

Chapter Twenty Three

“You’re thinking about something,” Sasha accused Carl.

They were lying in bed again, this time for the night, comfortably fed on take away and pleasantly inebriated by a number of Amber’s bottles of wine - precisely how many neither of them could remember. Carl’s brain had indeed been mulling over past events. He replied,

“I’m still frustrated I can’t solve Andreas’ diary code. It’s just a product of two numbers that should tell you how much to shift the rows and columns in this grid of letters. It can’t be that hard.”

“I expect it’s something to do with particle physics,” suggested Sasha, “knowing you lot.” Carl considered this before suddenly jolting upright,

“You’re right. That must be it!”

“You’ve stolen the duvet!”

“It’s combinations of quark colours, must be.”

“I’m supposed to say ‘huh’ now?”

“Gluons, the particles that mediate the strong nuclear force, act by changing the three colours of quarks. If something has no colour they can’t interact. That’s why a proton consists of three quarks. If one is red, one blue and one green, then when a gluon tries to interchange two colours nothing changes. So that’s why protons are colour neutral and aren’t bound up into further things.”

“You mean if the gluon changes red into green and green into red then one red, one green, one blue stays the same?”

“Yes. Another easy one is a quark and an anti-quark.” He was about to explain but realized there was a subtlety. “Well, you have to remember that in quantum mechanics there’s a probabilistic description of particles. You can have a quark and an anti-quark pair that are red anti-red a third of the time, blue anti-blue a third of time and green anti-green a third of the time. So again a gluon leaves that the same and it’s neutral – those particles are called mesons. There are another eight combinations like red anti-green that all get mixed up by the gluons – they do change, so the gluons interact with them!”

“Did you say I had to remember this?” Carl sent a playful box on the nose in her direction and continued,

“So three times three with a bar under it will be one plus eight. That’s the two numbers for shifting the code grid.”



“Now if you combine two quarks there is no neutral combination but the combinations split into two groups. The gluons mix the different possibilities within a group of three and again within another group of six. But there’s no mixing between those groupings. So three times three is six plus three. Again two numbers for shifting the grid. I’ve got to go and check if it works.” He rolled out of bed taking the last corner of the duvet with him. Sasha lay back and gave a loud mock sigh.

“It works!” came the cry from next door. “At least it does on these three times three grids I translated before. I thought it was shift down by one but it must be shift down by six which is the same! So three times three is six plus three!”

“Hang on though what does four times four mean? There are only three quark colours,” queried Sasha.

“I guess it’s just the same maths but in an imagined world with more quark colours. I’ll have to try it out on the other grids. The Masons keep stealing my copies of other cases though. I’ll have to grab them off the police again tomorrow.”

Next morning Carl and Sasha were having a leisurely breakfast and planning to do very little with the day, when the doorbell buzzed. WPC Thatcher identified herself over the intercom and Carl pressed the button to release the lock on the door below.

The WPC’s uniform as usual brought a serious air with her. She scrutinized Carl’s living room and said her formal hellos to Sasha.

“I’m just doing the final paper work for our case file,” she explained, “I realized that you still have one of the keys to Andreas’ flat, Carl. We need to return it to the landlord.” Carl went to dig the key out of his coat pocket in the hall. When he returned Sasha was doing the washing up while the WPC waited. He handed over the key.

“Thank you,” the WPC’s smile hinted at the woman he had kissed the previous Saturday, “And thank you for all your help on the case, Carl. I imposed more than I should have done on you.”

“I was glad to help,” he responded and then paused. He should tell the policewoman about his new revelation on the decoding front. That she wasn’t asking or pursuing it

herself discomfited him though. They were oblivious to the matter of Newton's book too he realized. How could they be closing the case? He tried to raise his disquiet. "I realize it's not really my place," he began, "but there still seems to be so much that we don't know about what Andreas was doing. Shouldn't you investigate more?" The WPC didn't seem offended but just smiled ruefully.

"I'm afraid that the victims' relatives and friends in these sorts of cases often feel unfulfilled at this stage," she replied. "We do know what happened really. Andreas was taking drugs and working with dangerous chemicals. Probably by mistake, he ate some mercury compounds. There is absolutely no evidence that anyone else was with him at the time and in any case it would be nigh on impossible to force feed someone the quantity he had swallowed. He then walked up to the Phi Institute, being sick on several occasions, before eventually succumbing to the mercury on the drive."

