – waiting for opportunity, marking theshees, dreaming up world-classh projectsh?"

"What did you do with Bruce?"

Big turned to face the wall and said, "He's in a better place."

"What? Scunthorpe?"

It no longer mattered. I realized that Big was trying to tell me something that did matter, something bigger than a single PI, bigger than a lab: maybe even bigger than the MRC.

"So, you're with the Germans. Working with them, one of them. What's the dirt?"

"Haven't you notished? They – we are in every lab. All over the world, working, obsherving, organishing. Not dishtracted by shillinesh." His voice dropped. I helped him pick it up and he said, "We do it better. We dishcover the Unknown Continent, and you play with pebblesh on the shore. Schience needsh ush."

I was disappointed. I had respected Big, and now he was telling me that he was just like every B-movie scientist that had ever existed, with dumb robot and beautiful daughter. The only things missing were the maniacal laughter and the fluffy white cat. I walked over to the splintered remains of his office door, knelt in the debris, and found my piece. I idly slipped the safety off and gestured with the barrel.

"There's one thing I don't understand. Why did you give me the cloning lab?"

"I wanted more like you, Richardsh. You've got drive, ambition, gutsh. What we want. What we need."

"Two things. Why did you steal the proteins?"

"What elshe could I do? You were too shucceshful. You had become a threat. We couldn't allow you to clone the Japaneshe. That wash evil."

"I see. *Quis custodiet ipsos custodes*?"

"'Who shtirs the cushtard?' What?"

I leaned against the wall. It had been a long day, and it looked like it was going to get longer. The pain behind my eyes had brought some friends, and they were fumbling in the desk of my mind for the keys to the liquor cabinet. They slammed the drawers shut and looked at me accusingly. Just one shot, and it would all go away. It wouldn't matter any more. But Mr Big was still here, and the whisky bottle was two floors down.

"What now, Big? I can't leave you here, I can't let you continue."

He grunted, and struggled to his feet.

"Do you know who runsh the MRC, Dr Richardsh? Really? Not me, not Jennie in the offish, not even that creepy guy in Shtoresh who knowsh where everything ish."

"And not the Germans?"

Mr Big gasped for breath and pulled my ear towards him. I had no choice but to get up and follow it. He leaned over, as if to whisper in my ear.

Click.

Suddenly he shuddered, and fell to his knees. Over his shoulder I caught a glimpse of a shadowy figure at the end of the corridor. I ran to the stairs and took aim – but there was no one there; just fading footsteps, the rain on the windows and the unmistakable odour of a recently fired Gilson.

Big coughed. I was kneeling at his side in an instant, supporting his shoulders. "Come on, Dick. Hold on, it's not over yet."

"It ish for me, Richardsh. I'm shorry. I wanted to make it work, make the MRC great again. It'sh – it'sh up to you now: make it shomething to be proud of. Watch" – he coughed again, a rattle in his throat – "watch your back, Nick Richardsh."

His head lolled in my lap, the spark of life finally snuffed out. And all the books of matches in the world would not re-light it.

***

I run the show now.

Everyone in my lab is hand-picked, each a brilliant investigator in their own right. They all have stories, and maybe, if you're lucky, you'll get to hear them.

There's not much else to say. It's a hard life, a lonely life. All I can offer is your own set of Gilsons and shares in a whisky bottle.

And a state-of-the-art cloning facility.

Welcome to the MRC. Don't let us down.

Rhythm Method

18 May 2008

There is a rhythm to this lab.

The whirr of the vortex, the whizz and the click of the centrifuge. The rattle of the flea in the PMSF bottle. The sub-hertz murmur and roar of the thermal cycler. The bubble of the water-bath. The chatter of the students in the next lab. In the corridor, the constant hum of huddled freezers and the susurration of the autoclave.

There is a another rhythm, only apparent from a distance of a few years. The students arrive each autumn, and leave after a few months. Some persist, extending the wavelength irregularly, out of phase with the post-docs.

Here is Juergen. He is pipetting solutions: tiny amounts of liquid from stock tubes to experimental ones. He uses the vortex, the centrifuge, the thermal-cycler. He has faith in invisible partnerships, and hope that it will be rewarded.

He has been in this lab for seven years, dampening the rhythm of the students and the less able post-docs. He has an arrangement that suits him. It suits the boss, who is freed from the recruitment beat. It suits the Head of Department, and because it suits him it suits Admin. The bureaucrats in Brussels would not be sympathetic, but because Admin understand the importance of an untroubled Head of Department, Brussels is not about to find out how convenient everything has become.

And here is Daniela. She has come from Cambridge, a sequence of constructs in her backpack and a procession of *Nature* papers in her CV.

Together, blond head next to dark, they puzzle over the most recent Western data. Something is not quite right, and they go to coffee. On the way they meet a laughing crowd from a lab upstairs. One notes their serious faces and hushed but urgent tones.

Coffee is inconclusive. They decide to run the experiment again. They work through lunch, through the afternoon, and into the gathering gloom. Finally they leave the lab together, and catch different busses.

Here is the observant one from upstairs. He was unlocking his bike as Juergen and Daniela left the previous night. He is collecting bottles from the autoclave when Juergen walks past. He asks if Daniela enjoyed wherever they went last night.

Juergen looks blank. Then he laughs. No, he says, we do not have that sort of relationship.

The observant one apologizes for forcing the wrong conclusion from the available data, but is waved away with a rare smile.

Two different periodicities coincide: the end of the week and the pay cycle. The lab—boss, students, post-docs— retire to the pub. Daniela and Juergen are still working, feeding films through the processor, varying exposures in the dark-room until they are both satisfied.

Laughing, and coloured from an undignified run across town, they arrive at the pub. Eyebrows are discreetly raised. The Boss offers to buy more drinks, and Daniela goes to help her with the glasses. You and Juergen, she says. You have been spending a lot of time together. Do we celebrate?

No, says Daniela, blushing. It is work. We don't have that kind of relationship.

There is laughter around the table, rising and falling in syncopated friendship.

Nights shorten, new leaves appear on old wood, and spring puts on her most extravagant dresses, resuming her interrupted dance: the oldest and most constant rhythm of all.

The manuscript is ready; read and re-read, revised, changes tracked: submitted. A phoney peace. Planning new experiments, grants; job applications written and reviewed. A sudden urgency —the frenzy to make reagents and perform the experiment requested by not unsympathetic reviewers.

Celebration, barely breathing space. Dead calm.

And the year peaks: a new project, another grant cycle. Summer students fly in and out. Hot, lazy wasps contest the orchards. Wheat is mown, grapes are harvested, steins are emptied. The year shakes out its best clothes for the last time, red and gold detritus nuzzling lanes and parks. First year graduate students learn by induction: the older ones contemplate some sort of closure.

A blackbird sings out of season. Plastic lids bang against wheelie-bins. The hum of traffic is almost turned into melody by the first muffling snow.

Here is Juergen, drowsy, fumbling for the alarm clock. Outside his window icicles deliquesce.

He lies back, his hand leisurely tracing a waveform in the bed. "Will you make the coffee?"

"No," says Daniela, as she smiles and draws him close, "we don't have that sort of relationship."

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Freedom Fighter

August 2008

The stars are veiled tonight, as if ashamed at their unwitting collusion. Streetlights remain unlit, not a lamp shines from a single window.

It is the hour of curfew. I creep along the back streets, through alleys, behind gardens and beside fences. My eyes are accustomed now; what little glow comes from the military compounds and searchlights reflecting from the low clouds is sufficient. Besides, I know these roads, this town. I grew up here.

We had received their radio signals two years before; spent months deciphering them, translating their language, composing replies. Their spaceships, as big as cities, hovered far above our farms and valleys with gunports closed. When their Marines came down, in house-sized metal boxes atop tongues of fire, they wore soft caps instead of helmets, their weapons shouldered and pointing at the sky.

They said they were our friends. We welcomed them. The President had been briefed and re-briefed until her every word, every breath, was perfect.

There is a rumble in the distance. A patrol is approaching. It is a couple of streets away, and their lights shutter them into a narrow cone of blindness. I am safe, for now.

I have made it to the rendezvous. I roll up a sleeve to display the Mark, which glows with a faint phosphorescence, and wait.

Superficially they resemble us. Bilaterally symmetrical, but shorter and stockier; evolution responding to the immense gravity of their home planet to stunt them grotesquely. Their limbs—as in all but one of their native animals—are shortened out of all proportion. Their sensory organs, clustered tightly as they are, caused a number of dignitaries to feel physically sick. Some theologians wondered how they could be made in the image of the same God. The smarter ones talked ceaselessly about internals: how they must have souls and intelligence, and

how love and justice were to be considered attributes of God more than mere physical form.

The President met them with grace and dignity, extended an arm in (what we hoped was) a universal gesture of peace. It seemed to please, and possibly amuse, them.

A soft hand extends from the shadows, clasps mine.

"I didn't think you'd make it. The patrols have been everywhere."

"Beloved. You forget how well I know this place." I try to look into her eyes, but all I can see is the Mark on her own arm.

"Did you bring the detonator?"

"Of course," I say. "Is—"

"Yes. He is waiting for us. We must go now."

The aliens brought with them technology and medicine. With them came their government, their philosophies, their missionaries and religion. It did not take long for some disaffected individuals, fearful for our way of life, to hijack a returning transport and crash it into one of the eight ring supports being built on their planet. The President, as soon as she heard, boarded the next transport unescorted and unprotected, to plead forgiveness.

They arrested her. Put her in jail, sent us videotapes of her trial.

Executed her for the sins of a few renegades.

There would have been war, but we were completely outclassed. We saw the awful destructive power of their weapons, tested on infertile and uninhabited desert: weapons that we learned had been used without a second thought on their own kind. The supply of technology and medicines dried up. We surrendered without a fight, asked only that we be left in peace, to return to how we were before they arrived.

She kisses me.

"If I get back—"

"When," I say gently, "When you get back, my angel. We have sympathizers, remember? They will help you escape."

Then the rumours started. That we had our own interstellar programme. That we had our own weapons of equal destructive force.

The invasion, in the name of 'galactic security', was swift, unambiguous and brutal. They dismantled our executive structures, installed a puppet government.

We resisted of course.

It has happened before on our planet, when we still had parochial rulers. We have always had trouble with certain factions—the immoderate religious, the malcontent, the seditious, those who felt that the resources and the power had been unfairly distributed. In our own troubled history, major powers have frequently tried to project their influence around the globe, to protect their interests or to displace inconvenient governments, to convert people to their own way of thinking through military might.

Once they even called it 'liberation', but the resistance of ordinary people, fighting for what they knew and loved, escalated into a conflagration that almost consumed our entire civilization. We stepped back from the brink, vowed never to let it happen again.

"Will you wait for me?" she says softly.

"Of course. There is nothing else I can do." I touch her face in goodbye. I feel her breath on my hand. Then she is gone, lost to the night.

They came from the stars. And now she boards this sleek and urgent vessel, her mission as terrible as its cargo: to visit upon the planet they call 'Earth' the destruction they would wage upon us.

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Man of steel

December 2008

The suicide note itself wasn't particularly remarkable.

Handwritten, of course. Even the oldest computers would have detected the quiver in the voice, or parsed the strained phraseology, and automatically alerted the authorities. The blue ink scratched its way across the paper, as if hard pressed to recall the individual shapes of letters. At one point the nib had pierced the white sheet. Few people wrote regularly with pens. It was still taught at school, but the odd love letter or shopping list was as far as most people got. And suicide notes, of course. This was no different; the writing was that of the very old, or the very young.

In a way the hand was old, the oldest that had still lived. But just as the sunrise is as old as time and new each dawn, so this hand was new: three months and twelve days, according to the factory's records.

Even the words, the symbols of the man's thoughts, were not worthy of note. They would have won no literary prize; inspired no doomed, romantic quest; enquickened no tired and demoralized army. The very human story was the usual one: of love, of ennui and, ultimately, of heartbreak.

No one, least of all himself, remembered quite when or how he had lost his first hand, more than 300 years ago. The accident was recorded, but if the loose-leaf binder still existed, the cheap ink was long faded into obscurity. Sometimes he claimed it was an explosion in a fume hood; at other times a gas cylinder had fallen from its moorings and crushed him.

What his memory was clear on, and what was attested to in the medical literature, was that he had attached ('single-handedly, haha!' he would joke) an artificial limb to the remains of his own arm. Not a simple *prosthetic*, but a fully functioning organ of composite fibre, ceramic joints and golden threads carrying two-way nervous traffic. The body's own electrical impulses

provided power to the tiny servos that drove the slender titanium flexors and extensors.

No accident, the second prototype: it was tested and retested, planned months in advance. His wife directed the operation, and when he woke, his right arm to the shoulder was fully robotic. A fortnight later, while he was still delirious from antibiotics and analgesic, she was killed by a drunk-driver.

The record shows that he opened a new lab with venture capital, employed three dozen scientists and disappeared into his research. The exclusive clinic followed: he himself was its first patient, walking out on legs of alloyed titanium— and straight back into the lab.

Half a dozen more clinics started up across the nation, opening their doors to anyone whose medical insurance would pay the fees. For ten years the company replaced natural limbs with artificial constructs that were functionally equivalent to the original. More than equivalent: these never wore out, never got cancer, never got tired, never felt weak or cold.

For ten years the clinics operated and the lab researched. No papers were published, no patents applied for, and investors grew nervous. Interest waned. Two clinics closed; a third of the research staff was laid off. Rumours circulated, created by and lost in the noise of the Internet. It was another three years later when, finally, a press conference was called on the lawn of the first clinic, the handful of journalists who bothered to turn up were turned away—and were called back, to face a man who under crepusculine clouds *glistened*.

The patents and the papers followed on the morrow: the artificial blood, the fuel cells, the intricate and minuscule fibres and vessels and motors: in short, a body wonderfully and fearfully man-made.

Only his face appeared natural, and over the following years even that was slowly replaced. Having no need of food, depending solely on a defined and especially formulated medium, protected by filters and powered by the elements, no toxins could threaten him. With hard, durable alloys and man-

made composites in place of bones and tissues, redundant systems and every organ replaceable, he was all but indestructible.

Alzheimer's had been cured by the time he reached 105, and the last bastion of mortality— the uncontrolled cell division leading to legion neoplasms— tamed a few years after that. And then he was a living brain in a metal and plastic shell, talking, walking and living: never fatigued, immune to all disease, the Tree of Life incarnate.

For 200 years he lived like this, never needing to eat: a weekly cocktail of nutrients and pharmaceuticals keeping the one, irreplaceable fleshly and uniquely human organ alive.

When the end came it was without fanfare or press conference. No papers were written, no patent lawyers notified. With the finest of Torx drivers he opened an access panel, removed a wire, took out a power cell, held it— his life in his own hands.

The suicide note of the world's first immortal ended simply enough:

I cannot live without her.

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The importance of beans and turnips

In Hell, every morning is a Monday.

Nrch!tchu was not finding afterlife easy in the Department of Infernal Affairs (Summonings & Entrapments Division). He worked, when not on a call, in a tiny office shared with up to twenty other hot-desking junior under-fiends. He would have liked to have considered air-conditioning a far-off dream; unfortunately it was an up-close nightmare. Despite the worst efforts of Maintenance the temperature in the office was uncomfortably low while remaining just high enough not to require the attention of the Sickness and Danger staff.

He toyed with the plastic name-tag on his desk. There was another thing. It was one thing to have a spawn-name that sounded like his mother had influenza, but quite another to be at this rank. No respect, no respect at all. He'd turn up at yet another amateur seance and announce himself and they'd all laugh. Sometimes he wouldn't even get as far as "Slightly Hard of Hearing" before someone would say "Gesundheit" and he'd be back on his way across the dimensions, ears and tail burning with the blessing, laughter ringing in his ears with a reedy voice complaining "Roger, you could have at least disguised your voice".

And what about Brtwtgahu over there? Been in this department only nine millennia and was already "Criminally Insane". Bastard. Nrch!tchu would have sold his own grandmother to be even "Mildly Vexed", Beelzebub knew. Actually, he reflected, he wouldn't: he'd already sold her for three pounds of over-ripe Camembert to complete that job in Canberra. Brtwtgahu also wasn't summoned every time a snotty schoolkid thought it would be a lark to play with a ouija board and a bit of chalk. It was the candles, he was sure. Everyone seemed to be allergic to something these days, and it was just his luck to be lumbered with wannabe necromancers who sneezed at the first whiff of molten wax. Summoned at the drop of a hat—or sniff of a candle as it might be. Whatever it was, it was a right pain in the fork.

Just because he was a demon, he thought, there was no reason to treat him like dirt.

Kids these days. All world wide web and internet. How in Hades was he supposed to compete? What could he offer? And they were a miserable bunch of artists: Nrch!tchu hadn't seen a decent pentagram in centuries.

Still, all the calls meant his Fearmiles account was looking good. Another few hundred summonings and he'd be able to ask that tasty-looking succubus in Accounts out for a drink. He might even be able to take one of the company cars and go somewhere really special. He'd heard Birmingham was nice at this time of year. Maybe he could get a few apostates, which would be worth a promotion, surely?

That bastard Brtwtgahu. Not only did he score all the vowels but also managed to get assigned to some creep called Dawkins. What a crock that was. Just had to go in, throw a few synaptic switches and bugger off to the pub for the rest of the day. He always got a laugh. Always. Nrch!tchu had been given some druid called Williams. A druid! That was so two millennia ago. What was the point? Instantly forgettable—Nrch!tchu couldn't even remember his first name.

A flash, the stink of cheap matches. Now what?

Another accidental summoning, another spotty kid with asthma and red-rimmed eyes and no hope of a girlfriend. Nrch!tchu thought ruefully of the succubus in Accounts and speculated sadly that any potential necromancer who had a girlfriend probably wouldn't be doing this.

Sounded like a tree. Rowan, that was it. Nrch!tchu had turned the assignment down.

"I conjure and abjure thee—"

"I'm sorry, you'll have to speak up. See, says here on the name tag. Was that 'adjure' or 'abjure'?"

"What? You do as—"

"No, look, see I've got to be sure, I've got this timesheet and my line manager gets real *pissy* if—"

"Demon! I abjure thee to—"

"Right, 'abjure' it is, I'll be off then, cheerio, hope the cold gets worse."

Then there was the annual review. As the most senior junior demon he'd got into trouble for the moustaches that had appeared on the inspirational posters all round the department. He was supposed to set an example, they said, and even though the one about Sickness and Danger and the four-sided pentagrams was, from a certain angle, quite funny, it was his responsibility to make sure that sort of thing did not happen. Of course, we know you didn't do it, they said (you don't have the imagination, haha) but we have to set an example.

That wouldn't have been so bad, except that he *had* done it and no one believed him.

At least he was *trying*, not like the wastes of sulphur downstairs. But as his least unfavourite uncle kept telling him, you don't get points for trying: we're only interested in measurable outcomes.

And now this memo from Inhuman Resources. A 'reassignment' to the Department of Tempting Devices (Silicon). That would have been great fun when the human state of the art was bloody great Welsh rocks, but now it was all iPods and computers. Windows. What a low-grade, shabby evil that was. The potential that had been *wasted*. And everyone knew what 'reassignment' meant. The pitying glances from the rest of his so-called 'team' were nearly enough to make him consider switching sides.

What he wouldn't have done for a short extracurricular assignment, thirty years perhaps, to Conflicts. He'd seen the roadmaps for the Persian Gulf, and 2011 was gearing up to be particularly tasty. They'd be shorthanded for sure.

