

## CounterClockWise

### Chapter 6 -- Proteins

It is a week before Christmas, and the lounge is decorated for the holidays. A large Frazier fir sits in the center of the room ablaze with lights, and a large wreath hangs over the fireplace.

Kevin and Diana are sitting comfortably close to the fireplace as a Yule log burns within. Having just finished a light lunch, they are playing a leisurely game of chess and are sipping hot chocolate.

Somewhat casually, Diana asks Kevin,  
"Tell me something else about yourself back in our time."

Not looking up from the board, Kevin replies  
"What would you like to know?"

With a far away look in her eyes, she says,  
"Tell me one thing about you that you never tell anybody."

Surprised at the request, Kevin looks directly at Diana now as he tries to escape the question by telling her information she already knows,  
"Wow! That's a tall order...let's see ...

"I was born at a very early age. My parents were both professors ...my Mom at SpringHill College and my Dad at the University of South Alabama."

But Diana is not to be denied,  
"Nice try," she says "but no cigar...come on something really deep."

Studying her face intently for a moment he decides it is time,  
"OK," he says "By the time I was 5, it was obvious that I had some affinity for numbers as well as some indefinable *je ne sais quoi*...some characteristic of mind that manifested itself in strange ways. Sometimes I was lucky beyond all reason. I won at games of skill when I had no skill...I won at games of chance in the face of statistical defeat."

Surprised, Diana exclaims, "What!? You have never mentioned this."

But Kevin disagrees, "Actually Chaucer did."

"When?" she asks.

Kevin replies, "He mentioned in one of our meetings that I had a callidity index that was off the scale."

To which Diana replies,  
"But I thought that callidity was just cunning or shrewdness?"

And he explains,  
"Not when used in reference to a measured index. It is like cunning because nobody knows how a cunning person manages to accomplish seemingly impossible things.

"But my 'talent' manifests itself in different ways at different times. I know things without knowing how I know them. If I focus on a person or object, I can infer or deduce seemingly complete pictures from the tiniest of detail.

"I can construct the whole from the merest of patterns."

Realizing the implications of what he has just told her, she stiffens a little as she says, "That's a little scary...what do you ...infer ...when you look at me?"

Disappointed but not surprised, Kevin says to her,  
"Now that's exactly why I never speak of it. You asked for a real confidence and I gave you one. If you want to really know me...you can't be afraid of my (pause)... 'talent'."

And she softens quickly as she realizes the truth of his words. She looks directly into his eyes and says,  
"I could never be afraid of you, my hero. It's just that I have some personal secrets that I have never told anyone...and now if you can see right through me, it makes me a little nervous."

A little relieved at hearing her response he teases her,  
"I know...I inferred that!"

Diana throws a pawn at him and, smiling weakly, she says,  
"That is NOT funny!"

Displaying his amazing reflexes and perhaps his 'talent', