

Chapter Five

Prof Roy Fields radiated an aura of smug, self certainty. He was large in the way that only Americans seem capable, overflowing the computer chair he'd wheeled to his desk in great rolls of fat. He spun the chair seat on its bearing gently back and forth, exhibiting a slight nervous tension. WPC Thatcher couldn't help but wonder at the dedicated eating regime that must be needed to maintain such a bulk. His face was a reddish circle punctuated by a thin black moustache and glinting brown eyes. He was in the middle of a small monologue, booming presented in a West coast accent, on the dominance of theoretical thought in physics. She had triggered this by a question on Andreas' studies. Fields seemed to be enjoying the points he was making, ending every sentence with a self satisfied smile.

The gist appeared to be that he, and his community of string theorists, already knew most of the answers to the ultimate questions of science. Apparently his experimental colleagues would switch on their next machine and find a particle called the Higgs boson. This would then require a whole slew of particles somehow associated with a "super" symmetry. This too was only a prelude to the remarkable fact that particles were really tiny strings, although experimentalists had little chance of ever looking on small enough scales to prove this. Andreas had been working on a subtle twist that would render the stringy nature of particles manifest soon, although Prof Fields clearly felt this was a remote possibility. It did "encourage our experimental colleagues" he smirked. The WPC's gaze drifted across the view of the gardens through the first floor office window and concluded that she would not provide any encouragement to the other staff by hinting at her physics background.

Fields seemed uninterested in the fate of his dead staff member. He confirmed that he was essentially Andreas' boss but was at pains to stress that everyone at the Phi was an independent researcher. His interests had not particularly coincided with Andreas'. His knowledge appeared to end at Andreas' CV and he had gone home before events unfolded last night, a fact that was emphasised with his peculiar Cheshire cat grin.

The police woman moved on to interview Prof Caroline August who was the other permanent staff member in the wing where Andreas had worked. Fields, August and their employees constituted the string theory research group. August though was a very different character from Fields. She was very English – pale, skinny and a little drab. Her office was just so, no piles of journal articles here, just neatly filed rows of exercise books. The single book open on her desk was filled with neatly scribed equations punctuated by occasional sentences. August seemed fretful discussing Andreas, delicately chewing her lower lip, as if his death did not fit her carefully plotted life. She too seemed to have little to contribute to the WPC's report.

"We do so strongly encourage junior staff to develop their own ideas," she offered as explanation in a quiet, slightly breathy, but precise voice, "Andreas was more in Roy's camp in any case. I'm much more interested in the mathematical foundations of string theory, less the immediate physics consequences. I think recently though that he had

more interaction with Norman Clark and his postdocs over in phenomenology. Apart from over coffee, it's been 10 days since I spoke with Andreas on... well, curved spaces. The details are.." she let the sentence fade out apologetically. Her contribution to the WPC's notes faded away too. She had left at five the previous night and had no explanations to offer.

Carl couldn't bring himself to be too surprised that Andreas had been into something harder than cigarettes. He would have guessed just cannabis but perhaps that was a sign of how disconnected from real youth culture he had always been. Carl defined himself by his thoughts when awake and alert not by what happened under the influence, so drugs were a peripheral part of his self image. These days though even Tory politicians seemed to be into cocaine. He supposed the hard drugs angle made an unintentional but self inflicted death a more likely scenario. It made you wonder if Andreas had ever been high while they'd talked physics – could Carl really not have noticed? He felt uncomfortably naïve, so returned to the content of the desk in front of him to find distraction.

The journal full of random strings of letters was presumably in code. Most likely it was a simple replacement code with each letter representing another. Carl tried listing the occurrence of each letter in a paragraph. There weren't really enough letters to even pick out the vowels. He could try on all the sections with the same numeric codes. Well none were precisely the same but it looked like the first two digits were the date – 05/07 and so forth. Then there was one of 2.2 or 3.3 and so on up to 9.9. That was presumably the key to the code. Carl puzzled over it but nothing inspired came to mind. If it was in German he might not even spot that he'd got it right.

Carl's mobile phone trilled in his pocket, the simplest "ring, ring" tone. Digging the thing out, he waved it at the policeman in the next room and made for the door. It was Sasha, his girlfriend up in Birmingham.

"Hi love, you're up then?" at the other end Sasha gave a big Bagpuss yawn.

"Barely. Lying in bed contemplating getting up." Images of unkept blond hair and teddy bear nightshirts momentarily replaced the stress of the last day. "Still, deserved rest after the construction of robo-toddler!"

"Huh?"

"Four year old kid was on a trampoline when twelve year old big brother landed on her. She had this amazing spiral fracture of the tibia. I've never seen an x-ray like it. Anyway we bolted her back together with a bunch of iron. She'll be off without even a plaster by the time I go back in." Sasha had entered the ghoulish world of medicine and seemed to gleefully cope every day with events that would have Carl in shock for weeks.

“Great. Well I’ve been doing mortal injury too.” Carl proceeded to give Sasha a blow by blow account of the last 24 hours’ events. He had walked out onto the Cathedral Green by this point and sat in the dappled sunlight under a tree just off the path down to the Cathedral’s main door.

“Poor thing. Are you sure you want to be reading his stuff – you could just ask the police to get on with it.” He could hear the worry in her voice.

“No, it makes me feel like I’m doing something about it, so it’s OK.” Across the path, sat on a bench, a man, who Carl judged to be in his twenties with a startling array of swirling black tattoos on his arms, caught his attention. The man was wearing mirrored sunglasses and holding up a copy of the Daily Star. It seemed to Carl, though the shades made it hard to be sure, that his attention was not on the scantily clad women in his paper but squarely on Carl himself. Probably it was just the angle the man was sat but even so Carl felt uncomfortable. He levered himself to his feet and with a scowl in the man’s direction, began to wander away down the path.

Sasha was offering up more verbal sympathy though quiet and physical contact were what they were both yearning for. Words down a phone never filled that hole. Long distance relationships were not satisfactory even if they had become unavoidable, reflected Carl - another animal versus intellect conflict. Sasha was offering to come down to Winchester though she’d have to check her schedule next time she was on shift.

“That would be great,” it would be a few days yet then. The inadequacy of the contact left Carl a little deflated so he switched the conversation to more factual matters, “You up to anything tonight?” Sasha let out a groan,

“Andy,” she offered up glumly. “He’s just been dumped by his latest woman, Kate was it?”

“Last I heard he was still with Jo wasn’t he? Oh maybe not, it’s hard to keep track.” Andy was an old university friend whose love life was about the most convoluted they had ever encountered.

“Well a Kate has dumped him and his ex by three, Gail, she’s the nurse in geriatrics, says we have to take him out and get him drunk. At least he’s always late so I’ll get a good natter in with Gail first. How about you, are you out with the physics crowd this evening?” Carl had totally forgotten, given events, that Wednesday night was when the postdocs at Phi hit the pubs.

“Oh yes, I suppose I’ll never be forgiven if I don’t fill them in on all the gory details. We can exchange stories of drunken revels tomorrow then sweetheart.” As they exchanged final farewells Carl realized he’d wandered down the back of the cathedral amongst the gravestones. Turning he started to walk back across to the crime scene noting in passing

that the man he'd spotted staring earlier was now gone. Perhaps his scowl had registered.

Prof Norman Clark positively launched himself across his office to shake WPC Thatcher's hand. He was tall and lanky, a little ill coordinated and dressed in old shorts and a tee-shirt.

"All I've heard is gossip!" he declared. "What on earth is going on?" Before the WPC could answer he had distracted himself by tugging a mountain of paper off a small chair buried against the wall. He proffered the seat bodily to her. While she positioned it on the floor amidst a host of other piles of office detritus, he manoeuvred to his desk on which he sat, knees up against his chest. He regarded her pointedly, still awaiting an explanation.

"We are at a preliminary stage of enquiry, but we have no reason to suspect any sinister involvement as yet. There are a few oddities to events that we are investigating though." Clark's eyes were fixed on her intently and combined with his thin face and unshaven jaw she couldn't help thinking of a rat.