The phone rang. With a weary sigh he picked up the receiver:

"Nrch!tchu the Slightly Hard of Hearing and Socially Maladjusted, Summonings."

"Nrch!tchu. It's Senyr?cds in Accounts. Look, I know we've never met, but I've been admiring your trident for a while, and I really liked the way you got that University Department to change the line about being "crippled by indecision" to "differently-abled due to resolutely-challenged lifestyle choice", and, well, I've got tickets for the Bullring. Would you like to go with me?"

Ah, maybe Hell wasn't so bad after all.

Published in Mallorn, 2009

Helpdesk

October 2009

It's the smells I find most evocative. They take me places, short-circuit the other senses. A hint of rose; elderflower in the garden. The river and its white-sanded estuary; the crashing of surf. Smoke from the soldering iron; the high-school physics lab. The softness of her belly and a warm summer's evening.

Soldering iron?

I blink my eyes, trying to focus on the swimming greenness around me. I am on a forest floor, dappled sunlight picking out —no, that's not right. On a river bed perhaps, light refracting oddly and glinting off dust motes—that doesn't work, either. Besides, I can breathe. The air, and it is definitely air, I think I would know if my lungs were full of water, is clean and sweet, but with a definite odour of electronics. Dead electronics.

My nose itches. I move my hand to—I try to move my hand to scratch it, but something isn't quite right. My arm won't move. I try to sit up, see what's happening: but my body is just as stuck. I wonder if I'm drunk. That might explain why I can't remember what happened just before I ended up...wherever here is.

But here, here something appears. I want to say 'swims into vision', but that's not quite right, either. Nothing is quite right. There are two somethings, now. At least I think there are two. I can't focus properly. Maybe I can focus, and they are meant to be that fuzzy?

They are dark. I want to say they are the size of dinner plates, but I can't tell how far away they are. And now they shrink. Are they shrinking, or are they—

Ah. They are moving farther away. And they are framed by something that's shaped almost like a—and they're gone, and now they're back. Is that a nose, do you think? A slit in the greenness appears, a dark slit that seems to oscillate (and there again is the memory of the electronics bench swimming just out of my depth) and some strange noise in my ears.

And understanding in my head.

It is awake.

The words make themselves understood, even though I don't remember hearing them. I am surprised that I am lucid enough to realize this. But I've seen this apparition before: my heart suddenly racing, I open my mouth to scream but before I can it fills with something—something that feels like candy floss, squeaky like a balloon; dry like the taste of chalk. I try to sit up, buttocks clenching, chest straining against the straps holding me down, pin pricks of sweat on my brow: one drops into my right eye and I can't wipe it away.

There will be a moment of readjustment.

I fall back, breathing heavily. I remember getting out of a ski lift somewhere in the Swiss Alps, fighting to draw oxygen into my lungs. But there was the hush of freshly fallen snow; here this strange, pervasive, persistent borborygmus.

It is all right. Everything will be okay.

It's not a voice, it's a certainty in your mind. Force yourself to look at the creature (naming it tames the terror even as it engenders it) and focus on it. Take in its round eyes; the holes for nostrils; the lipless, quivering mouth. Force yourself to stay still as three long, thin stalks that you suddenly know to be fingers brush lightly (oh so lightly, like the touch of a hesitant lover—but that is not the source of the smell of the solder; this is the scent of evening) over your face and remove the gag.

We crashed. There is a problem.

There is a noise, a real, honest-to-God, human noise, like the release of pressure from a train's brakes. Light (and can this be real sunlight fording this turbid air like a frontiersman?) breaks in, and the creature seems smaller somehow; no less inhuman but not, somehow, as alien.

"I'm still on Earth?" I manage to force out.

Yes. There is no structural damage. We need your help.

A certainty. But why me? I'm a programmer, not an engineer.

"Show me."

The glaucous light changes then, flickers, moves. I am on a gurney and they are transporting me...where? I am being raised: my feet come into view, and suddenly my arms are free. Straps yet restrain my legs, but the tightness across my chest is gone. In front of me, it looks like nothing so much as a TV screen, or computer monitor. Blue screen, with white, alien characters. But some, I realize as my blood suddenly pounds in my ears, some I recognize:

```
0x0001000B 0x5043 ...
```

From the endless depths of space they came: technology to conquer distances that can only be measured in terms of photons; a civilization I can't imagine. And yet ...

I look at the blue screen again. Over my coughing, the pain in my chest, the tears that are suddenly streaming down my cheek, I hear them say, trembling, almost apologetic:

It just stopped. We didn't do anything different.

Published in Nature*: http://www.nature.com/nature/journal/v461/n7268/full/4611312a.html*

Dreams

April 2010

This wasn't right.

I heard the snarling first. It came round the corner at a run—large, black and foam-flecked, skin pulled back from its mouth, two rows of impossibly white teeth—and then the head jerked back, the snarling turning into a muted whimper and someone, presumably the dog's owner, hauling hard on a chain.

'Sorry about that, mate. 'E 'asn't 'ad 'is tea and you startled 'im.'

The first time this had happened it wasn't right either, but I'd got used to it. This time wasn't like the first time though, nor like any of the other times. This time it was different.

I muttered something noncommittal, and looked up at the skyline.

This time it was *wrong*.

***

I never thought I was special, or gifted, or particularly talented. I made my way through school with a minimum of effort, picking up perfectly adequate grades along the way. A passable degree; a group of people I might call 'friends'; a series of nights so late they were early; a couple of broken hearts—nothing out of the ordinary. Nothing *unusual*. The advertising job came along, and like so many things before, it seemed a good idea at the time. To my surprise I'd apparently been better than the competition. That's how it had been with Sarah. We got on well, we liked each other, spent more and more time in each other's company—and one morning woke up together in her flat. A few months later, the dreams started.

At least, they seemed like dreams; only more vivid, more real. They were happening about twice a week, now.

The first time: I can remember the first time most clearly of all. It was just after we had scraped together enough for the deposit on a small two bedroom end-of-terrace, and we were still

wondering what to do with all the boxes. I'd filled the kettle—an old-fashioned affair with a whistle—and lit the gas under it. Standing in my boxers looking out over the—my!—garden, Sarah had slid her hands around my waist, pressed her breasts against my back and nuzzled into my neck.

'Hello gorgeous,' she had said, 'what are you doing awake?'

I wriggled a bit, twisted to try and face her, and

> *there is an irresistible pressure in his back, and his mouth is full of mud. Someone is plucking at the coarse wool tunic he is wearing. There is cacophony around him, but he can make out the words 'Get up! Get up you lily-livered Limey!' The accent could be American. He pushes up on one knee, using the stick in his hand, but it's not a stick it's a rifle and he knows, somehow, that this is the bolt and that is the safety catch and this rag is keeping mud out of the breech and then he's on his feet, running, running over wooden planks across the bottom of the trench, following the pair of boots in front of him. A whistling; someone shouting in his ear to get down; a hand shoving him from behind...*

The whistling gets louder, more intense. I feel Sarah rubbing my shoulder:

'Go and make the tea, will you sweetie?'

***

There was a lane here, curving away and down a slight hill. I walked past the man, his dog still growling at me. A slight breeze carried the suggestion of cherry blossom and the sun warmed my face. Through a break in the hedge on the right I could see a flat, groomed green; a white-clad figure stooping to release a bowling ball. Bluebells waved gently along the side of the lane.

I risked another glance upwards. Yes, it was still there—no Londoner could mistake the triangle-studded bullet shape of that building, even up close—but what were the buildings that towered above it? Sandstone and red brick, gothic arches, flying buttresses—and here, an octagonal outpost, the size of maybe

three double-decker buses, apparently suspended by a curved and eye-achingly slender arch.

To my left stood a small, blue hut.

***

Sarah was a scientist. The first time I saw her was at the birthday party of a mutual friend. She was leaning against the kitchen door with her eyes fixed on the light fittings, while some guy in pointy ears and a yellow sweater talked to the her breasts as they bulged over the top of her corset. My eyes lingered over the stockings and suspenders, and I hummed a low drone of approval. I must have been smiling—she suddenly looked across, took in my outfit and cocked an eyebrow. What the hell, I thought, and wandered over.

I interrupted Spock.

'Frank N Furter?'

'Yah, Gandalf.' The corner of her mouth twitched into a faint smile. 'The invite said Science Fiction, not Fantasy.'

I shrugged. 'There's a difference?'

She looked at Spock, who was now staring at me, openmouthed. 'Some people think so. I've got a PhD in cognitive neuroscience and all I get is sad jerks talking about the difference between Trantor and Coruscant and the improbability of Vogon spaceships.'

'That's Vorlon, not Vogon!' said Spock, turning back to her.

'Oh for fuck's sake,' she said. To me: 'I'm Sarah.'

'Simon.'

She nodded towards Spock. 'He's a complete nerd, but you look like fun. Come on, this place is boring me.'

The rest of the evening passed in a blur. We went for a beer, a curry; to a club; and then I woke up in the bath in my shared house still wearing the sandals; the fake beard in a grubby heap on the floor and someone hammering on the bathroom door.

When I managed to ache my way back to my room I found Sarah face down and sound asleep on top of the bedclothes.

I lent her a jumper and walked her back into town, stopping off at her lab. I sat on a stool in a clean, white room with gleaming bench-tops and the faint smell of disinfectant while she swiped cards and punched keypads and disappeared through solid steel doors 'to change the mice'. I remember being surprised to see no chemicals anywhere, or tubes or even—the only thing I could really remember about high school chemistry—Bunsen Burners. But there was what looked like a cycle helmet wired up to an electrical transformer, and next to it, a much smaller version. One that might fit a mouse, for example.

***

as the third green light turns red he feels the first twinge of real panic. A man turns to him, but he can't hear what he is saying. He takes in the white face, the sweat-stained collar and the undone tie. 'Number two! We've lost number two!' The control yoke in his hands is stiff and unyielding. 'APU's fritzing! We have to do it manually!' The other man flips up a cover and begins pushing down on a rubber-covered lever. Outside it is getting dark, and fine, grey ash is tapping, tapping incessantly against the cockpit...

Rain patters on the window. I open my eyes. Sarah snores gently beside me.

***

We went to her lab together a few times at weekends. Sarah would do whatever it was she had to do behind the security system that made Fort Knox look like a Wendy House, and I'd sit on a stool, idly fiddling with whatever pieces of equipment had been left out, typing love letters on her PC or—very occasionally—trying to make sense of one of the scientific papers on her desk. The visits stopped after we moved in together. Sarah claimed her grad student was more than capable of looking after the experiments on the weekend.

Occasionally though she'd bring scientific journals home, and even, once that I saw, one of the wired-up cycle helmets and a truck battery. I heard the clatter as she fought with her keys, and got up from writing a proposal for a small printing company off the Old Kent Road ('You think it; we print it!') to help her. I opened the door and took the battery from her.

'Careful,' she said, 'it's attached to this.'

'All right.' I put the battery down and she handed me the helmet.

'Thanks. That taxi driver must be the most unhelpful bastard this side of the river.'

'You're all tangled up,' I said. 'Let's have a go at the wires.' I extricated her arm from the bunch of blue and brown cables, and she took off her coat. I tried the helmet on.

'It's backwards,' she said.

I turned it round. 'So what happens if you throw the switch, now?'

'You really wouldn't want to know.'

'Try me.'

'Have you any idea the sort of trouble I could get into doing that?'

I laughed. 'So why did you bring it home?'

'I need to take it to the Whitechapel lab tomorrow.'

'Couldn't you have taken it straight there?'

It was her turn to laugh. 'What, and miss out on the chance to experiment on you? No, I just need to make a few adjustments before it goes over, and there's a viva party right next door to the lab. Too noisy.'

She put her arms around me. 'Would you help me carry it?'

'Of course.'

'Thanks.' She kicked off her shoes and slid her hands under my shirt. 'Anyway, it's not calibrated for humans yet. It could fry your brain.'

I kissed her cheek, and breathed in her scent. 'You don't want me for my brains anyway,' I said.

> *the stink of smoke stings his eyes. His back is hot, and the wall beside him dances orange and red. The crackling of the fire and swish of the hoses drowns out any hope of hearing her voice, but he stands still; attentive. A brick shifts, and he scrambles over the pile of debris, scrabbling at the dirt and the rubble with his bare hands—scratched and bleeding, but he can't feel that, only the numbness in his chest. He tugs at another brick, and—there! A finger, moving. 'Over here!' he shouts, blind now to the Miltonian hell around him, blind to everything except the hand, her arm—he only hears his own blood pounding in his ears: deaf to the shouts of the warden and the fire crews; deaf to the screaming sky to the East...*

Blue light flashes on the bedroom ceiling, and the ambulance dopplers down the road outside. I lie still for a while, listening to my heartbeat slow to normal.

***

From the outside, it didn't look like a lab. We left the District Line at Aldgate East, and crossed the road.

'Behind the poor man's Canary Wharf,' Sarah said, pointing towards a hut in the shadow of the Lloyds TSB building.

'Hah.' I looked over my shoulder. 'Aldgate Tower's going up. Wonder when that will be done?'

'They reckon next year,' she said. 'Here we are.'

I looked around. 'What, the Portaloo?'

She grinned and, almost too quickly for me to follow, punched a code into a keypad set into the side of the tiny prefab. 'You'll see.'

I heard bolts slide back, and the door swung inwards. As we entered I noticed the thickness of the walls. 'Wow, what do you keep in here?'

Sarah pushed a button on the wall and the door closed behind us. An energy-saving bulb flickered into half-life; in front of us was a lift with no controls. The lift door opened and we stepped inside.

'Monkeys,' she said, drily. 'Everything is underground. In the basement of the tower, actually. You probably shouldn't even be here, but it's the weekend and the boss won't mind as long as you don't touch anything.'

***

I could still hear the dog growling further up the lane, and my fingers hesitated over the keypad. The hut was exactly as I remembered it, but it had no right to be surrounded by grass and trees. I closed my eyes and tried to remember—but it had only been a couple of months ago, not—how many years would it have taken to do this? Whitechapel had turned into a oasis of countryside, surrounded by a skyline from the imagination of Ridley Scott. If this was Whitechapel, of course—but there was no mistaking the Gherkin, and I knew that if I punched the six digit code the six-inch thick steel door would open.

The lift was the same, but the illumination seemed to come from the walls themselves. I got into the waiting lift, and for the second time in as many months—or was it centuries?—my ears popped with the increasing pressure.

When the lift door opened, I saw that little had changed. The door into the lab was still propped open, and the walls were lined with large, clean cages. But there was no hooting or shrieking this time—the monkeys were long gone. I walked the corridor, brushing my hand along the bars, checking the nameplates on each cage, noting the wired helmets hanging unused on the walls. I couldn't remember the names I'd seen that day, if they had changed; had no idea how many inmates had succeeded the ones I'd seen so recently, yet so obviously in the distant past.

This was new, though. At the end of the corridor there was another door, that I swore hadn't been there the first time I'd visited. A small sign informed me that beyond was the

'Historical Research Unit'.

And underneath, in even smaller writing,

'Temporal Management. Authorized Entry Only!'

There was no handle on this side of the door, but it didn't matter. It door slid noiselessly aside.

'Hello Simon. I wondered if you'd figure it out.'

***

I open my eyes, and she's looking directly at me. I say, 'I've just had the strangest dream.'

Ever fallen in love (with someone you shouldn't've)?

05 May 2010

It started so well.

We have been together for a long time now, ever since that gloomy Friday afternoon, the rain spattering against my tiny window, grey light from the iMac playing over my lab book. Fran walked into the office – do you remember? – and asked if I wanted to go to the pub. I shook my head, said I still had to work, try one last permutation of the data. She turned the light on and I blinked against the intrusion. I'd be quicker, she told me, if I could actually see what I was doing.

I rubbed my eyes, picked up a couple of the papers that had been sitting, accusingly, on my desk for a week. I skipped the abstracts, skimmed the introductions, read the results. Examined the figures. Re-read the results, checked the discussion. Called up the journal's website and the high-resolution pictures of cells. Swore softly at the figure legends and the over-cropped IPs. Wondered, briefly, what the reviewers were thinking: if the paper had even been reviewed.

I turned back to the preliminary data I'd generated and pretended that there was no previous work; that somehow the published papers were fundamentally flawed (a mental exercise that was all too easy). I ran my finger down the column of numbers, clicked on a few links, double-checked, and –

And there you were.

Different from the others, somehow. Not obvious. Unconventional, but you grew on me. I remember taking a step back, not committing to anything. I'd been taken in before, and was wary. I was afraid to get too close at first, wondering if it would work this time. I determined to get to know you better, find out what you meant.

Everything fit together. It was perfect: you answered all my questions, and posed your own. We grew together. I told people about you – just a few friends at first, not wanting to share you, share us, with the world. Not just yet. But then I found I couldn't stop talking about you. I wanted everyone to know.

And for a few months we were happy. Everything we did together seemed to make sense, to be right. Everything seemed to vindicate those initial, tentative proposals; we were made for each other. There were questions – there always are – about you. How could I be sure? Isn't it too early? I put them down to jealousy. I knew you were the one.

It's not that cracks appeared. It wasn't a slow fading. It was sudden, unexpected. It was a simple control experiment, one that would hardly have been mentioned in the paper. Confused and choked, I repeated the experiment, hoping against hope I'd simply mixed up the tubes, yet somehow knowing it was over.

Now I'm sat here by the window, sunlight picking out every detail on the goldfinches at the feeder, and there's no other choice. Like so many hypotheses before, I've got to let you go.

It's not me, it's you.

Published online at http://www.lablit.com/article/595

Poetry

parenthesis

2008

The clocks went back
(to where? Another place—
gentler, softer,
less complicated.
Perhaps.
Maybe
they looked for the shift
in my paradigm;
to tell me
what changed)
and the mornings are brighter.

escape velocity

The darkness that follows
is not so much an abyss as a singularity.
A lost black hole fatally seducing my wandering world:
Decaying orbit—sense and words spiral in,
promising to subsume this fragile organic in an
obscene epiboly.

You fly in a higher orbit, precessing
in a charged field: defying entropy.
A polar magnetism is inevitable.

Perhaps you might share your momentum;
repulse the deadly clutch of that nuclear force
and accelerate me to escape velocity.

Published online at http://www.lablit.com/article/374, 20 April 2008

Minding the Gap

In case of emergency
remain
on the train.

Alert the crew, and move—
if there is danger present—
to another carriage.
Follow instructions, and always
remain
on the train.

The one-way help point
listens to cries
but gives no advice
except
to remain
on the train.

And empty stations
and wires and sleepers
rattle past
with the ballast
while I alert the crew
and remain
on the train.

This is, I think,
an emergency. My heart
has stopped and I
have difficulty breathing.
All I can do
until help arrives
is
remain
on the train.

Morning

And the sun slides between
half-closed eyelid curtains;
light caresses
the surface of heavenly spheres,
finesses advantageous curves.
Biologically opposable—
a hand slides between
half-open, drowsy legs
chasing thoughts of night
and subconscious desire—
Fully awake, imperative,
a genetic reaction
and sunlight rainbows through Fresnel hair:
a sheen of perspiration,
a tectonic slowing;
and we are still once more.