"We needed to understand why he was working with the chemicals but we know now, as you helped us uncover. He was playing a practical joke on one of your colleagues, Prof Sinclair, forging documents. He needed the paper to have chemical traces on them. Maybe he also enjoyed trying out the reactions he was writing about. That's what happened don't you think Carl?"

Carl considered this version of events. He didn't disagree with any of the conclusions but he still felt there were big holes in the narrative. He tried to explain,

"Yes, I do agree. But your version doesn't really explain his motives. Why was he doing all these things?"

"I'm sorry, Carl, but that's really beyond our ability. We can't read the minds of dead people. In any case what right do we, the police, have to probe further? Certainly if a murder happens we must pursue such intrusive lines of enquiry. In a simple case like this though, I think we're better to let friends and family know the facts of the case and hope they can then move on with their lives. We could do a lot of emotional harm to no end."

Carl sat and reflected on this response which seemed very sensible. He liked Lousie Thatcher; she was very down to earth and sensible. Just the sort of person he would want in the police, he concluded. The WPC decided to try a different track to allay his worries,

"Besides, Carl, in your job, you must be used to the idea of unknowable answers. I've spent the last week hearing different people's visions of the ultimate theory of everything! Will you ever know if there's a Higgs particle?" Carl suddenly laughed,

"I suppose that's the problem with a theoretical physics institute. You've missed out on the whole other side of particle physics. There are teams of thousands of people building a particle collider in a 25 kilometre round ring underneath Geneva right now. It's at a laboratory called CERN and the experiment is called the Large Hadron Collider or LHC for short. At the end of 2007 they're going to begin colliding protons together with ten

times more energy than we have ever collided particles before. It's a machine designed to search for the Higgs so we'll know all by the end of the decade."

"How can you be so sure?" asked the WPC, "you told me you didn't know how heavy the Higgs was. Anyway there might be some theory you haven't thought of in which everything is just out of the range of your experiment surely?" Now Carl beamed,

"No, actually, this experiment is the Holy Grail of science in that it is a 'no lose' machine! If you take our theories of particles and omit the Higgs, funny stuff happens. In particular if you scatter W particles, the ones responsible for the weak force, then the chance of them interacting grows with energy. Eventually the probability of interaction becomes bigger than one!"

"What does that mean?"

"It means the theory is rubbish! Something has to happen that's new. The LHC will be able to probe this behaviour for sure. So we're guaranteed to find another part of the puzzle." The WPC seemed impressed,

"Alright, I hadn't realized that, maybe you're not all as far from reality as I'd supposed! I'll listen out for the results."

"You're right though, that most likely big puzzles will remain," Carl sadly admitted, "Traditionally we've always believed that quantum gravity is beyond any hope of experimental probing. That's why the ideas Andreas was working on were so fun – if the gravitational force became strong in the LHC we might find the ultimate answer, whatever that could be." This final idea renewed his enthusiasm – at least there was a chance it seemed.

"So mostly in life there are things we can't know," gently concluded the WPC. Carl perked up again though,

"Not so fast! Actually I think I cracked Andreas' code! It was all to do with quark colours. If I can see the diaries again we can find out what he was thinking!" The WPC winced slightly,

"I'm afraid we gave the diaries to Andreas' parents. We can write to them and tell them your theory," suggested the WPC. Carl looked a little crestfallen and then theatrically collapsed onto the sofa,

"Life is all waiting for answers!"

The Newtonian Legacy

A popular science novel

A younger researcher, Andreas Born, is found dead at the particle physics institute where he works. A policewoman is assigned the job of penetrating the intellectually charged atmosphere his colleagues work in. She is forced to unravel the mysterious world of subatomic particles to understand the dead man's motivations.

Meanwhile, Carl, one of Andreas' collaborators embarks on an exploration of Andreas' murky life outside physics including sex, drug dealing and bizarre alchemical experiments. Carl is followed by a mysterious stranger and must fight to preserve both his life and the relationship with his girlfriend.

Learn about the frontier of particle physics within a fast paced crime adventure.

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