"You know this really is a tragedy. Andreas had such promise... potential. He could take that stuff Fields and company do," he flapped his hand in the direction of the String theory wing, "and make connections to those of us at the coal face. Terribly important. This is such a crucial time for our field. There are so many possibilities for what we may find. We need novel thinkers and to lose one..." he seemed genuinely fraught with frustration. Apparently Prof Fields version of a few loose ends in particle physics to be tied up was not held by Clark.

"You were working with Andreas frequently then?"

"Yes, almost daily. Oh, but not yesterday. I don't think he was here yesterday, well until... I'd wanted to talk to him about a scattering cross section result. It is a tragedy!" Clark picked distractedly at the edge of his sock where it was riding down into his trainers.

"Was there any tension with Fields about him working with you? He was employed by a different group," The WPC probed. Clark snorted,

"I'm sure Fields was pleased we'd seen the light of his work." The WPC was picking up on a pecking order in the Institute with the more mathematical theorists lording it over those more closely connected to experiment. She was still drawing a blank for the investigation though and learnt little more in the next ten minutes. Clark had left early yesterday to play squash in town and only heard of events from Prof Trant that morning. Prof Trant had phoned in finding the body for Carl and was the next on her list.

Trant won the WPC's award for the best turned out Phi professor. He sported a neat grey suit, dark blue bow-tie and immaculate grey hair. The WPC had taken his statement briefly the previous night. He had seemed affable and in control of himself and she had taken quite a liking to him. His office on the ground floor was dominated by an array of large computers and a collection of office toys, including a rather large Newton's cradle. She rechecked his memories of the previous night and his responses were thoughtful and precise. He had been in late the previous evening because he was preparing a talk for a conference in Poland the following week. He had encountered Carl in a bit of state on his way back from the rest room and assumed responsibility.

The professor said he had only known Andreas by sight and through the two seminars he had given. When she asked, he declined to express an opinion on Andreas' work saying that it was outside his expertise. Computer simulations of the strong nuclear forces between quarks were his speciality. The WPC rather doubted that such an obviously astute man would not have come to some judgment of Andreas' work. Trant's comment that he preferred to work within the confines of experimentally verified phenomena though provided a strong hint of his views. The WPC completed her notes and thanked him for his time concluding that should the need arise she would prefer to raise any further issues with him than the other staff members.

The WPC's immediate task was complete. The final downstairs wing of the Phi building housed the Cosmology group. It transpired though that the entire group had upped sticks and moved for the summer to Aspen in Colorado where they were running a long workshop on their studies. Aspen - mountain retreat for film stars and apparently physicists? WPC Thatcher reflected on her last day long course in Modern Community Policing held in the greyness of Basingstoke up the M3, before concluding that her investigation was helpfully reduced by their absence. As the day had progressed and the Phi's staff had filtered in she had come to realize just how many junior staff and visiting fellows there were here in addition. She fervently hoped that the need would not arise to interview everyone in the building. Before heading back to her car the WPC checked in with the computer techy she had left in Andreas' office. He seemed to think the 10,000 e-mails stored in a mass of directories was counterbalanced by the joy of the machine boasting Unix rather than Windows as its operating system. It didn't look like she was going to get anything useful from him until at least the next day.

Carl was beginning to wonder if he had been forgotten, when, just before five, the WPC came up into Andreas' flat.

"Has our intrepid translator unearthed anything for us then?" she asked.

"Well, this isn't modern physics, none of the stuff in here is our work. My best guess, to be honest, is that Andreas was forging historical documents on alchemy." Carl wondered if he really did conclude this or whether he was explaining away something less rational.

“I can imagine it might have entertained him to try and bluff historians.” That certainly matched with Andreas’ character so perhaps his explanation was right.

“OK. That’s an interesting angle. I wonder who he might have been talking to about it? Perhaps I should take a look on Ebay to see if he was selling.” Simplicity was entirely lacking in this case reflected the WPC. She sat down on a wooden stool and tried to collect together the days events.

“While I’ve got you here can I get some more physics explanations from you?” she asked.

“You can try,” grinned Carl.

“It’s really what I said this morning – I don’t understand what the Phi staff actually do. I know that particle physicists build huge great machines that accelerate particles to vast energies and then smash them together to use that energy to make new particles. Obviously there’s a lot of work in building those machines. But the Phi staff don’t do that right?” Carl nodded in agreement, “So then there are the lists of particles that have been found in this way. But what do theorists do? The list of particles can’t need that much maintenance!”