Published online at http://www.lablit.com/article/417, 21 September 2008

Love

What shall we do with love
once we have made it?
Shall we store it in the pantry
With cakes and chutneys to fade? It
will not stay in the drawer,
fights fork and spoon, jams it
open at knifepoint despite
the hand that rattles and slams it
will not sleep alone
with no fire to breathe: it
wants to be free, wants to be heard
wants to believe it—
on my fingers it lives,
under skin I can feel it;
cleaved close to my heart
and none may steal it.
Turned on a wheel, forged in the fire
and tested by time it
etches the sky, burns in the stars
where only your lips may find it:
waits for the kiss, the curl of your arms
the touch of your hands to wake it;
forms us as one, splices our hearts
longs again that we might make it.

Seasons

'Dream of me,'
she says,
'writing my novel
under the sumac tree':

while leading spring fingers
ruffle
the trailing edge of winter
and on my lips your perfume lingers.

a silver line in the cloud
marks this
yearly mitosis: a swelling
joy as dark as night's shroud

covers in pure complementarity
half the globe;
my black to your white,
the 'when' of perfect parity.

Comets

It's cold, out in the Oort Cloud.
So every now and then
we holiday in the Sun:

Sending postcards from the Kuiper Belt
we strip off our winter coats
and just wear scarves against the wind.

We take in the gas giants
the rimy moons
the organic oases

(that according to Hoyle
we might have seeded with life—
but then we might not: we're not saying).

Tweaking the Solar System's girdle:
Hasn't Ceres grown?
—no, it's a trick of the starlight.

We tease Lagrange points,
those minima of potential
where the kinetic is poised,

where a tickle of gravity
stirs up the fluff
at the bottom of the well.

We like Earth:
your smiling moon, and
you always leave the lights on.

But we never stop for long
at the pinch of perihelion.
We check for doppelgangers,

coins down the sofa;
shells in the sand;
And then we're gone.

****

You think it's nice of us to drop in
though you only see us on holiday
every few centuries.

It's fun to visit
foreign parts.
But we wouldn't want to live there:

Don't pity us.
We're not lonely at aphelion:
We have each other.

Published online at http://www.lablit.com/article/471, 15 February 2009

Seconds (with thanks to Steve Turner)

I wait in darkness.

The sun rises in
three thousand, eight hundred
and forty two seconds.

Each one must pass
at its allotted speed
in its allotted order.

None of them hurry.
None of them realize
what they are doing to me;
none of them care.

They will not march out of order.
They will not come in twos or threes.
Several dozens will not slip by unnoticed.

Three thousand, seven hundred
and six

seconds until my sun can rise.

Gordian

21 December 09

When morning creeps through shades of grey
Or rose-tinged clouds draw out the day
Or aching blue wraps up the sky
Or diving swifts in thermals fly;
Where people stare and scratch their head,
Where boldest souls might fear to tread,
Where Gordian knots of right and wrong
Are frayed and lost in angel song:
My deepest heart to you will bring
More love than I could ever say;
And swifts, like angels, only sing
When mortals look the other way.

Seasons part two

7 February 2010

I still dream of sumac trees
But now you write across from me;
'Show not tell' you whisper soft,
Now we share what could not be:

Tulips bend their purple scent
And longer days promise lighter skies—
No dawn nor dusk in antiphase:
Our match yet burns, this kite yet flies.

A Universe collapsed in hope and love
And snowdrops squeeze out Winter's cold:
No more the 'if', the 'when' is now;
Ever more to love and hold.

Poems in 140 characters (Twitter)

13 August 2009

Streams of suits and frenetic fuss;
We'd all be screwed if not for the bus.
Signal failures our fates assign:
Severe delays on the Jubilee Line.

****

16 December 2009

'This train is destined for Wembley Park'
No more illusion of free will;
But destiny's arrow missed its mark:
We jumped ship at Dollis Hill.

****

24 December 2009

I remember—

> A cold, wet night, by candlelight—
> Our love as strong as death—
> Your soft, warm thighs and soul-dark eyes
> Sweet wine upon your breath.

Reviews

Out-of-body experience—A Test of Survival by Marnie Schulenburg

23 December 2007

Cancer.

When I was a young and idealistic graduate student, my supervisor, in one of those melancholic late-night sessions at the pub, opined that he didn't care how he died as long as it wasn't from cancer. According to the US National Institutes of Health, a fifth of women in America fear breast cancer more than any other health threat, and nearly 60% of those questioned feared some form of cancer more than anything else (1). Similarly, breast cancer is the biggest health fear for over 40% of British women (2), yet in developed nations heart disease is twenty percent more deadly than all malignant neoplasms combined and accounts for over a quarter of all deaths in the US (3).

What it is it about cancer that makes people fear it so much? Is it the thought of our own bodies turning against us, like some biological fifth columnist? Is it the perceived assault on our masculinity (prostate cancer) or femininity (breast cancer)? Perhaps the reason is more subtle; perhaps cancer has been de-stigmatized too much. Maybe we are too aware of cancer (especially breast cancer) and this knowledge itself makes us unreasonably afraid.

From being a condition that dare not be named, often referred to only as 'a long illness', breast cancer has become the 'biggest disease on the cultural map, bigger than AIDS [...], bigger even than heart disease, lung cancer and stroke' (4). Less than 15% of all women will have breast cancer at some point in their lives, but it affects all of us, from trying to avoid the pink-festooned teddy bears in the shopping mall to compulsory mammography.

After thirty or more years of serious research, there is no reliable cure for cancer. In theory, cancer therapy should be trivial. You discover what class of cell has slipped its leash, figure out what drug kills that cell type faster than it kills the patient, and administer it. But after surgical resection, the increase in long-

term survival in response to the best chemo- or radiotherapeutic regimes is disappointingly low (5).

The major problem, and the bane of proud mothers of scientists everywhere, is that all cancers are different. Not just trivially, as in lung cancer versus breast cancer versus prostate cancer; but each different organ or tissue is subject to a bewildering away of malignant subtypes. To take our example of breast cancer, there was great excitement when BRCA1 and, four years later, BRCA2 were discovered: the 'gene(s) for breast cancer'. However, despite their presence corresponding with a poor prognosis, mutations in these genes account for probably less than 10% of all breast cancer (6). Environmental mutagens are essentially random in their targets—nearly any gene is an oncogene in the right (wrong) conditions. No single drug, no single dose of gene therapy, will be 100% effective against cancer, and although combination therapy does improve a patient's prognosis, the more drugs you give a person the more ugly are the side effects. We should perhaps not be surprised, then, that against the background of fear and ineffective therapy people are turning to increasingly desperate measures to effect a cure (7).

Against this background, Marnie Schulenburg's novel asks a brave question—brave not because it deals with cancer up close and personal (the blogosphere is full of that), or that it tackles the infantilization of breast cancer by the Pink Ribbon brigade, but because it simply asks "Why do we treat all cancers the same way?". Standard cancer therapy consists of trying one drug after another until something good happens. It's a little bit like trying to solve a crossword puzzle by sticking a pin in a dictionary at random.

A Test of Survival came to me 'print-on-demand' from iUniverse. Somewhat larger than a trade paperback, the type is clear, spaced well and with good margins. The paper is thicker than that of most paperbacks on my shelf, and it became dog-eared rather too rapidly for my liking—at US$22 I would have expected the quality to be better. The binding, however, did survive multiple train journeys and two trips to the beach.

The premise of this novel is that it is possible to determine which drugs will prevent a cancer recurring before exposing the patient to months or years of painful and quite probably ineffective chemotherapy. By taking a biopsy of a tumour and testing its response to different combinations of drugs in the laboratory, in an ex vivo assay, it should be possible to determine what will work best for the patient in terms of limiting neoplastic recurrence. The difficulty is that if it were that easy, ex vivo, which has been around for at least 30 years (8), would already be standard practice.

But as anyone who has done serious cell culture will know, cells in flasks die at the slightest thought of mistreatment, which makes testing their survival problematic. Primary cell culture (or ex vivo) also has many other snares to trap the unwary: bacterial contamination, mixed cell populations, aggregation, syncytialization, identification and validation, spontaneous immortalization and so on. Even with a good protocol, appropriate media and experienced handlers, cells excised from a primary tumour and separated from their siblings can lose tumour-specific markers, indicating that they have changed in indeterminate ways.

All these problems are probably tractable given sufficient time and effort (9,10). However, as surgical resection aims to remove all malignant cells from the site of a tumour, and subsequent therapy (i.e. radiation and/or drugs) is directed at killing cells that have escaped and therefore by definition are different from primary tumour cells (metastasis itself representing a significant change in a tumour cell's life), a big question mark remains over the interpretation of any tests performed on the original, cultured biopsy.

This is the core of Schulenburg's story. The protagonist is Gus Ephraim, a rather unlikeable physician-turned scientist-turned lab technician who hawks his testing laboratory across the US in an effort to gain respect and recognition for ex vivo testing of anti-cancer drugs. Along the way he nearly breaks up with his wife, teeters on the brink of an affair with his first wife, is reconciled to his estranged son, is thoroughly humiliated, fights

the powerful director of a cancer research hospital (and loses), fights him again (and wins—through blackmail), somehow manages to get powerful lawyers on his side, and all the while is the only person qualified to analyse the actual assay upon which his and his (current) wife's livelihoods depend.

Despite the rather stark opening chapter, this not a book about science. It continues bleakly (for this reviewer, it was rather hard going until about half-way through) but the science does not. Even believers in ex vivo technology (the method is not scientifically unrespectable, despite the somber appraisal of the disinterested characters in the novel, and is in fact the focus of ongoing research [11-14]) would laugh at the assay endpoint as described—as one character remarks, bleach kills cells; but that does not mean Domestos is an appropriate chemotherapy agent. And they would have a fit when they found out that Ephraim is the only person who can read the assay. When his ex-wife asks for details on the drugs that the assay flags as being appropriate in her own case, she admonishes Ephraim for not explaining the science, but then falls asleep while he explains; and we, the readers, are similarly unenlightened.

Unfortunately, much of the book consists in unexplained details and minor irritants (side effects, maybe?). There is the character who is Scottish, but strangely not 'a Brit' and says 'ass'. 'Data' is treated as a singular noun. Colours as adjectives are much abused, and while Schulenburg can report, there is an aching journalistic dryness in her atmospherics ("Just the facts, ma'am"?):

The office smelled of rotten apples, vaguely sweet. The wastebasket was plugged with the brown hour-glass skeletons of several chewed-up apple cores. Gus moved through food favorites, specializing in one for months and then abandoning it.

We have interminable shopping lists of people's names and what they're wearing, yet in the middle of a descriptive passage about a county court room and the people trickling in, the author seems to get bored and mentions 'another woman'. The inconsistency is jarring.

And there is a problem with the characterization in general: Gus Ephraim might be unappealing, but he's also uninteresting. His son develops in ways that seem quite incredible for a teenager. Apart from the bogeyman of the piece, only one other character seems to have any spark; yet as she was getting interesting her ultimate demise is telegraphed well in advance. So by the time of her casual rape, and heartbreak, and death, I was as utterly disinterested as the cancer itself.

The story does pick up pace in the later stages, and we learn that our protagonist is not wholly jejune; he's actually quite nasty. The blackmail apparently comes from nowhere, and rather annoyingly the reader ends up feeling sympathy for Ephraim's opponent. Although I am no clinical scientist, I became incredibly vexed at the depiction of an untractable conflict between ex vivo and clinical trials. This is the theme of the book, and unfortunately for the story it is a false dichotomy. Ephraim seems to realize this, belatedly, but only after I had been screaming at him for several pages. Shoehorning these rather subtle and interesting issues into a single either/or question is too simplistic. Culturing neoplasms outside the body and subjecting them to various drugs is not a treatment for cancer. It is—or could be, or might be—a diagnostic tool to tell an oncologist what kind of cancer the patient has.

Cancer treatment as it stands is the pin in the dictionary. If you're a cynic you might say that this state of affairs suits the pharmaceutical companies just fine; they can sell their drugs in ever-increasing doses and in countless combinations, knowing that the clinical trials say at least 80% of the patients will survive for ten years. They might not have their hair or bladder control, and maybe 60% would have survived that long without the treatment, but you don't know who they are and the executives certainly have no interest in finding out (which, incidentally, is part of the reason too few people have heard of pharmacogenomics [15]).

But if you can identify the precise type of cancer, if you can predict with reasonable confidence what will kill (or prevent) metastases in any given patient, then you can start the process of

individually tailored chemotherapy, using drugs that have been tested for safety and efficacy in clinical trials. The diagnostic technique at the heart of this story should be judged in this light, and the scientific jury is still sitting.

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See-through science

10 October 2009

Since the development of methods to study molecular structures, scientists have struggled with the best way to display them. All we have are models: the early wood and metal constructions; the stereo pictures; the beautifully rendered ray-traced three-dimensional shapes that rotate on your computer screen; these are simply representations of things too small to see for real.

This problem is not greatly reduced when we move up the size scale to viruses. We can see them with electrons, shadowy and artefactual, but even the largest virus is barely visible under the light microscope.

And because they are so small, they have no inherent colour. Too small to absorb or diffract light, they are invisible to our eyes. The models that terrify and captivate us from newspapers and the covers of journals are coloured for effect, not to reflect reality. Luke Jerram, the artist who created these beautiful yet sinister models, is colour-blind. He neatly side-steps the question and problems of nanometer resolution through the use of uncoloured glass.

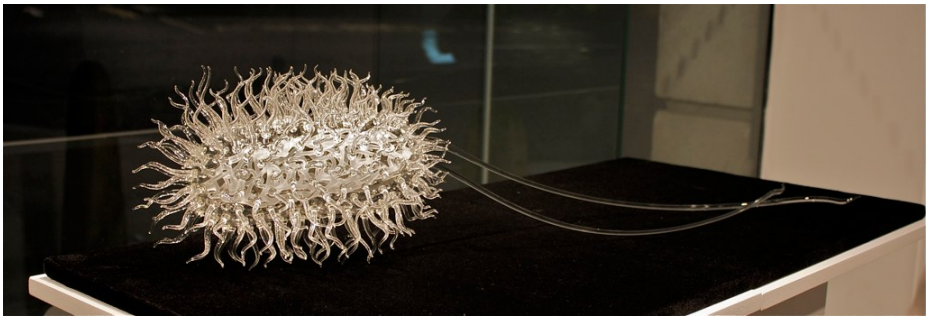
Taking out the colour, and the emotional baggage associated with it, we can begin to appreciate the form and structure: how the association of nucleic acid and (generally globular) proteins gives us these regular shapes and fascinating patterns. Perhaps

we can view them as things of beauty, rather than simply as agents of disease and death, to be dissected and studied and destroyed?

For Jerram, science – perhaps ironically, seeing as he trained as an artist – has been a fruitful venture. When the Wellcome Trust approached him to acquire his first piece for their famous Collection, they asked what he wanted for it. Never having sold his art before, Jerram thought fifty pounds would be reasonable.

"Come back," they said, "with a serious offer."

The highlight for me (and my pocketbook, unfortunately, won't stretch to the Wellcome's prices. I was seriously tempted, however) was not a virus, but something that can be seen with the microscope: a louche Escherichia coli, with flagella crossed and reclining on black velvet.



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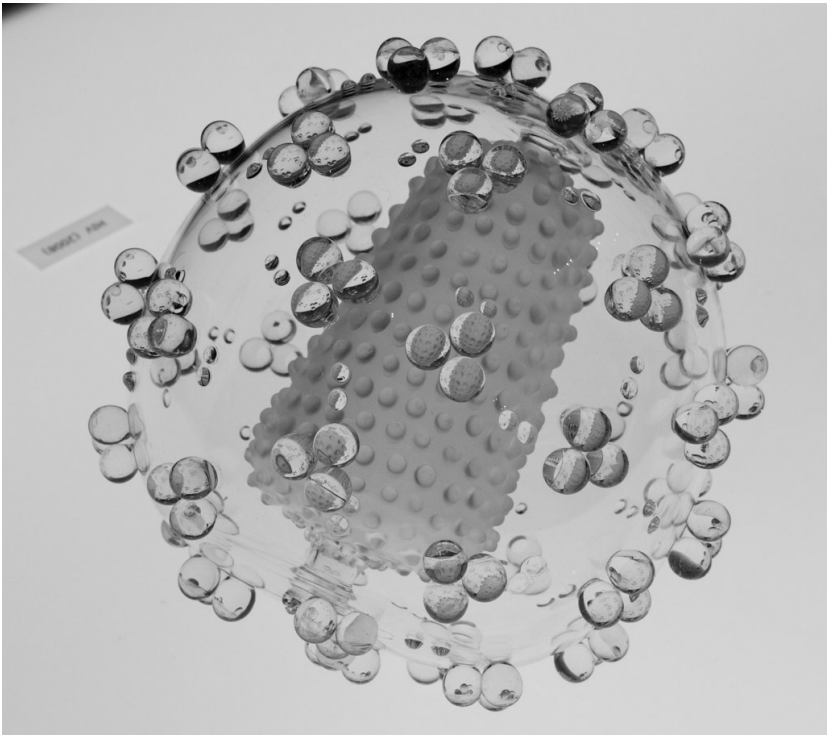
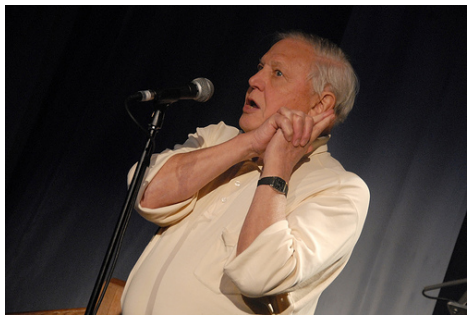


On Creation

10 October 2009

It was nearly a month ago that David Attenborough and I went to see a preview of the Jon Amiel film *Creation*.

Well, I say that, but there were 398 other people there too. And I didn't actually get to meet Attenborough. Or even see him. But we were in the same room. I say 'room', but I mean the Science Museum. He touched Karen James' shoulder! And she's my friend, so that counts. Doesn't it?



Where was I? Oh yes. Heroes. David Attenborough is a hero to many. On the other hand, Charles Darwin has been turned into a saint. I've reviewed the movie elsewhere. These are some thoughts that didn't quite make it there.

Philip Campbell welcomed us to the IMAX theatre at the Science Museum, telling us that Nature is a magazine as well as a journal; the narrative is as important as the science. (There may have been a small cheer from the LabLit representatives at this point.) After welcoming various luminaries (the producer Jeremy Thomas, screenwriter John Collee and Toby Jones—who played Thomas Huxley), he introduced the director John Amiel.

"This place is so cool!" Amiel said, before apologizing that the film was in 35 mm and not IMAX. He played on the narrative theme again, explaining but not apologizing for the liberties taken with objective reality: He made the point that a 'true' dramatization would have to spend eight years studying barnacles: 'I'm not going to say, *guys it's only a movie: get a life*.'

The film we were about to see was an imaginative rather than a literal truth, dealing with the spirit of Charles Darwin: man and

scientist, because his 'life and science were one piece'. I don't know if it was intended, but I saw him drawing direct parallels with the Biblical account of creation. Truth in spirit if not in literal fact.

Nature selects for survival; man for appearance

The film was a feast of visual elements and hidden meaning. The (fictionalized) account of Jemmy Button and the del Fuegians; the bad science (or medicine, rather) juxtaposed with the bad theology; Jenny the orangutan; the process of decay, Huxley's bullying and the balance of nature with a fox and a stunt rabbit. The opening scene of the movie, with the finger of Charles reminding us forcefully of the finger of Michelangelo's God. (And I would have cheerfully held Darwin's coat while he thumped the vicar—or performed harm bodily and grievous myself.)

We would do well not to idolize our scientific heroes. Darwin himself tells the doctor that 'logic isn't everything'—and tries to make a childish bargain with God for the life of Annie. All great scientific advances are made by human beings, heir to the same heartache and thousand natural shocks as all flesh: and the message of *Creation* is that this, not our idealized notions, is true cause for celebration.

http://blogs.nature.com/rpg/2009/10/10/on-creation

On dancing with Smurfs

17 January 2010

> just saw AVATAR... long and a bit boring in places but GODDAM AMAZING EFFECTS

says the Elder Pawn on her Facebook profile.

Which is a succinct review, if a little lacking in insight. But she's right: I took the Pawns to see James Cameron's latest oeuvre this afternoon, and it is a very long movie (subjectively at least) but made rather special through the clever use of 3-D. We're not talking about red/green glasses here, either: these are (rather nerdish-looking) specs that I suspect are made of slightly differently polarized lenses, such that each eye sees a slightly different view and the brain interprets this as 3-D.

I spent not a little time taking the glasses on and off and squinting at the screen—the bits that are meant to be given depth are fuzzy when viewed without the glasses, but you can see perfectly normally with them on. Very neat. (And *someone* said, as we entered the theatre, 'I wish the cinema itself was in 3-D!". Um, yeah, we laughed at that.)

Enough technology. And enough of the *politics*: there are a few points I want to ponder later, but Abigail Nussbaum has already dumped a load of well-informed comment into her excellent blog. Let's talk about the science (or the biology, anyway) a bit.

So I was reading somewhere else that the complete world that Cameron has built is one that is "intelligently designed" rather than evolved, because of the whole hexa/tetrapod thing they've got going on. Now, laying aside the fact that this is a goddammed *movie*, folks, and once you start talking about consistency of alien species you may as well pick up your *Star Trek* collection and go home, I'm not convinced by that argument anyway. It seems to me that the land-dwelling beasties could quite happily share a common ancestor; indeed, the sloth-thingies had a joint for the extra pair of legs three-quarters of the way up the front limbs, and it wouldn't take much of a mutation to give animals an extra set of limbs. *Hox* genes, anyone?

What is more unbelievable is the presence of bipedal humanoid creatures that (apparently) breathe through their noses; where everything else on the planet breathes through their chests. (A much more sensible arrangement than the Terran, one would have thought). But as we all know this is simply a case of narrative imperative: if the dominant, intelligent aboriginal species was a six-legged herbivore then you'd have no chance of manipulating the sympathy of the audience.

Being able to grow a body and transfer one's consciousness into it willy-nilly strikes me as a reasonably original concept. This of course isn't the message of *Avatar*: that's the rather naive and insulting one about ecology and noble savages, which has been pretty much taken apart all over the shop. Even the ability to plug oneself into the brain of another animal has been done (Terry Pratchett, anyone? "I aten't dead"?), although I did appreciate that this was possibly related to how the 'avatar' mechanism was supposed to work in the first place.

What was cool, and what actually flowed naturally from this concept rather than being a stonking great *deus ex planeta*, was the entire biosphere being some kind of interlinked super-organism. This wasn't given to the credulous viewer as axiomatic; rather the idea of a mass of communicating nodes giving rise to intelligence—some flavour of deity, in fact—was compared with the fact that billions of synapses make up a functioning and above all conscious brain.

And this is where it was rather neat to see Sigourney Weaver scrabbling around in the lab and saying things like "signal transduction!" in cold blood. That the signals were being transduced between trees rather than neurons is just a matter of scale.

That about wraps it up for science, so I'll finish with some thoughts about the politics. A braver movie wouldn't have had the ~~Red Indians~~ Na'vi winning. A thoughtful movie, one that wasn't simply toeing the party line on ecological messages and being a showpiece for admittedly gorgeous special effects, would not have had a cartoon bad guy talking in clichés; would not have had the industrial-military complex being beaten by

guys with sticks: rather we'd have seen the scientists save the day.

The scientists (embodied in the amazingly fit Sigourney Weaver) were treated sympathetically, even if portrayed as a little kooky (and why, 140 years from now on a planet with a hostile atmosphere, would anyone smoke cigarettes?). The scientist, just as in *2012*, went up against the baddies (in this case the industrialist rather than the politician). Unfortunately in the movie common sense and compassion didn't prevail, and Sigourney Weaver karked it at the bottom of a huge, glowing tree (and that *had* to be a body double, surely?). She did have a brilliant last line, though—Jenny laughed and poked me in the ribs and told me to remember—"We need to take some samples." That's biological dedication for you.

And all this is a bit of a shame, really, quite apart from the wasted opportunity to do something interesting with the plot. Because you know what's going to happen in a dozen years, don't you?

A private company has managed to build a spaceship; a rather lovely one, actually, that reminded me strongly of the *Discovery*. They've had their mercenaries wiped out and been sent packing, leaving behind vast deposits of some incredibly expensive and above all *useful* if stupidly-named element (just what do you think was holding those mountains up, hmm?). What's more, there's a shedload of technology been left behind in the hands of not-too-bright-but-obviously-quick-learning natives. Natives who are incredibly warlike, too—they only accepted Braveheart Smurf on parole when he said he was a warrior (of the 'Jarhead' clan: possibly the best line in the movie). I'd actually be quite jittery if they were my neighbours.

And not just the technology—a scientist and a technician who in all likelihood know how to use it. Can we say 'accelerated development'? I think we can.

So the company reps get back and go straight to the most powerful government on Earth at the time, and say hey, there's these guys who just whupped our corporate ass, who've got

guns as well all sorts of wildlife on their side, and what's more they're sitting on these deposits of magical ore. You don't think they might be a bit sore about this? You don't think they might be plotting revenge? You don't think that the traitors might be teaching the natives the secrets of interstellar travel?

Don't you think that maybe, just *maybe*, we should build another spaceship and nuke the site from orbit?

It's the only way to be sure.

http://blogs.nature.com/rpg/2010/01/17/on-dancing-with-smurfs

Non-fiction

Pig

2008

Mike was five minutes late. In New Zealand five minutes barely counts as 'on time'. But this was different. This was something I'd been wanting to do for two years, and finally, finally we were going—if only Mike would hurry up.

I was up at five. By moonlight I had put the kettle on and walked, silver-clad, into the garden; pulled the cover from the pool, dived in. As the eastern sky turned grey I swam the tired from my eyes and the sleep from my limbs. Tea, a hasty breakfast. Packed a sandwich, water, chocolate: not knowing for how long I'd be gone.

Long socks, boots. Chapatis. Fleece. All feeling very odd in the middle of a Marlborough summer.

I walked up the drive as the stars faded and waited in the cool air. Finally two bright headlights came into view. The Toyota was loaded for bear: dog box on the flatbed, bolt-action .308 between the front seats and a .22 for rabbits in the back. I jumped into the cab and we were off: my first pig hunt.

Down the New Renwick road, past the rows of vines. Asking after Mike's father—a shared understanding of how frightening pneumonia can be. Speed limit irrelevant. Hell, it was midsummer and pig-hunting is a winter sport. What did we care about speed-limits?

The short-cut to the Waihopai Valley goes over a ford impassable by anything less than a four wheel drive. The owner of the vines around it wants the road closed to the public: in some kind of underhanded deal the council did not accede to the request but refuses to repair it from public funds. The Hilux has a turbo diesel engine with enough torque to stop the planet from turning. The ford was barely a warm-up for the main act.

The names of the roads are as evocative as the morning scent: Dog Point, Lake Timara Road West; Waihopai Valley and the not-so-secret secret listening station. We passed yet more vines in echelon to starboard and port, Mike describing the loss of the

most productive sheep pasture in the southern hemisphere to the creeping imperative of the almighty grape.

We caught up with some cove tootling along at 80. Our age, but driving like an old man. Mike downshifted and we shot past. Then the dead olive grove, off the tarmac and up the Avondale road.

"They'll see us coming," said Mike. "You can't see the road from the house, but they'll see the dust."

At half past six on a Sunday, we were unlikely to be the milkman.

We met up with a second Mike at a farm house on a slight rise. I wondered, drowsily, if names were in short supply. There were three hangers-on: the next-door farmer's son, his cousin from Auckland and a mate. All around fourteen, one of them with his foot in plaster. The farmer's son was our ticket through the land we were about to travel: it's not safe to trespass when every cocky has a rifle that probably saw service at El Alamein *and still works*.

From tarmac to dirt, from dirt to sheep-track. *This* is what four-wheel drives are made for. Bouncing about in the cab, I wondered about the dogs in the box behind. The Toyota seemed to cope better than Second Mike's Ford; but then the Ford was designed primarily for suburban warfare (the school run is hell, these days) and came fitted with road tyres. When Second Mike had slid backwards down a hill in it the previous year it took Mike in the Toyota to pull him out of trouble, and Second Mike had gone straight home to fit knobbly tyres.

One of the dogs—the youngest, also on his first hunt—began to whine at the scent of livestock. Mike growled at him to shut up. We don't want to frighten off our quarry. You might think that the noise of the diesel would be louder than a whining dog, and you'd be right: but the wild pigs that destroy the hillside and attack weak lambs are used to the sound of engines, and spooked by the sound of dogs.

The air was chill up here in the shadowy foothills of the Malverns, sandwiched between the Awatere and Waihopai

valleys. We leapfrogged through the stock gates, a thousand or more feet above sea level, native forest rising through the mists.

On the walkie-talkie I picked up that we were looking for a particular cow carcass. Wild pigs feed on the roots of ferns and grasses, as well as carrion. If the cow we were looking for showed signs of being eaten then there was a good chance of finding pigs in the same area.

The vale widened, lush and sheltered from the worst of the summer dryness. We stopped between stock gates where the sheep-tracks forked. Four of us climbed a hillock to the north, sending the dogs up to sniff. Another two dogs went to the south, racing away with the pent-up energy of nearly two hours in the porta-kennel. The air was heavy with green-smelling bush and the pervasive odour of sheep.

But there was no sign of the carcass. Up on the hillside however there was plenty of small-scale scree, telling us that pigs had rooted here, loosening the soil and fouling the pasture. A family of wild pigs can wipe out acres of grazing land overnight. To stockmen they are a pest to be exterminated. To Mike they are food, or if too fatty to spit-roast at home, diesel in the tank when sold to a butcher.

A conflab, and Second Mike took his rifle, wired up a dog with a radio receiver and took off towards the south. One of the lads drove the Ford, and we went through another few gates, still looking for the carcass or fresh spoor. The dogs, a couple of them wired, ran alongside.

Yet deeper into the hills. Nearly eight, and we were still in shadow, the sun visible only as a glow between peaks. We parked the trucks, leaving the lad with the plaster sitting in the Ford. We climbed over another gate, the dogs slipping through and over like mist. We walked along a low ridge, then cut back down and crossed a stream, doubling back. The two boys were a hundred yards in front of us, nearly back at the trucks, when there was a bark from the hill to the south.

"Pete's found one!" Pete—the patriarch of the pack, on his last fling before retirement—had thrown up a pig. More barking, the

flash of brown and black as the other three dogs launched up the hillside and disappeared into thick bush.

"Come on!" Mike started running up the hill, his long legs carrying him easily. I followed, determined to keep up as much as best I could.

We crested a hillock, only to realize the barking was coming from the mountainside beyond that—a quarter of a mile away, three hundred feet up and receding. We took a breath and set off again. The two boys loped past us, youth and enthusiasm trumping cunning and resourcefulness for once.

I was struggling a bit; Mike kept pulling ahead and waiting for me, but having to wait longer each time. I was determined not to let him down. The upward struggle levelled off—I trusted Mike to find the best way through the scrub and ducked down to follow, amazed at how such a big man could move with seeming ease through the bush. The track—broken branches of the pig's flight—shot upwards again. I grabbed a tree to steady myself and push off against, and came away with a broken branch stuck in my hand. No time for that—I pulled out the wood as best I could and set off after Mike, hearing the squeal of our quarry for the first time.

Past more trees, blood dripping from my hand, towards the barking of the dogs and the squealing of the pigs, nearly drowned out by the pumping in my ears. The smell of mud, dead tree bark. Sweat stinging my eyes and sticking my shirt to my back. My heart hammering against its cage. Mike pausing, pointing, un-shouldering his rifle. I made one last push, giddy from exertion; and there was the pig.

The dogs had it bailed up, one to a corner. A black tusker, bloodied from a hole in its leg, lunging at the dogs as they barked, moved forward, jumped back. A good pig dog will nip the prey and quickly move back, avoiding the sharp tusks. Sows will run at the dog, toss it out of the way and keep running. Boars are stupid; they stand and fight, which would be good for them if all they had to deal with was dogs.

Mike directed me to a rear leg, told me to grab hold of it. One of the fourteen year olds took the other back leg. The dogs moved around to the front, still barking. Another squeal, the rough bristles against my hand and I could smell the pig now, smell its fear I thought. I kept an eye on the tusks—one of the dogs had been gashed already. The rifle was against a tree, there being no way Mike could take a clear shot.

Through the rushing in my ears, the dogs, the sound of the other lad kicking the pig between the hind legs (you idiot! As if it weren't mad enough already) and yes, a touch of nausea, I heard Mike telling me to reach under the beast and grab its opposite leg. Mike reached over its back and together we rolled 120 kg of thrashing pork over, exposing its belly.

And then he was pushing the handle of a thin but vicious-looking knife into my hand. He pointed to the pig's throat. My head cleared: I had no idea, when it came down to it, how you went about killing a pig with a knife, but having got this far nothing was going to stop me.

I pushed the blade into the pig's neck next to the windpipe, surprised at the empty space under the skin. It squealed for the last time. I tried to cut across, changed my grip, started cutting into the trachea. Mike's hand covered mine, pushed it *down*. "Into the heart!"—held it there while the animal stopped struggling. I stepped back, my sweat mixing with the pig's blood. Time of death, half past eight.

"Well done Pete, well done boy!" The old dog was exhausted, but eyes bright with success. The injured dog was barely scratched, already sniffing the body. Mike slit the pig's belly, spilling its distended stomach. "Let's see what he had for breakfast".

Wild pigs smell bad enough on the outside, but when Mike opened its stomach the stench was almost visible. Mike pointed out the half-digested fern roots, the grass seeds, the wriggling white maggots—"He's been at the cow carcass". He scooped out the intestines and most of the liver, precipitating a swarm of hot,

buzzing flies (and I suddenly appreciated the seductive draw of spontaneous generation in the days before Pasteur).

He left a serving of liver inside; in these areas cyanide is laid out in possum traps, and wild meat has to be tested before it can be sold. This beast was too fatty for Mike's liking, so would eventually find its way to a butcher shop.

My kill, so I was offered first dibs on the jawbone and tusks. I laughed, saying there was no way I could get them past Australian customs. The cousin from Auckland said he'd have them, and Mike started cutting out. I realized, later, that I should have said yes. I could have boiled the teeth clean, and paid sixty dollars for them to be gamma irradiated.

Mike handed me the rifle and rigged up a crude harness (rope through the nose and to a tree branch, more rope round the back legs) while the dogs breakfasted on innards. We took turns in pairs half-carrying, half dragging the carcass half a mile along and 800 feet down the valley. We were hot, thirsty; my hands were covered in blood—pig's on the right, my own on the left.

In the valley we heaved the carcass up and behind the dog box. Down the bank to the stream: I washed my hands and my face, and drank the beautifully cold, clear water.

We raised Second Mike on the radio. He'd missed all the action, but lost a dog. He had been sitting on a ridge, waiting for us to complete our kill, when a sow and piglets had broken cover and ran across the track in front of him. Before he could raise his rifle they, and his instinct-driven dog, had vanished into the bush. We got back into the vehicles and drove a short way out of the hills.

Here the stream fell vertically about four feet. Mike cut out the pig's arse and castrated it, and I helped him drag the carcass into the shaded pool under the waterfall . An hour after the kill and the day was already hot. The meat would spoil rapidly if not cooled.

We drove up to collect Second Mike, and toured the hills and valleys, stopping occasionally to listen with the TV antenna for the missing dog. Our biggest fear was that he'd gone clear over to the Awatere. At one stop Mike spotted a rabbit, and handed

me the .22. Unfortunately, by the time I'd steadied myself on the bonnet and peered through the 'scope, Peter Rabbit was safe behind a rock. As we drove past a lush slope he pointed out where Second Mike had slid backwards fifty yards in the Ford.

The missing dog turned up—and we realized that the young pup was missing. Back into the mountains. Not bad this, driving around the hills all day, a couple of cockies with rifles and boots and nothing else to do.

Finally we were all together: dogs, Mikes, lads, teeth. We retrieved the soaking pig from the improvised refrigerator. A brief stop at the farmhouse, then back down the Waihopai, slowing to cast a covetous eye over some farmed 'wild' pigs innocently and obliviously grazing among the dead olive trees.. Past the golfballs, over the Timara ford, along the New Renwick Road and finally to Mike's house.

We hoisted the carcass and Mike hosed it down. Put the dogs back into their kennels. I stripped down to my daks and dunked myself in the pool. I gratefully accepted a cold Oranjeboom from Fiona and posed for a photograph.

I could get used to this.

Hyams Beach

May 2008

"Richard," they said, "Robyn's car's stuck".

I had been for a swim, a shower and put on a T-shirt and sarong. Sitting out of the sun, surprisingly strong for autumn, I was eating a toasted sandwich and drinking coffee. The lab retreat—or 'advance', as I preferred to call it—was in full swing. The crimson rosellas were extravagant as usual in the gum trees, the wattle birds filled their air with tinkling song (I know it's 'tinkling': the Encyclopedia Britannica says so) and the sun glinted off wavelets in the Bay.

I noted the page number and put down my Le Carré.

"Show me," I said.

Robyn had reversed her Toyota from the grass in front of their house and, instead of aiming for the driveway, had driven over the small drainage culvert. 'Over' is too strong a word: 'into' but not 'out of' would be more appropriate.

The near-side front wheel was suspended. The front bumper had been all but torn off as the car went down into the ditch. Being a front-wheel drive car, the Toyota was stuck. The five or six people standing around looked to me for guidance.

"I've got a tow rope. Let me find the car keys."

One end of the rope went through the towing loop on Robyn's car; the other through its counterpart on mine, fastened with the end of a broom handle especially sawed off for this very purpose. I started the engine, let in the clutch… and we didn't move. I got a couple of the guys to stand on the Toyota's opposite corner, to try to raise the bumper off the ditch, and tried again.

I stopped when the clutch started smoking. Decidedly a bad look. I unhitched the tow rope and took my car round the block to cool off and check the transmission.

When I got back, Robyn was calling the NRMA and Lin was attempting to chock the suspended wheel with pieces of firewood.

This, I thought, has potential.

In my sarong, in my flip-flops, I walked up to Lin and stood with my back to the car. I felt under the wheel arch.

"OK, Lin," I said, "got some flat pieces of wood?"

He nodded.

"Right. After 'three', then."

I braced my legs, and counted him in. I straightened up, lifting the wheel a few inches clear. There were gasps from behind, and Lin shovelled in pieces of wood.

"Again." Another brace, another couple of bits of wood — and more admiring looks.

"All right. Let's try it."

I went around to the other side, got in and started the engine (and… it's a bloody automatic, isn't it, so what do we do? Oh yes. Brake down, 'P', turn key, select 'R', release brake...). We still weren't going anywhere, but I had the bit between my teeth now and no combination of poor terrain and toy motor was about to beat *me*.