Carl looked thoughtful for a moment. It was after all a perfectly valid question. What did they all do?

“The simplest answer is that the theories of particle physics that say how the particles move and interact are very hard to compute with. You have to spend several years learning how to calculate what the outcome of even two electrons hitting each other is. Somebody has to work out the expected outcome of every imaginable process in an accelerator machine. So a lot of people are doing that. Actually that’s not what most of us are doing though.”

“The theories we work with contain some astonishingly beautiful mathematical relations and we spend a lot of time trying to uncover those. That often means we calculate things in theories that don’t directly describe nature. That can be versions of our theories but in different numbers of dimensions, or with different types of particles and so forth. We’re just trying to understand the underlying structure because that often leads you to new ways of enlarging the theories that might become important for future discoveries.” Carl regarded the policewoman to see how he was doing and in the hope of a prompt.

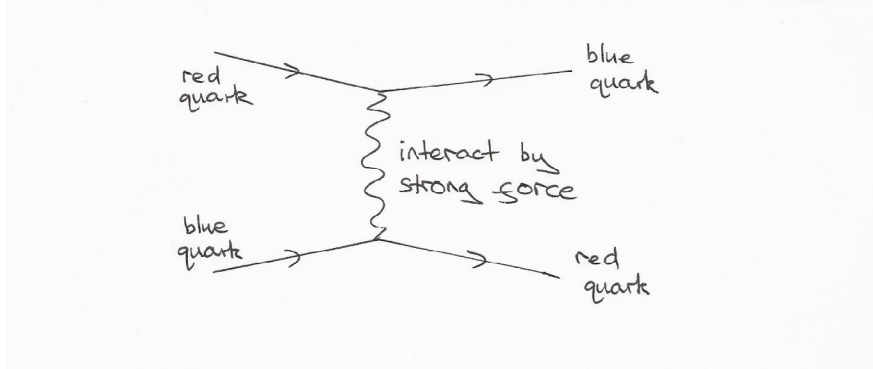
“Can you explain an example of one of these strange mathematical beauties?” she asked.

“Well the most important example is something called symmetry... a good example is that it turns out that there are three copies of every quark. They look completely identical but to remind us there are three copies we call them by colours – red, green and blue – not real colours just labels. Now we have to insist that our theory of these quarks gives

the same answer no matter which ones we call red, blue or green. There must be a symmetry, we must get the same answer if we, say, switch red and blue.”

“If they’re identical how do you know which one you’ve seen?” puzzled the policewoman.

“Ah that’s where the real fun is! It turns out the Universe has the same problem. In this room it might decide to call one quark type red but next door it might have made a different choice. Now when those quarks move and come together what happens to undo the confusion? Well the Universe has invented a force, the strong nuclear force, which the two quarks use to probe each others’ colour – they actually switch colours in the interaction – so they can reconcile the different choices made when they were apart.”



“Now the astonishing thing is that there’s only one way to make a theory like that and that’s the theory we have. The symmetry between the quarks determines the whole theory!” The WPC attempted to digest this idea but Carl was off on another track, “Once you’ve found a principle like that people try to construct the whole set of theories we have from a similar principle or set of them. That often only works if you include extra particles, so then they predict they will be seen in future experiments.”

“Oh and another fun game is to try to break theories! You can imagine calculating the results of experiments you can’t do – like unbelievably high energy scatterings for example. Gravity is one theory we know for sure doesn’t make sense at very high energy. So then you can try and fix the theory and guess the answer before it’s done.” It looked like he’d said enough from the WPC’s glazed expression. “So we just mathematically play in the space of all possible theories to see what we can find and what’s useful.”

“Right... it looks like you’ve been playing at something here judging by all those notes on the desk” she indicated the sheets Carl had been using to try to decipher the coded books. He briefed her on the diaries.

“Could I spend a little longer working on them? I feel like they shouldn’t be too hard to crack.”

“I don’t think I can let you take the book but you can copy the entries you’re interested in,” the policewoman offered. Carl set to copying some of the paragraphs marked 2.2 (it seemed as good a choice as any other) before heading for home.