Back around to the near-side wing, check how much space I had. I asked Paul to sit on the roof, diagonally opposite to the stuck wheel. Then … who looked the strongest?

"Stand here, Doug. Fingers underneath. Got a grip? Ready Lin? Good. After 'three'." We held the car up while Lin pushed in larger pieces of wood.

"And again. One, two, *three*".

"You could probably carry the car out," said Philippa.

"We'll try that next," I promised.

"OK Paul, I think… I think you should get down." He looked a little relieved. I got in the driving seat, paused, and stuck my head back out through the open window.

"Eh, guys? Three of you, on the bonnet." I gestured to the front of the car. "When I say, you push."

I started the engine, gently let go of the brake, gave her the merest smidge of throttle—and reversed onto the road. I parked up, pushed the bumper back into place and told Robyn she might want to let the NRMA know. There may have been applause.

Then I got a beer from the fridge, and went back to *The Honorable Schoolboy* and my place out of the sun.

Selected weblogs

Riding with the King

22 August 2007

This is Science.

You try. You push, you fight, you struggle. You take tiny, baby steps, and all the time you feel like you're running to stand still. Everyone else seems to be successful, and your plugging away only draws attention to to the void that waits where your next paper should be.

But still you try, hoping against hope, long ago going through the place where any sane person would have given up because deep in your heart you know that this is the only thing you can do; the only thing *worth* doing.

And maybe you look at the papers in the field and realize that the experiments that set you off on this wild goose chase were complete crap anyway, and the mechanistic interpretation, if there is one, is deeply, fundamentally flawed. You present a poster with your ideas, which, despite—or maybe because of—your lack of results, is very pretty and even enjoys a brief moment of glory on display alongside the prize-winners of this year.

Others need convincing, so you perform more experiments, and with tragic inevitability any data you generate are variable, standards don't and negative controls aren't. Little hints here and there suggest you might not be completely crazed, but you wonder if you've given your boss any reason at all to believe in you.

Then one afternoon you sit down to look at some very preliminary data: incomplete, waiting on the proper controls and still shy of the experimental nirvana that comes from $n = 3$; and you really don't know what you should be doing with this program but you fight it because by God it's not in you to give up, and you realize that you're reading the wrong strand of the chromosome but when you finally get the numbers to match six bases SHOUT at you from the Ensemble web site and you echo

the shout to the office as you realize that here, indeed, is an Answer.

All your heartache and disappointments are forgotten in that sweetest of brief moments. You are the only person in the entire world to know what you do now.

You savour the exultation while your pulse recovers, then you grab your scribbled notes and a pencil and hotfoot it to the boss's office, where you try to keep the shaking out of your voice while you explain what you've just found. His reaction stuns you, as he leaps from his chair and calls in other members of the lab who have a vested interest in this project and whose own work has just been vindicated. You have to explain the result three times while phrases like "this is the best result" and "this is so fucking cool" are bandied around carelessly. The uninitiated look on, somewhat bemused.

Then comes the inquest, the 'whatifs' and the 'yeahbuts' and you have to explain how your model appears be right, pending further investigations and appeals and peer review. It's dark outside, it's late and you still need to set up a PCR before you can leave.

Nonetheless, they can not take it away from you:

For a Day, you were King.

Published online at http://blogs.usyd.edu.au/labrats/2007/08/riding_with_the_king.html
and
in The Open Laboratory: The Best Science Writing on Blogs 2007 eds R. Cartwright, B. Zivkovic

On sexism and shiny sports cars

22 July 2008

True story.

At the Gordon Research Conference earlier this month during one of the 'free' periods, we'd organized to go to the lake and kayak and swim and generally chill in the warm sun (the water was lovely, too). I'd made friends with a French-Italian chap (now working in the US) by the name of—well, let's call him Giacomo, for reasons that might be self-evident—who had hired a car for the week. So I persuaded him to drive myself and three others, who all happened to be female, to the lake: even though he didn't want to do anything so water-sporty he, being Giacomo, was happy to drive three ladies anywhere.

So the three piled in the shiny red Pontiac, leaving the front passenger seat free for me. A comment was made about the male/female distribution and I did point out that I'd let them choose their seats. Giacomo would obviously have preferred someone prettier next to him.

One of the women said something complimentary about the attractiveness of a man and sports car combo. I felt it would be remiss of me to fail to remind everyone that whereas Giacomo had hired a shiny red sports car, I actually *owned* one.

"Ooooooooo!" chorussed the back seat.

On the return journey I sat in the back, in the middle. A fun time was had by all, with the possible exception of Giacomo.

Postscript.

The funny thing is that the following day, the weather being inclement, Giacomo and myself went to a pub in town. I ordered a couple of beers and some nachos + salsa, *and was asked for my ID*.

http://blogs.nature.com/rpg/2008/07/22/on-sexism-and-shiny-sports-cars

On '-ize'

20 August 2008

Cath is frustrated with variant spellings. This, actually, is something I come across a lot in Australia, where they seem to want to follow the Francophone world (beats me why).

Let me explain.

In English ('English'. Not 'British' English or 'International' English: *English*) if you form a verb by adding a suffix to a noun, you use *-ize*. Many people get this wrong, and add *-ise*. I have a theory why this state of affairs persists.

Once upon a time the *-ize* was standard. Then, when personal computing started taking off, certain software developers thought it would be a good idea to include spell checkers with word-processing software. Most of these people were in the US, and one of them realized that across the Atlantic we quaintly used *-yse* at the end of certain verbs, whereas he (unlikely to be a 'she') was used to *-yze*. So, this got lumped in with the 'u' deficit and the f/ph switch as a simple variation in English spellings[1]. So far so good. However, he made the mistake of assuming that all verbs in English outside of the US ended *-se*.

Note the mistake. It is quite subtle.

So a generation of Microsoft Word users *outside of the US* grew up believing that there was such a thing as 'British' English, and that verbs end with *-ise*, and not the correct *-ize*.

Australia, with its devil-spawn Macquarie Dictionary, perpetuated this error, following the French:

> This practice prob. began first in French; in mod.F. the suffix has become *-iser*, alike in words from Greek, as *baptiser*, *évangéliser*, organiser, and those formed after them from L., as civiliser, cicatriser, *humaniser*. Hence, some have used the spelling *-ise* in Eng., as in French, for all these words, and some prefer *-ise* in words formed in French or Eng. from L. elements, retaining *-ize* for those of Gr. composition. (**—*ize***)

But all this nonsense about Greek and Latin words is irrelevant. As the One True Dictionary says,

> (T)he suffix itself, whatever the element to which it is added, is in its origin the Gr. (_-izein_), L. *-izre*; and, as the pronunciation is also with *z*, there is no reason why in English the special French spelling should be followed, *in opposition to that which is at once etymological and phonetic*.

Scandalized? You bloody well should be.

http://blogs.nature.com/rpg/2008/08/20/on-ize

[1]The Americans are absolutely correct with their spelling of 'aluminum'. However, 'aluminium' is prettier.

On depression—a personal perspective

14 September 2008

Last week was Invisible Illness Week, as I discovered from Citronella. I also found out that one of my favourite webloggers, has been taking an anti-depressant for two years.

I bring this up because it is a very brave thing to admit to such things. I suspect that the vast majority of people do not understand depression, nor how incapacitating it can be. Depression is not sadness, or necessarily something that occurs temporarily in response to external events. It is as much an illness as cancer, or pneumonia. In many cases it goes undiagnosed, maybe until the person affected can not take any more.

The Black Queen and myself suffered from post-natal depression for a few years, and did not realize we had been sick until afterwards. We looked at ourselves one day and said "Oh! *That's* what was happening to us". We had no support, our friends did not tell us something was wrong, no one from church picked up on it: we did not realize we were suffering from something that was treatable. Once during those dark times we had friends round for dinner, one of whom is a clinical psychologist. I asked, knowing I was 'down', what is the definition of clinical depression. She replied that it is incapacitating; that you can not get out of bed (and there was nearly an Argument because someone didn't want to talk about it). I thought then that I must be OK, because I could function quite well thank you very much. I thought I was just inexplicably sad.

But there is a difference between depression and sadness. The latter can usually be tied to an event, a crisis, unwelcome news. Mild depression is more of a constant companion, a black hole around which you orbit. It can indeed be the result of circumstance, a low-level nagging that wears you down. It can also be the result of a chemical imbalance. It is scary (and I understand that many depression-related suicides occur on the up-tick, because the victim *never wants to feel like that again*), and can be debilitating if not incapacitating.

Most of my friends and acquaintances would possibly diagnose me as monopolar manic. But there is a darkness that follows me, which I keep hidden from all except those who are very close. I have approached the edge, I have flirted with the event horizon. Fortunately I have never had severe depression, never felt I needed treatment. What I have done is learn to mould it, use it creatively. This does not always work--sometimes I end up wasting time rather than writing--but I have help from one or two people now who understand me, and encourage me.

I can not stress enough that depression sometimes *requires* pharmacological intervention. But sometimes it is a sign, a symptom if you like, that something is wrong and needs to be addressed. A disease that lacks a cure. For me, over the last eighteen months or so, the singularity has approached quite closely. But in the last few weeks I have been thinking about my future career directions, and I have come to a decision.

And the event horizon has receded. It has disappeared from my radar, and this is an unusual feeling.

I'll keep you posted.

http://blogs.nature.com/rpg/2008/09/14/on-depression-a-personal-perspective

We are Stardust

17 October 2008

'How do we make water?'

That was the question I was asked on Wednesday morning, by the Younger Pawn (YP, nine on 5th November). Not, as you might expect, 'where does water come from?' but specifically, 'how do we *make* water'. The EP kept saying 'from the sky'; by repeatedly answering the wrong question she's either going to be a politician, or perhaps she's just a product of the public school system (in Australia, 'public' is equivalent to our 'state').

So I thought about this, and said by the combustion of hydrogen-containing fuels, but immediately realized that this wasn't going to cut it (yes, I could have said 'respiration' and talked about haem-Cu reductases and oxygen atmospheres but I want to riff off that for another blog entry. Besides, chemistry *then* biology, right?).

How can you understand that $H + O_2 \longrightarrow H_2O$ if you don't know what H or O are?

We started basic. *Real* basic. Back when the Universe formed, I said, all that there were was hydrogen atoms (I lied), and drew a little circle. I said that there's more hydrogen than anything else in the universe and that hydrogen atoms are actually friendly little things and like to go around in pairs. I then said that if you squish hydrogen molecules together you can turn them into liquid, but if you do this even more they *fuse* and become 'helium'. I said that hydrogen atoms weigh 'one' ('one *what*?' asked YP, incisively. Good girl), but that helium atoms are number 'two', weigh 'four', and are very unfriendly.

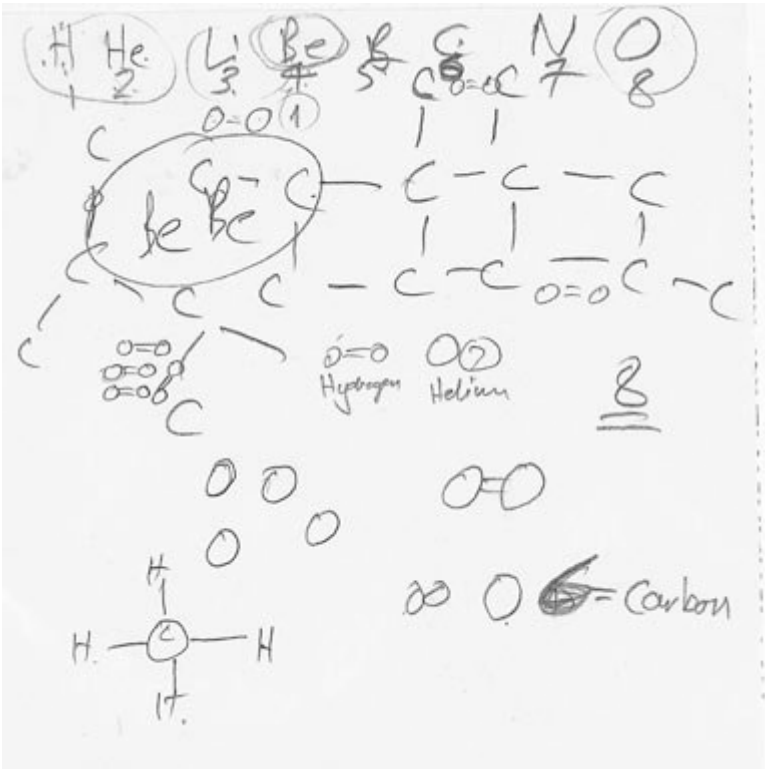
If you then squeeze helium together in the same way you can get beryllium, and then oxygen atoms, which like to be friends with two other atoms.

'Oh,' said EP, 'the *weight* is twice the *number*?'

'Up to a point, yes. But the weight gets bigger quicker, so chlorine—which we put in the pool, yes?—is number 17 but

weighs 36, for example' (I know, I know, shut up. It's close enough).

If you could mix these first atoms together in the right way, in the middle of stars, I continued, you can get the other atoms, like carbon. And carbon, you see, is *really* friendly and likes to make friends with four other atoms, like hydrogen, and then you get methane. Sometimes it makes friends with other carbon atoms, and do you know what this is?



It's what the lead in this pencil is made of. And if you organize the carbon atoms a bit differently so they stick out of the paper you get diamond.

'Coo-oool' chorussed the Pawns.

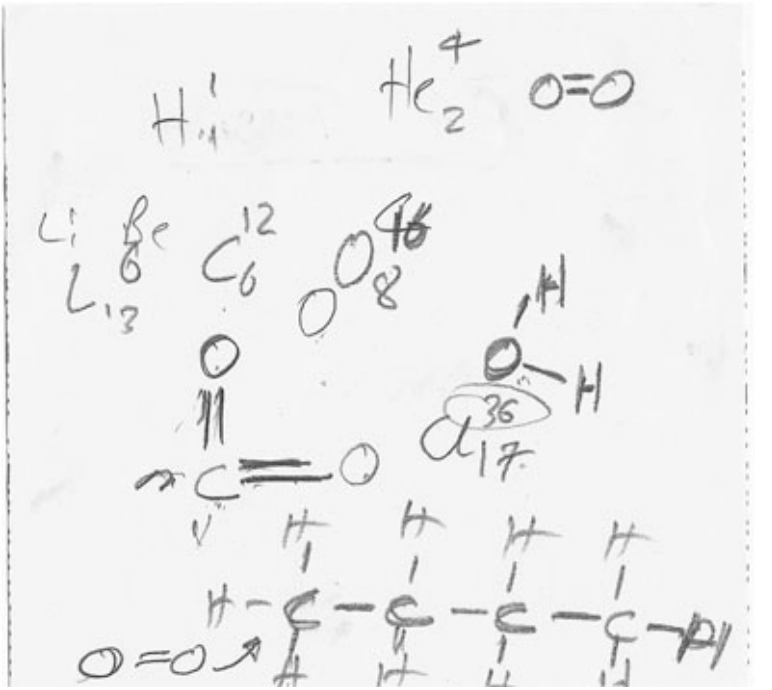
And the incredible thing is that all these atoms were made in stars right back at the beginning of the Universe, billions of years ago. And when a star *dies* —

'That's when the sun gets bigger than the solar system and then shrinks to nothing' said YP.

Exactly. When a star dies, or goes 'nova', these new atoms are spread into space and form part of new stars, and planets, and you and me. We're made from bits of old stars.

'Wow.'

(And that piece of news was shared rapidly and enthusiastically at school on Wednesday).

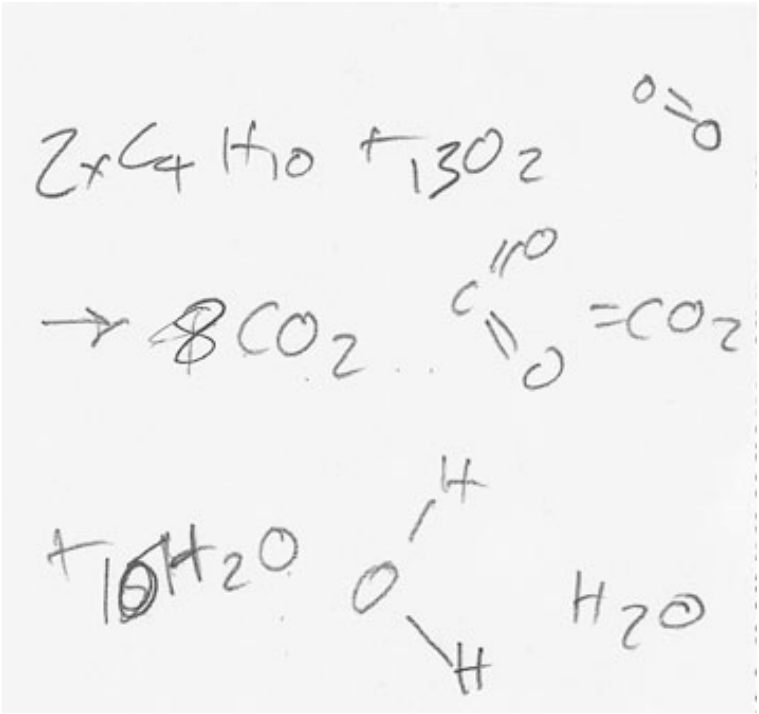


So what happens, I said, drawing butane, is if you have a molecule like this with all carbons and hydrogens all friendly and happy, and add an oxygen molecule—which is what happens when you burn things—then because oxygen is friendly

with just about every atom (including itself) it breaks all these other bonds, and you get carbon dioxide (because oxygen is such a good friend with carbon there only needs to be two) and...

water. Dihydrogen monoxide. H_2O.

And that's how we make it.

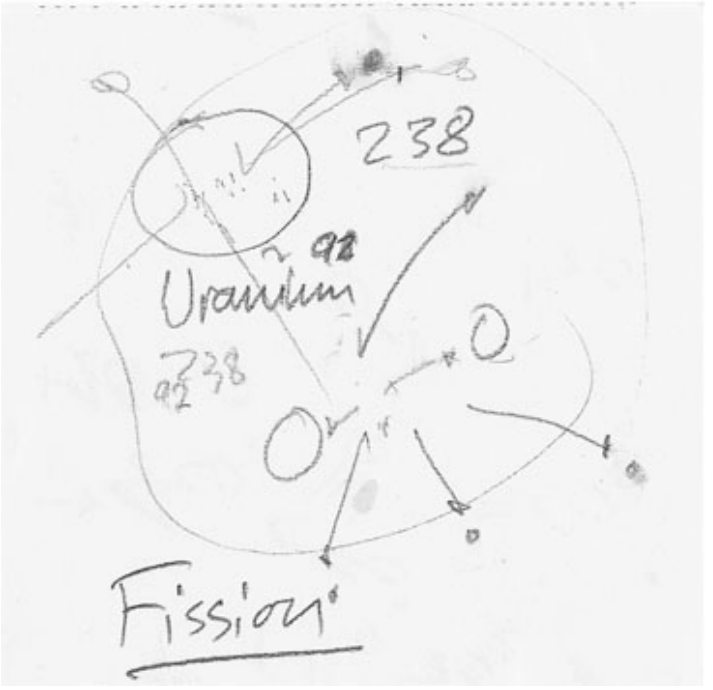


I said that we can also break water apart: if we stick an electric current through water it splits into hydrogen and oxygen gas. Their little eyes lit up and before they could ask if we might try that, I changed the subject.

I told them that the process by which we got our atoms of all sizes is called 'fusion', and asked them if they knew what 'fission' was. That's when I drew a uranium atom.

'OK, you've heard of nuclear weapons? Atomic bombs? No?'

I explained that if you had a lump of uranium about this size it would be warm, and it would give you radiation burns and cancer, because all the time it's spitting out little things that are a bit like hydrogen atoms—they weigh 'one' and they're travelling very fast. And when one of these neutrons hits another uranium atom, it will break it apart, and two or three more neutrons will come out, and they'll hit two or three more uranium atoms and... they got the point of a chain reaction. Each time this happens, I said, you get an enormous amount of heat given off. And if you have two pieces of uranium, and bang them together very quickly like ***this***, you'll wipe out Sydney.



Seriously, I said. It's so powerful, it would kill everyone within five miles.

'Could you make one?' they asked, horrified and fascinated. No, I explained, I couldn't make one. You'd need a lot of money and machines and people.

'I hope people never do it,' said EP, fervently.

'Sweetheart,' I said, 'it has been done.' And I told them about Nagasaki and Hiroshima, about the hundred thousand people that were killed each time, about how certain people were worried because they think North Korea and Iran might be trying to make this sort of bomb instead of using uranium for power generation like they claim to be trying to do, and how the countries that do make these bombs are very scared to use them because they know how deadly they are.

But, I said, you can control this reaction and use it in power stations. France makes most of its electricity this way. It's clean, there's no greenhouse gasses—

'Why don't we all do that then?' demanded YP.

I said it's a political issue. I said the Greenies were intellectually inconsistent. I said there *had* been accidents—Three Mile Island and Chernobyl—but the technology then wasn't as good as it is now and people hadn't followed safety procedures.

'Well that was stupid, then,' said YP.

Hell, if a nine year old can figure it out, it can't be that difficult, can it?

And then I said, as powerful as fission is, fusion—the process in the middle of stars that makes them hot, the process that makes all the atoms that make you and me and the earth and everything in it, how we get the H and the O and the C and *everything* —is yet more powerful. Each time you fuse hydrogen, you get much more energy than you do from splitting uranium.

'Oh,' said EP, nonchalantly, 'we've been told about fusion power. Why don't we use it?' and then I had to explain why they couldn't come into the lab and try to fuse hydrogen or make liquid helium: except it was time for school and we were running late.

http://blogs.nature.com/rpg/2008/10/17/we-are-stardust

In which I watch the Watchmen, and land a new job

05 December 2008

It started, as things often do in this age, with an email.

Their project is exciting, and one I had admired from afar. But then there was the conversation over Skype—my night, their morning—the chairman saying more than I did, but the few words 'we'll fly you out and talk to you' making more of an impression on me than anything else I could imagine. Hastily arranged flights, then—bagging a cheaper deal with my preferred carrier than their travel agents could find, and at a more convenient time. A nine hour layover in Singapore, made bearable by a spartan but comfortable room in a transit hotel.

A grey afternoon, wet: trains on the Piccadilly line skulking between stations as if ashamed to be seen overground. Purple and blue liveried coaches queuing up to take commuters home on a precipitous Friday afternoon. Towering Victorian architecture, sleek Intercity engines humming with repressed power: the scent of soot and concrete. Queues of people sidestepped to acquire an Oyster card: sufficient credit for a single journey. Damp pavements, the rounded peace of All Souls, the white and black art deco frontage of Langham Street; and a soft double bed crammed into a third floor room.

Old friendships renewed over warm pints and between sleepless nights. Hurrying along Euston Road, black-coated denizens as necessary and determined as corpuscles: squeezed and quantized and pulsed by traffic lights.

My first meeting in London was at the Nature offices. No, I didn't really want coffee but the water was refreshing. A project for which I was eminently unqualified, but the energy of potentiality worth keeping as a back-up plan: the main act was in Middlesex House, back past the British Library, the Wellcome building, UCL.

A day of meetings; another of follow-ups and arguing with the chairman. The promise of an offer and a meeting with the company lawyer.

Tuesday evening: ever increasing circles around the Borough market (closed but still smelling of fresh produce) until I found the Market Porter: Amy recognizing me as I looked for the gents. Half a pint of whatever I was having, and then Jenny turned up: after getting her a glass of wine (not Merlot, not Shiraz—it's good to know what you want) she asked me to look after Amy. So I retrieved her bag from the bag thief (not difficult: I could barely lift it myself), took her to a noodle bar and then two stops on the Jubilee line. To Jenny's home, through the woods and frost-gilted grass then back to my hotel.

On Wednesday I found presents to take back to Sydney, met Henry for lunch and returned to Cleveland Street to talk to the head developer. Saw the company lawyer (and understood him, and he me, when we talked about assets and security and remuneration) and the chairman again. Could barely believe my ears, incoherent as I was through exhaustion and jet-lag. Could not, actually, wait to leave before he changed his mind.

Back in my tiny hotel room I sent some emails, showered:walked to Freuds. Jenny treated me to a celebratory Long Island ice tea.

Richard in his element: surrounded by incredibly smart and beautiful women

Thence to Black's in Soho, to tear apart the artist's vision over somewhat lacklustre (and dare I say it, 70s) food and a long table set for twelve. Most of those who had actually read the book claimed not to like it, but gave it surprisingly high marks. Refusing to be cowed by convention I rated 'G' out of ten—and added weight to the end of the table that wanted to judge the book by the standards of the time it was created, not those of twenty years later. I tried to point out that Doc Manhattan and Rorshach (with whom, perhaps surprisingly, most of us were least unsympathetic) and the rest of them were merely plot elements: the point of the story is not what happens, nor even speculative fiction as a setting for interesting characters; rather, *Watchmen* poses a moral dilemma that would make Jeremy Bentham proud.

They were having none of it, the bastards. I did, briefly, invoke the spectre of utilitarianism and said that even if you save the planet, killing three million people still makes you a mass murderer, and all the other 'moral agents' in the story—save one—were dishonorably complicit. What is the price of a new world order? What, actually, is the difference between someone (like Hitler) who murders millions of innocents because they want to make a 'better' world, and a character like Veidt, who murders millions of innocents on a gamble to save the world we have? One of these people was stopped at great human cost, the other went completely unpunished and uncensured.

Ultimately then, as the book asks, who watches the Watchman? No one? Rorshach?—and he's dead.

But dessert was stupidly late (Tania never did get that glass of water), calculating the bill turned into an intellectual exercise equalled only by the watchmaker's reincarnation, and I was almost asleep. Finally I made my way through Soho streets prowled by garbage trucks and desperate taxis, the December air biting my nose and cheeks, to pack my suitcase.

Now I am thirty five thousand feet over the Caspian Sea and the crescent moon—the same moon I saw above Oxford Circus last

night and the same moon that that hangs above Sydney—reflects on the wing of this Airbus. In a curious dichotomy I am moving further away in space but closer in time to what is not 'their', now, but 'our': my project, my city, my home.

Watch this space.

http://blogs.nature.com/rpg/2008/12/05/in-which-i-watch-the-watchmen-and-land-a-new-job

beautiful and essential

19 December 2008

When people think about science they often frame answers to the question—Why is it important?—in very stark, utilitarian terms. Science, people claim, is important because it makes our lives better: it gives us aeroplanes and dishwashers and space flight and computers. It gives us the antibiotics that undoubtedly saved my life two years ago and a fighting chance against cancer.

It teaches us how to think critically, to weigh evidence and hypotheses, to determine what is true and what is merely imagined. To tell us what "works" and what is wishful thinking.

And these are good reasons, noble reasons, and when we, as scientists try to persuade various agencies to give us money for our research, they are reasons we will play on, reasons we use as tools. Understanding mechanisms: how this protein does that thing will help us cure cancer, we say; or develop an AIDS vaccine; or cure hunger in Africa; or save the panda.

But there's more to it than that. Science is not just important for what it does for us practically, or even philosophically.

When I was five or six, I was walking with my parents along some Suffolk byroads. I looked up at the pylons as they marched across across the countryside. 'Mam,' I said, 'how does the electricity "get into the wires?"'. Just a few weeks ago my youngest daughter paused with a spoon of breakfast cereal halfway to her mouth and said, 'How do we get water?' These are good questions, and children ask them without fear of the answer. They want to know "how stuff works". It seems to be genetically programmed, but as we grow older we lose that inquisitiveness—or have it beaten out of us—and miss out on the emotional engagement that comes from finding out about the world.

Science is important because, just as much as literature, or art, or music, it teaches us to be human. It's part of us, part of who we are.

Science is as necessary as art. Darwin is as important as Dali; Copernicus as Beethoven. Science is "who we are", beautiful and essential.

Published online at http://whyscience.co.uk/contributors/richard-p-grant/richard-p-grant-beautiful-and-essential.html
as part of Alom Shaha's WHY IS SCIENCE IMPORTANT? project

The year of living dangerously—Part 1

30 December 2008

As those of you who have been paying attention will realize, I'm changing career next year. This is exciting and scary, which is as it should be. It's not, actually, the first time I've left academentia, and I'd like to tell you a little story about that.

Are you sitting comfortably? Then I'll begin.

In the latter half of 1997 I had been in Oxford for ten years, and was looking for a change. My first post-doc had gone reasonably well, but it was time to move on (and get away from the medics who kept cluttering up the lab). I interviewed for four jobs over the space of about three months: the first I thought went well but I didn't get it (a plant biochemistry project at the John Innes), the second I came second (the chap was very apologetic; wanted to hire me but needed someone with a touch more pre-installed bioinformatic prowess) and the third I was offered. I turned it down: although it was in Cambridge I still thought I could find a plant project.

The fourth application was to a small start-up (yes, redundant, I know) in Cambridge and I heard nothing for weeks. When I'd about given up on them I got an email saying that although I hadn't made the shortlist the first time around, they wanted to interview me on the strength of my communication skills. Which I remember being slightly odd, but went along anyway, and was offered the job.

The feeling I had on the train back to Oxford, looking out at the harvest, was not dissimilar to that of being on the plane back from London four weeks ago: a slight sadness at the passing of an era; an excitement at the prospect of a new venture; and gibbering terror at the thought of getting everything organized and sorted in time.

My boss was upset that I was leaving. I suspect there was a little bit of jealousy, and disappointment at 'selling out'. It was only at the end of a rather tedious rant that I received a very grudging 'congratulations'.

During my notice period I found myself fielding phone calls from the CEO, trying to get me to start earlier than my current contract would allow. He made the point quite forcefully that this was a 'market-led' company. As I discovered from Dilbert a few years after I'd left, this is code for 'we blame our customers for out lack of innovation'. Oh, and 'we can't figure out why we're five years behind the competition'. He had an 'open-door policy' and I also had to fill in one of those personality tests (not that, as I was to find out later, they took any notice of it). All these would have made a more mature head send insistent 'run away, quickly' signals to its legs and 'scream, loudly' signals to its mouth. But what was I to know? I even thought that stock options in an unlisted company wasn't a bad idea.

And so I started in industry, as a 'senior scientist'. On a salary that was more than my academic one but certainly well within the dreams of avarice. (According to the psychotic secretary who was employed the year after I started, we were paid 'industry average'. This was true, as long as you figured academic salaries into the calculation.) We managed to find a nice enough house just south of Cambridge and I started commuting by car, a novel experience for me.

My first task in the new gig was to redevelop a range of manual DNA prep/extraction kits. The company was founded on the basis of a one-tube method of making plasmid DNA from bacterial cultures, but the machine that was supposed to run twelve of these simultaneously in under twenty minutes failed at market launch (because it was crap): so while it was undergoing emergency surgery the company needed to make money some other way. I also had to man the helpdesk and accompany sales reps on site visits to interpret them to the scientists and vice versa. Seeing as we weren't actually selling much at the time, and only had two sales reps, I was mostly in the lab.

After a couple of months I'd re-vamped the kits to my satisfaction, and tested them against the so-called market leaders. My plasmid method in particular was superior in every way, compared with the brand that starts with 'Q' and doesn't have a 'u'. Better yield, longer sequencing reads, could use rich

broth (2xTY instead of LB, for example) without swamping the matrix, and significantly faster. The only downside was that you had to use a matrix suspension instead of pre-made spin columns: but that helped us keep the price down (I was told that the leading brand cost 18p per prep but retailed at £1.09p. We were cheaper). I even persuaded The Powers That Be to source and include in the kit a collection tube with an extended neck so that you didn't have to cut the lids off in the centrifuge. It took Qiagen about six years to catch up with that innovation.

My plan for world domination was foiled by the useless marketing division. My kits did not exactly fly off the shelves (although of our two sales reps one smelt like an ashtray and the other seemed to be barely out of nappies). Nonetheless, upper management were impressed with what I'd done and asked me to take on the task of making the AutoCrap™ machine (not its real name) ready for market. Two less senior scientists were placed at my disposal and I was told to get on with it.

(To be continued...)

http://blogs.nature.com/rpg/2008/12/30/the-year-of-living-dangerously-part-1

The year of living dangerously--Part 2

31 December 2008

The principle behind the AutoCrap™ was, actually, quite clever. There was a plastic sealed cylinder with a membrane separating top and bottom. You pipetted 1.5 ml bacterial culture into the top, sealed it, and pressed the start button. Everything was driven by hydraulics. Positive pressure forced the broth through the membrane leaving the bugs behind. Lysis reagents were squirted into the top and clever changes in pressure mixed them up. Then everything was filtered through into the lower chamber where the plasmid DNA stuck to a slight variation on the standard matrix. The normal washes, a drying step, and then the DNA was eluted in water into Eppendorf tubes.

The first thing I did was optimize the volumes of the lysis and wash reagents, and determine which of the various DNA-binding matrices we could find performed best (the best matrix for the manual kits did not perform so well in the columns). Then I went to the machine itself, taught myself TurboPascal and re-programmed the machine to take advantage of the improved chemistry. Then back to the chemistry for more tweaks, and a final round of protocol wrangling in TB. I took the new machine out to various labs in London (trying to absorb as much nonsense from the rep as possible) showing them how, this time,

it actually *worked*. When I had finished the AutoCrap™ could justifiably be called the AutoQuitereasonablereally™.

In my spare time I fielded phone calls, sat in on marketing meetings, visited labs, showed Charlie (Venture Capitalists) around and wondered why the CEO was such a creep.

And all this time my line manager did little more than use his PC to check the football score and send emails to his girlfriend. Occasionally he'd claim he went to management meetings so that we could be spared the bullshit. The IT manager visually scanned web traffic logs for signs of wrong-doing (I stung him on this one. One day he went around telling everyone that someone had been downloading porn, he knew who it was, and they were for the high jump. An inveterate Mac-hater, he had no way of knowing that 'G3' and 'hotnaked' in the URL merely meant someone had stripped a G3 Mac and posted pictures of the internals of a computer on the web. Face, meet egg) and on Fridays (management meeting day) over half the company got locked into the meeting room.

I spent a while tinkering with the machine, making sure it was as good as it possibly could be, and wondering how Marketing were going to cock *this* one up.

While I had been working on this, the other 'senior' scientist in the company had been developing a rapid and high-throughput method for rapidly extracting genomic DNA from whole blood. The protocol was simple: add 1 ml blood to a column with a certain type of Whatman paper in it, heat for 2 minutes, wash, elute with water. Presto! PCR-ready genomic DNA.

This was called 'gNAPS', for 'genomic Nucleic Acid Purification System'. We, naturally, took to calling it 'guh *naps*', much to the chagrin of Management. 'Gee naps,' they said, to little avail.

As I must have been looking a bit bored, Management spake unto me, saying 'Go thou, and make this work for large volumes of blood. Say ten to 25 ml." And I looked at the setup, dicked around for a week and saith unto Management, "Nay, for I canst not break the laws of Physiks. Furthermore, what wouldst anyone do with that much DNA?"

"Never you mind," they retorted. "What the customer wants the customer gets. Make it so."

I went off, muttering that if they needed to archive material they could just run two columns instead of one, and that any fool could see that you couldn't get heat transfer into the middle of the paper fast enough for it to work. But I talked to the tame engineer and got him to mock up a heating block, and destroyed hundreds of 50 ml syringes and burned through gallons of expired human blood from Addenbrookes (the smell of hot plastic and cooked blood still haunts me) in a futile attempt to 'make it work'.

It was then things started getting interesting. About the same time I was preparing my report to show that really, this was not going to work, ever, we had a business meeting to talk about future directions.

A few months after I'd started Peter (the CSO, inventor of the automated column system and founder of the company) asked me if I knew anyone who could set up and start running a genomic DNA extraction service. The plan was to get clients to give us clinical blood samples, we'd prep DNA, and sell it back to the client. I said that Kate was looking for a job, and so he hired her. Kate then almost single-handedly set up and ran the service (including doing the extractions!), which I believe became the first commercial DNA extraction service in the UK. (And then the CEO realized it was a success and hired a manager over her head to run it. Which was typical, really).

Peter, naturally, wanted to expand the company's horizons. He suggested that we started offering SNP detection services, concentrating on P450 to start with. There was the market, and any number of primers--we also had a really rather hot sequencing machine and a competent monkey to run it. But in front of the entire company (all 20 of us) the Marketing Manager stood up and said that no, we couldn't offer that, because it was *too difficult*.

You might imagine the feeling among R&D at this point, being told something was too hard for us. And my line manager? Not. A. Word.

One day, Peter dug out some notes from two years previously, and asked if I could do anything with them. What he had come up with was a one-tube method for making plasmid DNA. No matrix, no spin column: just one tube and certain organic reagents. He also showed me, in an old freezer at the back of the lab, certain enzymes that no one had worked on since they were discovered. Suddenly, I had new projects.

And then Peter disappeared.

Well, that is to say, he didn't turn up to work for a week. At the end of that week, the CEO called us all together and said, "Peter is taking some leave to consider his future."

That evening I called him at home. "Peter," I said, "what's happening?"

"Richard, they've fired me."

(to be continued...)

http://blogs.nature.com/rpg/2008/12/31/the-year-of-living-dangerously-part-2

The year of living dangerously--Finale

05 January 2009

I hopped in the car, and a couple of pints later Peter spoke, and spoke fast. I had to ask him to slow down. (Sorry, a Private Dick moment there). As far as I can tell, Peter had been fired for being too smart and innovative, which are not qualities wanted in a small startup, apparently. At least not one run by a greaseball of a CEO who, while we were in dire financial straits, was quite happy for the company to put him up in a hotel because he didn't want to move from Manchester. Rumours about secretaries, improper liaisons with, and tills, fingers in, are mentioned only to dismiss them. Although they would make interesting side-plots in the screenplay of my life.

I suggested to Peter that it couldn't have been a personality clash because for that to happen the CEO would have had to have a personality to start with. Although we laughed, I learned more about corporate behaviour in that one evening at a pub in Heydon than I had in the year and a half previously.

Having been tipped off as to the slightly dishonest nature of certain people (and realizing that there was no way the company had the cojones to fire my manager so I could have his job), I began looking for something new. Back at the ranch, things started moving in even more disturbing directions. Despite my best efforts, the AutoQuitereasonablereally™ was not flying off the shelves (although those who had bought one were very happy and kept re-ordering consumables from us), and the company was strapped for cash. So in a stroke of genius the CEO laid off the poorest paid people--the two who who worked in production, putting together the columns to supply the AutoQuitereasonablereally™, the kits, and making up the reagents for Kate to run the DNA extraction service. Which not only pissed off the production manager, but also made the hierarchical pyramid even more top-heavy and holed one of our revenue streams beneath the waterline.

About the time the enormity of this error was realized I had already responded to an ad in *Nature* for a post-doc at the MRC-

LMB. I was also able to assist Peter as a consultant in an edition of *Time Team*, in which we attempted to PCR DNA from a Stone Age human tooth (and if you look very carefully you can see the back of my head behind ~~Baldrick~~ Tony Robinson in one pan shot). By the time I was told I had to assist in Production, putting plastic columns together (because someone realized that we had to assemble the bloody things in order to make any money at all, and oh look, we have no staff to do this), I was really losing interest in the company itself.

And one day the CEO called me into his office.

Times were tough, he said. They really appreciated the work I'd put in, he said, to develop the kits and make the AutoCrap™ salesworthy. There was no money for a pay rise but please, he said, take myself and Kate out to a nice restaurant and the company would cover it.

To the tune of fifty quid.

I heard *Please don't leave us*. I said, "Thank you."

Then we found that the company was being sold to Whatman, apparently for our IP. We were told that our stock options were worthless, although we still had to hand them over so the sale could go through.

Kate and I went to the Jade Fountain, had a nice meal and a reasonable bottle of wine, and after I got the money back from accounts I handed in my notice.

During the next couple of months I wasn't allowed to work on anything useful, so I spent the time documenting the AutoCrap™ software and re-writing the user manual. Documenting the software shouldn't have taken that long, but I decided to make the most of it and wrote it as hyperlinked pages, which was the perfect opportunity to learn HTML 4 and CSS. My position was advertised--and they actually appointed *two* people to replace me, which was rather gratifying.

When I left I took a pay cut, but the MRC pumped a load of money into the system soon after, and the rather generous raises we got over the next six years more than made up for it. They

were the best years of my career to date, so it all worked out rather well in the end. But it was quite the ride at the time.

And the company? A couple of months after I left, Whatman relocated it to another science park in Cambridge, right next to an expanding biotech company. When most of the staff were made redundant a year later they quite rapidly found new jobs. The only thing left now is the contract DNA extraction service, last seen operating out of a small shed in Ely.

http://blogs.nature.com/rpg/2009/01/05/the-year-of-living-dangerously-finale

On summer students

12 June 2009

A good summer student, it is said, will only set you back a month.

I was reminded of this rather pessimistic piece of advice when I commented on Jenny's post about dark arts this afternoon.

When I was at the LMB in Cambridge, we used to take on summer students if they came with a recommendation, if they could demonstrate at least that they knew one end of a Gilson from the other, and if some brainless monkey work needed doing. It turned out, one summer, that I needed a shedload of protein growing so that I could solve its structure by NMR. We got a summer student, he spent all summer in the cold room, and we got enough of the 7 kDa fragment to solve it by natural abundance (^{1}H) methods. This work was published in the then *Nature Structural Biology* and we were very happy, and even happier when we realized that it was a complete work of fiction and published the correct answer to our question a little bit later.

cough

Anyway, this was a good experience with summer students, and so we tried again a a couple of years later: again when I needed a lot of protein for NMR.

Oh boy.

Now, to be scrupulously fair, it was the fault of the lab manager, who taught the chap how to grow up bacteria for protein preps. For ages (except for a couple of aberrant years when a ~~quitter~~ visiting post-doc from Australia got everyone except me using IPTG and GST-tags) we'd been doing transformations, taking single colonies into a litre of 2XTY in a 2 l flask, shaking overnight at 34°C and letting the little beauties auto-induce protein expression (long before Bill Studier published his impressive analysis of auto-induction, by the way. We just didn't think it was worth publishing, which just goes to show, innit?)

So after I trialled the method, and left the student with complete instructions under the care of the lab manager, we got one successful prep. But nothing afterwards — we weren't getting any protein at all, and wasting the horribly expensive ^{13}C and ^{15}N while we were at it. One day I watched this chap set up a prep.

He went to the freezer, took a frozen bacterial pellet, scraped some gunk from the top of the pellet with a pipette tip and dropped the tip into fresh media for his grow up.

After I had peeled myself off the ceiling, I asked him why.

"Zat ees how the lab manager showed me," he said.

One culpable homicide later, we got back into business and made the protein and I solved the structure and I blogged about it.

This summer student was not completely harmless though. Before all this, I was showing him how to do certain things.

"Oh," he used to say, "zat ees not how vee did eet in Germany!"

Everyone in the lab used to get this. It wore a tad thin after a while.

One fine day, I was drying a protein gel between cellophane sheets.

"Oh," he said, "zat ees not how vee did eet in Germany!"

I am sorry to report that I very nearly lost my temper. I turned around, poked him in the chest (he was bigger than me) and said,

"Well sunshine, you're not in Germany now; you're in the Army, and we do it *my* way."

He was quiet after that.

For the entire summer.

http://blogs.nature.com/rpg/2009/06/12/on-summer-students

On running like hell

17 July 2009

It's still Friday. Somewhere.

'It's hot like hell. And you smell of death!' Lieselotte said to Neil one morning, not long before I left that particular lab. This is the girl who uses the English language rather like a cluster bomb: inexpertly, and people get hit by shrapnel.

'My barbecue cooks like hell!'

Back in Fenland we had a circular dichroism measuring-type instrument. If you don't know what one of those is it doesn't really matter, except to say that this particular one appeared to be carved out of solid granite, sat in a scary room in the basement and ate undergraduates for elevenses.

Despite that it was quite fragile, consisting of various antediluvian optics and a mercury lamp that absolutely was not, without exception, under any circumstances to be struck in the presence of oxygen. Not ever.

To help even the most suicidal student with this seemingly simple yet somehow elusive directive, the CD machine was connected to two dirty great nitrogen cylinders with an automatic switching device connecting them: the idea being that one would turn on the tap and flush the machine with nitrogen well in advance of wanting to use it (often overnight)—and if one cylinder were to run empty in the night then the other would without a flicker of a metaphorical eyelid take up the burden. And if one cylinder was empty when one came to use the CD machine one would trog off to Stores to replace it. You could tell that the cylinder was empty because there was a useful little dial on it with a red line and the letters 'E', 'M', 'P', 'T' and 'Y'.

And there were instructions and warning signs all over the room to this effect.

'BC9 expresses like hell!' Lieselotte said the next morning. 'Beta octylglucoside is like hell!'

Uh huh.

Time passed.

'My CD spectra are like hell!'.

Oops.

Turns out that Lieselotte had stormed into the basement room the previous night, in that inimitable way of hers, switched on all the taps and gone home for the night. In the morning, she'd stormed (like hell? probably) back in, struck the mercury lamp—and yes, you're a country mile ahead of me—and stormed out again to get her samples.

Not noticing, natch, that the needles on both the nitrogen dials were firmly against the letters 'E', 'M', 'P', 'T' and 'Y', and probably had been for most of the night.

Was she popular?

Like hell.

http://blogs.nature.com/rpg/2009/07/17/on-running-like-hell

On school days—Part I

30 July 2009

Once upon a time a callow youth—quite by accident—almost burned down a high school chemistry lab.

This is not that story, but an appreciation of certain details in this one will enhance your enjoyment when I get round to telling you it. This story involves Spencer Hogg, a bunsen burner and the thermite reaction. (Aside: I just googled his name, because I was certain I'd previously written about him on Nature Network. Turns out I've written about another exploit of his elsewhere, but as that's behind a paywall I'll have to adapt it at a later date.)

So. The thermite reaction.

***

One fine day in the top chemistry set at Kent School, one Mr Woods mixed together a small amount of Fe_2O_3 and solid aluminum powder in a small, ceramic dish. This was placed on gauze on a tripod (remember them?). Then all 20-odd of us were shooed behind the back bench, and Mr Woods lit the bunsen, turned it down really really low, placed it under the mix and ran like bloody hell to join us at the back of the lab. We waited.

We waited some more.

Eventually, Spencer Hogg spoke up.

'Sir,' he said, 'nothing's happening. Can I go and turn the bunsen up?'

'No, give it a bit longer.'

So we waited.

And waited.

And waited some more.

'Sir,' Spencer said, 'can I go and turn it up *now*?'

'All right then, but only a bit, and be very careful.'

Now, this might tell you a bit about Sir's character. One of these days (At SoLo09, perhaps) I might tell you what happened on a school trip to Amsterdam, but I fear that it would only distract you from what happened next:

Spencer duly emerged from the bunker, walked over to the demo, and turned up the flame by the merest amount. He turned away, and there was what I can only describe as a 'FOOM'.

Actually, that would be wasting a perfect opportunity to use the word 'pyrotechnics'. Bits of flaming *stuff* whizzed out of the ceramic dish: sparks, smoke; the works. I think Spencer might have flinched.

One piece of flaming *stuff* landed in the wastepaper bin by the hand-washing sink. This bin was a wire basket about three feet high with a green (funny the details you remember) plastic liner and full to overflowing with scrunched-up paper towels. Which ignited.

Woods, give him his due, leapt over the bench and dashed to the front of the class, releasing the catches on the red metal box to get at the fire blanket...which happened to be directly over the bin. The fire blanket dropped straight down, still folded, and the flames shot *sideways* through the wire, the plastic liner giving way almost immediately, while we pissed ourselves laughing.

Not to be deterred, he grabbed the fire extinguisher from the wall and put the awesome power of ~~yeast genetics~~ foam to its God-given purpose.

When the smoke had cleared and we'd filed back to our own seats, Mr Woods called in the teacher from the parallel class next door, and asked for help resetting the safety on the fire extinguisher. This cove placed the extinguisher on the demonstration bench, stood behind it and tried to force the safety; sending foam over most of the front bench and its occupants—fortunately for me my seat was at the very end (nearest the door. I'm not daft) and it missed me.

The extinguisher was left, then, and we thought no more of it, except what a great thing chemistry was and how Spencer Hogg was quite possibly the luckiest boy in the school.

My fun, however, was only just beginning.

http://blogs.nature.com/rpg/2009/07/30/on-school-days-part-i

On school days—Part II

03 September 2009

Where've you been? Holidays? Harrumph. You young whipper-snappers, why, you don't know you're born. In my day, we had to watch endless repeats of Monty Python and the Goodies and like it.

Anyway.

Just over a month ago I related a story about a demonstration of the thermite reaction. You'll remember, if you care to take your pencil out of your nose, Gee, and pay attention, that a cove by the name of Hogg assisted in this demonstration, very nearly burning down the chemistry lab in the process. Oh do put it away, Rohn. Unless you've brought enough for everyone? Didn't think so.

So, this Hogg character. Not exactly the brightest cookie in the toolshed, but keen. Very keen. Sort of chap who would do something stupidly brave and afterwards wonder what all the fuss was about and what all the ambulances were for. And one of the things about science is that actually, if you've got enthusiasm you don't necessarily have to be all that bright, as long as your creative energies are suitably steered.

Leastways, that's the charitable explanation for Hogg finding himself in possession of one of the very expensive glass syringes one day in the chemistry lesson, whereas those of us who were more or less guaranteed 'A's had to make do with the old, cheap and (critically) *unbreakable* plastic ones.

That fateful day, we were generating hydrogen by some method which probably involved acid; collecting the gas and measuring how much was produced. Thence—knowing how much stuff we'd started with—we were to quantify the reaction. Or something equally useful. It was another country, ~~and besides, the wench is dead~~ and a long time ago.

So we all had reaction apparatus, a length of tubing, and a graduated syringe with which to collect and measure hydrogen

gas. Some of us, as I say, had these plastic, crappy things and others, in what seemed to be gross unfairness, the expensive and accurate glass jobbies. After a certain amount of grumbling, we got down to business—Hogg, naturally, happy as a pig in shit.

Events proceeded according to the laws of nature: gas was produced, measured, and calculations begun.

Well, that's what *should* have happened.

Hydrogen gas indeed was produced, and as most of us were peering at the faded black lines on plastic syringes and trying to figure out exactly what 'e.t2' meant in cubic centimetres, there was an almighty **BANG** and a piece of glass went whizzing past my left ear. I turned on the spot, afraid that sudden movement might cause something to fall off. At the other end of the classroom, like a latter day Ozymandias, stood Spencer Hogg: hand outstretched, a smouldering splint in one hand and nothing but whispy smoke in the other.

The boy, miraculously, appeared unharmed.

When we eventually managed to prise Mr Woods from his hiding place in the stock cupboard, we discovered what had happened.

Hogg, all keenness and light, with glass syringe in hand (did I mention how expensive they were?), was desperate to repay the trust placed in him, and, in short, had tried to impress Mr Woods with his extensive knowledge of chemistry. After recording 7.3197 cm 3 precisely , he determined to prove that the gas evolved was indeed hydrogen. So he lit a bunsen, removed the plunger from the syringe, (mixy-mixy, little FAE) and plunged a lit splint into the open end of the syringe barrel, no doubt expecting a genteel 'pop'.

You can't blame a kid for trying, I guess.

http://blogs.nature.com/rpg/2009/09/03/on-school-days-part-ii

On multitasking

09 September 2009

The old joke goes that while mothers know their children's birthdays, shoe sizes, favourite sweets, least favourite foods and names of their best friends; and their best friends' birthdays, shoe sizes, favourite sweets, least favourite foods and *their* best friends, fathers are vaguely aware there are small creatures in the house.

Similarly, women are supposedly able to walk, read a newspaper, send text messages and help old ladies across the street while simultaneously reciting their children's birthdays, shoe sizes, favourite sweets, least favourite foods and names of their best friends. On the other hand, men can just about manage to chew gum without falling over.

'I'm concentrating on breathing'

Definitely a sexism thing going on there: women can multitask; men can't. I guess it's fair enough, given that misogyny is endemic in our culture. But, you see, it's actually a well-kept secret. As a man, I can say that we can do things like put up

shelves, look after the baby and cook dinner *all the while* listening to the cricket. Truth is, we'd much rather sit and watch the cricket and pretend that we're stretching our limited resources by knowing exactly how much beer remains in the fridge (just don't ask us to explain LBW, OK?). We find life a lot easier if we keep people's expectations low.

Anyway, Jenny twittered today about multitasking. And while I am keen to find out what exactly was going on in her UCL empire, I am also reminded of something that happened to me when I went to work for a little company you've probably never even heard of (unless you read this blog).

I realized pretty early on in my graduate career that I couldn't afford to do just one thing at a time. If I wanted G-actin (prepared from rabbit muscle) purified and labelled and polymerization-competent during the same timeframe that the protein I had to purify from buckets of chicken gizzards (five day prep, ammonium sulphate extraction followed by four columns, all in the coldroom) was going to be stable, I had to do things simultaneously. Especially if I also wanted to make competent cells so that I could clone and express the domain that I was also trying to crystallize before my stipend ran out.

Multitasking seemed pretty normal to me, as well as sensible. My first post-doc was the same: cloning, expressing, growing cells and chopping off the fingers of students who didn't know how to use computers all had to happen at the same time if the papers were to be published.

It was quite the shock when I got to the company, and was told very early on that I could only work on one project at a time, and shouldn't interleave experiments. Because, the story went, all the projects would then suffer.

I never did understand that. I did, actually, rather well at that company, getting two projects (the first minor, the second pretty major) to launch and realizing the third was utterly doomed, in three years. So well, that when I stormed out they hired two people to replace me and still spiralled into the ground a year or two later.

When I went back to academia I was straight back into multitasking mode: at any one time I'd be trying to crystallize (or solve by NMR) five different proteins (the chances of any one protein crystallizing are around 10%. But you never know which 10% it's going to be in advance, and you can never tell when a sodding high throughput structosomic project is going to gazump you. *Cock*) as well as growing cells and doing nuclear import assays, teaching students how not to poison themselves or anyone else, helping out other members of the lab and running secret projects on the side.

It's the same in my new job, too. I don't feel *happy* unless I'm juggling too many eggs. Not only do I find that I finish multiple tasks ahead of the combined schedule, I also get *bored* if I have to stick to one thing and one thing only.

So maybe being limited to one project does work for normal people. But for the type of person who likes science? Well, I don't claim to be normative, and I'd love to hear about your experience. As for me, I go stir crazy if I only have one thing to do.

But don't ask me to mow the lawn when I'm watching the cricket.

http://blogs.nature.com/rpg/2009/09/09/on-multitasking

On school days—Part III

04 October 2009

You might be forgiven for thinking that Hogg was the only character in my high school chemistry class. Indeed, sometimes I was forced to make my own entertainment: such as the time I poured a glass of water over the housemistress' head. From two floors up. Or set fire—but no. I'll leave that one for later.

High school physics experiment

There was, in fact, a whole regiment of patsies that could be relied upon to relieve the routine of studying for 'O' Level. And some of them managed to do it from behind a wall or two...

One fine day we traipsed into the chemistry lab to be given a list of instructions, complete with boxes for us to write down our observations. It was meant to be some sort of test; and just so that there could be no cheating, the other top chemistry set was sitting it simultaneously.

The first task was to take a set amount of chalk, and heat it over a bunsen. Then we were to let the powder cool, weigh that, then transfer it to a watchglass and add water. Finally we had to measure the pH of the suspension and figure out what just happened. Something like that, anyway.

We had instructions. *Clear* and detailed instructions. We heated up the chalk. We (eventually) transferred the resulting powder to watch glass. We read the bit where the instructions said 'holding it in your hand, add three drops of water'. And because we were doing this (all forty or so of us between two classes) simultaneously, the scream came at the precise moment we were dripping water onto the innocuous-looking powder in a watchglass.

Because some berk next door (and I know who it was was but I'm not going to embarrass him, on the off-chance he might track me down after 25 years) had taken the instructions too literally: tipped the powder directly into his hand and added water to that. The exothermic reaction alone must have hurt; the alkali burning a hole in his hand did the rest.

$CaO\ (s) + H_2O\ (l) \Leftrightarrow Ca(OH)_2\ (aq)\ (\Delta H_r = -63.7\ kJ\ mol^{-1})$

http://blogs.nature.com/rpg/2009/10/04/on-school-days-part-iii

On story-telling

14 October 2009

I've got to give a talk tomorrow.

In the best traditions of scientific conferencing the abstract submitted a month ago bears little relationship to what I'm actually going to say. (And in that tradition: What *am* I going to say? It's only because I had to upload some slides to their server this afternoon that I even have my slides ready.)

But in recognition that I'm now ~~Mr~~ Dr Corporate, and that I'll be addressing internet librarians *internationale*, I've decided against wearing my Levi's with the RM Williams. I'll still wear the boots, but smart trousers instead of jeans. By the way, don't buy RM Williams boots if you can avoid it. They look good, but the build quality is surprisingly disappointing. I think they're designed for riding dingoes around all day and shooting kangaroos, rather than walking to walk.

Where was I? Oh yes.

Talks given from the corporate side of the fence are subtly difference from those you might give as an academic, when you describe your research. For starters, unless you're giving a terribly boring presentation on sales or ROIs or whatever, you ~~can just make shit up~~ have quite a bit of freedom in how you present, and indeed what you're presenting. Your standard scientific talk takes a problem, gives you some background, describes what you did to answer the problem, shows some data and presents your conclusion (which is usually 'it didn't work' or 'we need to do more experiments', or most frequently 'give me a job. Please').

I don't have materials, methods, data or conclusions. I've got an interesting problem, sure, but it's more 'oh, here's a fly-infested ointment; what's being done about it and how might we tackle it?'. It's not 'gizza job', nor even 'buy our product', actually.

I'm looking forward to it. Even if I have to dress a little smarter than usual.

Now, there are principles that apply equally to academic and corporate talks, such as the '10-20-30' rule, the 'don't talk to the screen' rule and the 'my God but Powerpoint is complete *crap*, isn't it?' rule. But I was reminded of one rule in particular a couple of days ago, when I received a really lovely Facebook message from a student back in Sydney.

Nurse Donovan said,

> RPG you have left a lasting mark on me:
> Once at mmb you came and looked over my shoulder at the slides i was making for my lab talk, and you said "the title of your slide should always be the conclusion of the slide".
> And I have never been able to forget it!
> That's not to say that all my slides now have great punchy all-conclusive titles, but it means that now when i make a slide that has some sort of an airy-fairy title or (slide-god forbid) an ellipsis, i feel this nagging sense of guilt...
> Just thought i'd share that with you because i'm making some slides right now and there you were haunting me again!
> Hope you're great!

Isn't that totally brilliant? I may be gone, but my ~~smell~~ influence lingers on.

And tomorrow, I'm going to totally break my own rule. Rather than show each slide with a conclusion, episodic-like, I'm going to continue something I started experimenting with in Sydney, and managed to pull off in Nantwich. That is, I'm going to stand there and tell a story, and going to use the slides behind me to illustrate what I'm saying, rather than being the focus.

I'm going to tell a story. With pictures.

http://blogs.nature.com/rpg/2009/10/14/on-story-telling

On school days—Part IV

05 November 2009

I'm sitting in a hotel in Charleston SC, in a somewhat uncomfortable armchair, MacBook on lap and cursing the dodgy wireless signal in this place. Looking around, lots of people seem to be having similar problems. I've forgotten my adaptor so I'm hoping that my hung-over colleague makes it in with the work laptop.

It's around 72°F outside and it hurts to look at the ~~pavement~~ sidewalk through the hotel window; my boots and winter trousers are definitely not suitable.

I'll talk more about the conference some other time, but rather than go through my presentation again (I hate over-rehearsing) I'm going to tell you the long-promised story of how I nearly burned down the chemistry lab at school, assuming I get enough connectivity to upload it.

You might presume I was a keen student. Indeed, my imagination was limited only by limited access to necessary reagents and school safety policy (although when I did my A Levels I managed to—but no, that's another story). So when Mr Woods performed a demonstration of something that didn't blow up or burn holes in hands or set fire to massive amounts of paper, I thought this was my chance to have a little play.

Take, if you will, one open-ended glass cylinder about two inches in diameter. Place a square of wire gauze in one end and push it up a little way. Clamp the arrangement over a Bunsen burner. Ignite the Bunsen, allow the gauze to start glowing, then remove the heat.

Listen

This simple set-up results in an organ-like descending tone, full and rich and reasonably loud. (Why this was in a Chemistry lesson and not Physics yet escapes me.)

I turned to Allan Jones and said, 'Let's come back at lunchtime and see how loud a sound we can make.' He agreed, so we

approached the teacher after the class ended and put our proposal to him. He readily agreed to find the largest cylinder he could, and have it ready for us.

An hour or two later we had wolfed down our lunch, and hot-footed to the sixth floor of the Science block. Woods was waiting for us, with a cylinder about six feet long and six inches diameter.

Made of cardboard.

'You are having a laugh. Sir.'

'No,' he told us, 'it's compressed cardboard that they ship glassware in. It won't burn.'

'Fair enough,' we said, 'hand over the kit.'

So he went off for lunch and we were left alone in the Chemistry lab with a huge cardboard tube, clamps, a box of metal gauzes and an endless supply of natural gas. And matches.

We clamped the tube between two retorts on the front bench, stuck the largest piece of gauze we could find up inside the tube, and lit a Bunsen under it. After a minute or two we guessed that the wire might be hot enough by now, and removed the burner.

Nothing.

Not an issue, we said, we're obviously not getting the gauze hot enough. A problem solved by the application of scientific thought, and a second Bunsen. We repeated the experiment with this minor modification. Again, after a couple of minutes we removed the heat.

There was a rich, deep, *loud* tone. It went sort of

*bwoooo**PHUMP***

As one, we looked up. Smoke billowed from the top of the tube. Faster than you could say 'nucleophilic substitution' I had vaulted the teacher's bench, wrested the fire extinguisher from the wall and was climbing on the bench with the chimney, pointing the extinguisher down the hole from the top.

I squeezed the trigger.

Allan screamed.

I squeezed the trigger again, and looked down.

Flames licked round my feet and trouser leg: this was the same extinguisher Woods had used a couple of weeks previously to put out the fire in the wastebasket...and replaced without recharging. The compressed air in the extinguisher was having exactly the opposite effect as I'd intended.

I leapt off the bench, flinging the worse-than-useless extinguisher towards my friend, and sprinted to the next lab. There was no extinguisher there at all. I ran into the third and final lab on that floor, grabbed the extinguisher and pelted back into our room, which was rapidly filling with smoke. I scrambled up onto the bench, pointed the extinguisher into the top of the very flammable indeed cardboard tube, and squeezed the trigger.

The tube broke free of the retorts and tumbled to the floor. I jumped down, squirted again and the tube shot across the lab's floor like an off-course Saturn V. Through my laughter, I managed to make Allan understand that I needed him to stand on the tube, and we got the fire under control.

'Open a window, Jones.'

We coughed our way to the exit, just as the end of lunch bell rang. Mr Woods was coming up the stairs.

'We had a slight fire, Sir,' I said, 'but it's out now. The class is a little bit smoky, though.'

'Oh, don't worry about that,' he said as he pushed open the door.

We ran.

http://blogs.nature.com/rpg/2009/11/05/on-school-days-part-iv

On Public Relations

09 December 2009

Regular listeners will remember the Science Online London gathering back in August. The day before, Mendeley hosted a pre-conference 'fringe' event, organized by Jenny. It turned out to be quite a wild evening, and there is video evidence of shenanigans.

One thing I remember clearly (some of you might be surprised I remember *anything* from that evening, but anyway) is David Colquhoun getting a tad rabid about PR. The gist was that science doesn't need PR, it's a waste of time and money; I don't remember him saying explicitly PR people are professional liars but that was the impression I came away with.

I thought that was bollocks, and I still do.

PR is necessary not simply because scientists like to eat, and therefore need to be funded, and therefore need to convince various bodies (and by extension the people who influence those bodies) to give them money (and I want to talk a little about about 'justification' of research in another post) but also because there are crucial social and public health aspects of what we do. We don't just have to convince the wider community that a particular piece of research is 'correct', but we need to demonstrate--somehow--that it directly affects their health (or their wallet, or whatever).

I'm reminded of this because a friend of mine sent me a link via Facebook last week, saying,

> Some (including me) would argue that the greatest battles against illness and suffering should be fought on the PR/HR front, rather than purely in the arena of science. You, O Great Stream Feeder in the Gyre of Science Publication, may well have already seen this: RT David McCandless RT @GreatDismal: Emotional Epidemiology Of H1N1

The article is from a medical doctor, and describes the reactions, preconceptions and attitudes of visitors to her clinic in the face of the H1N1 epidemic; or, as she describes it, Emotional

Epidemiology. In brief, her patients at first demanded a vaccine against H1N1 (despite not wanting the seasonal jab...) and then, when the vaccine became available, *refused* it.

It certainly isn't related to logic or facts, since few new medical data became available during this period. It seems to reflect a sort of psychological contagion of myth and suspicion.

Another report last week backs up my claim. The *Daily Express* reported that taking aspirin could "significantly reduce" age-related macular degeneration. Sounds great. But let's see what the NHS has to say:

> This is a well-designed and well-conducted study, the results of which have been incorrectly reported in the press. This study found that low-dose aspirin had no effect in preventing age-related macular degeneration, a common cause of sight loss in the elderly.

Far from being a significant reduction, the authors of the reported (large, double-blind) randomized controlled trial took pains to stress that there is no benefit. Indeed,

> There are risks associated with taking daily or alternate-day aspirin, which should be weighed against the benefits. Elderly people, to whom this research will be most relevant, are most at risk of gastric irritation if they regularly use aspirin.

What's going on, here?

In both cases, it's a failure of PR. It's not simply a matter of education. It's a matter of getting things right, and getting that information out there, to the public--via the newspapers or schools or physicians in surgeries. Just as with anthropogenic global warming there is no (serious) debate about the *science*; it's a matter of PR. And I know it's difficult. I have no idea who Jo Willey is (apart from Health Correspondent for the *Daily Trainwreck*), but I would love to see the press release that she read. Because I also know that they are difficult to get right. On Monday I had to completely re-write a release that we were about to publish because the person who produced the copy got the message of the research completely wrong.

PR is necessary. And it's *hard*; perhaps even harder than the science.

Christen, W., Glynn, R., Chew, E., & Buring, J. (2009). Low-Dose Aspirin and Medical Record–Confirmed Age-related Macular Degeneration in a Randomized Trial of Women Ophthalmology, 116 (12), 2386-2392 DOI: 10.1016/j.ophtha.2009.05.031

http://blogs.nature.com/rpg/2009/12/09/on-public-relations

Winner of the
Research Blogging Awards 2010—Philosophy, Research, or Scholarship

On peer review

15 April 2010

I'm a fan of peer review.

There, I've said it. And I'm not saying it in the way that Sir Winston Churchill famously spoke of democracy; 'the worst form of government except for all those others that have been tried.' I'm also not talking as one with no experience of the peer review process, nor one with uniformly good (or bad) experience —I've had papers accepted without hesitation, I've had others improved substantially by the review process, and I've had a manuscript bounced around for two years until we found a sympathetic editor and reviewers who understood just what the bloody hell we were talking about.

I suspect that my experience matches that of the vast majority of jobbing scientists. We don't have particular axes to grind, we just want to get our stuff published in as 'good' a journal as possible (and there's a whole other can of fish to worry about) and we want to move on to the next experiment. Truth be known, we'd also like to see what our colleagues and, well, *peers* make of our work, and maybe even make constructive comments before the entire world gets to see it.

I'm also not a football fan of peer review. I won't support this system unthinkingly, against all comers, waving my blue and white scarf above my head and throwing rolls of toilet paper at the opposition (actually, that attitude seems to characterize most opponents of peer review, but more on them in a bit). No; I recognize there are problems, and I'm certain it could be improved. Just don't ask me how: I don't know, for example, if single or double blind review, or complete openness would improve matters or make them worse, all things considered.

The thing is, peer review has been getting a bit of stick recently. Medical journals, especially, seem to get very worked up about it. The matter of M*edical Hypotheses* is another case in point. The Editor, Bruce G. Charlton, is embroiled in a fight with Elsevier, the publisher. Elsevier wants to make it peer reviewed, and

Charlton thinks that will destroy the spirit of *Medical Hypotheses*. As if one editor is going to be in any way 'better' at assessing a manuscript's 'worth' or 'rightness' (not newsworthiness—that's different entirely and it's something the crew at, say, *Nature* do very well) than any three peers—and let's be explicit here, in this sense 'peers' means 'experts in their field', right? Anyway, I'm not overly concerned about the pros and cons of that case (except to point out that every professional in the field knows exactly how much worth to place on anything published there. It's only the press—and the naif—that get confused about such things): rather I'd like to look (briefly, because it's far too painful to spend much time on) at some of the comments on the *Nature* news article.

First, the repeated assertion that *Nature*, by virtue of having full-time editors, does not do peer review is patently ludicrous. How anyone who practises science could hold that opinion, moreover repeat it in a very public forum, is beyond me. At least the commenter had the grace to admit he was wrong, but this demonstrates the sheer level of misinformation and ignorance surrounding the entire issue. How can we have a reasonable debate when even those involved don't know what they are talking about?

Second, we have the frothing-at-the-mouth prophets:

> Peer Review should be universally rejected by all scientists and researchers as the thought control experiment that it is. Science is not Consensus! Truth cannot be discovered by vote no mater how smart the electorate thinks it is.

Right. There is so much wrong in those three little sentences that I really don't know where to begin. Let's just say that it's another exemplar of people Just Not Getting It.

It gets better. It always does:

> Peer Review as a concept, is no more than an easy way to influence, suppress, and control the direction and funding of scientific research. It is no less than tyranny and must be rejected as such.

Uh, OK, keep taking the tablets—actually no, get some different ones because those aren't working.

Please, just one more?

> Both Socrates and Galileo were "Peer Reviewed". We all know how well that worked out.

Ah here we are. We're dealing with someone who has had an obviously quite brilliant Idea that nobody will publish, let alone listen to, and the problem is not the Idea but peer review! If I had a quid for every loon who emailed me his theory on how everybody is wrong and how he (invariably a 'he'; 'she's are far too sensible) has found the secret to life the universe and 42, only he can't publish it because of the tyranny of peer review, and look how nobody believed Socrates or Galileo or Einstein, oh God especially poor old Einstein; well, I'd have fifteen pounds and sixty pence (that last one was a particularly sad and tragic affair).

Look, people: we've moved on from arresting or murdering people for having wacky scientific ideas—at least in the West. There is no conspiracy, no shadowy cabal that stops you publishing anything (and indeed, the internet makes publishing ridiculously easy). It's far more likely, all things considered, that your Idea is so much dingo juice and you're suffering a severe case of sour grapes. If your Idea is, actually, good; then Time will prove you right. It always does. But my money is on you being a wacko.

Even the company I work for is not trying to replace the initial round of peer review. Yes, our Chairman jumpstarted the Open Access revolution (and you'll see why I was keen to establish my own bona fides, above), and yes, we're really interested in what I'm calling post-publication peer review—assessing the likely impact and importance of the scientific output soon after the point of publication—but even we recognize the value of peer review as it stands today (notwithstanding arguments about anonymity and the like).

Ah! A voice of sanity and reason:

> But people whose ideas, popular or not, that are backed up by sloppy research, or no research at all, should not be published until they can come up with the proper evidence supporting their claims. Coming

> up with adequate supporting evidence is another driving force behind science and ensures its credibility.

The point of peer review, actually, is neither to suppress nor promote good, bad, wacky, conventional, nuclear or world-changing Ideas. The major question that peer review is designed to answer, and is best at answering, is, "Is it done right?" It's not some vast conspiracy to keep ideas down, nor to deny lunatics a forum or grant money. It's there to help workaday scientists (some of whom *will* have brilliant, paradigm-shifting Ideas) do their research, without having to wade through a Stygian morass of ill thought-out crap.

We have to know our limitations, of course. Peer review suffers terribly from poison-pen reviewers. A field I worked in was almost destroyed because one PI kept trashing the community's papers in review stage (she turned out to be mentally ill; that, also, is a story for another day). But that's no reason to throw the F1 out with the autoclave bags. We need to identify and fix the problems with peer review, not destroy it entirely.

I need to address one last misconception. Peer review, done properly, might guarantee that work is done correctly and to the best of our ability and best intentions, but it will not tell you if a particular finding is **right**—that's the job of other experimenters everywhere; to repeat the experiments and to build on them. Indeed, a friend of mine has been known to say, in public even, that most things in *Nature* are wrong. (And he should know—he's a *Nature* editor.) He's right of course—everything published will be superseded. But the point is, and the point we're in danger of losing sight of to our great detriment as jobbing scientists, is that peer review done even half-arsedly cuts out a whole pile of junk and lets us get on with the real business of Science; that of finding shit out.

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and
http://blogs.nature.com/rpg/2010/04/15/on-peer-review

Epilogue

On saying goodbye

30 November 2009

Who gets custody of the Gilsons?

I've left a few labs in my time. It's part of the nature of science: we're all at least a little bit itinerant, needing or wanting to move on every few years (except for the lucky few who get tenure and who can then reabsorb their own brainstem). First degree; graduate degree; first, second, *n*th postdoc—we've been there.

We've hastily indexed freezer boxes and photocopied notebooks, fought over items of equipment, snuck into the lab in the dead of night to make surreptitious aliquots of treasured plasmid stocks. Taken chemicals and dissection kits that we took *into* that lab, and that nobody else would use anyway. We've said our goodbyes, got pissed on cheap lager, woken vowing never to do it again; at least until the next time.

My own series of farewells started earlier than most: my father was in the RAF, which meant that every two to three years I'd have to move on, say goodbye, make new friends—and this has continued into my adult life. Longest time in one place? Six years, leaving for reasons that turned out not to be very good after all.

It is tempting to paint previous engagements with a brush that does not reflect the truth. This will often depend on your current situation: if you're having a good time you'll tend to think more poorly of your previous job, or boss, than the reality would warrant. Similarly, if you're struggling a little bit, you'll wonder why you left that cushy number. The psychopath you couldn't wait to away from was simply encouraging you to do your best; the mentor who let you find your own way lacked discipline and leadership skills.

When I finished my thesis I had to find a job pretty quickly: my boss' programme grant wasn't renewed and he got offered his dream job on an entirely different continent. I had no time to

finish up the experiments and write papers, and took up an offer that had been kicking around a while. No time for lengthy goodbyes or second thoughts (although I did receive a dressing down for not *asking* if I could take various plasmid stocks). Leaving my first postdoc was soured by the boss having a complete benny on discovering I was going into industry—and then screwing me over on paper authorship. Again.

I've talked previously about the next episode in my professional life, but didn't say that it led directly into the best six years I've spent in science. When I left the MRC-LMB (in the process turning down the offer of a permanent contract) it was for all the wrong reasons, even if the split was on the best of terms (despite having no leaving party, and working right up till midday on Christmas Eve solving a structure by NMR). As you might know, that's also when I left for the UK, seriously expecting never to see certain places —or even certain people—ever again.

I did better that time round, and kept the contacts, kept the collaborations alive; in spite of the seeming impossibility of it all made a serious attempt at not burning bridges. I never seriously thought I would need anything else—professionally or otherwise—from my colleagues in Cambridge, but I stayed in touch, stayed friends; moved on but with gratitude and friendship.

Then it all changed, and I came back to the UK, back home; and began rebuilding those friendships (that had never, really, gone away; they'd just been put on hold). Made new friendships too, of course; and I have never felt so alive or fulfilled as I have these last few months in London. They say that you spend the rest of your life trying to unmake friendships formed in the first week of college, but while that may be true (and I have felt some of it myself), some friendships, made long ago, can survive drought and famine and are just waiting to be picked up again when time and circumstance are right.

And this evening I am very pleased that I did pick up and rekindle one of those in particular.

Rob was my best mate. I knew him at Oxford (not during the first week though: maybe that makes a difference?) and attended his wedding. I went to his ordination (despite my theological uncomfortableness) and supported him as best I could. I loved him like a brother. When his marriage collapsed, despite feeling utterly betrayed I was there for him as much as I knew how. I helped him move house. When no one else wanted to know, we were there for him (and his wife and children). Just three weeks ago I was hoping he'd do the same for me. We spent a warm night in August making matchstick rockets, and exchanged jubilant text messages over this summer's cricketing successes.

But that dark and rainy Friday night, a vehicle coming down a hill lost control and crossed onto his side of the road. It took the fire brigade two hours to cut him out, and he never regained consciousness.

I've been to Gloucester and back today for the final goodbye. Took a Streetcar, Kate and the girls. Stood during the first song of the service unable to make a noise above a sob. Held the girls: gave and received comfort. Hugged his wife for what seemed the longest time, but that could never be long enough. Hoped he knew that I loved him.

Vale, Rob.

http://blogs.nature.com/rpg/2009/11/30/on-saying-goodbye

The Beginning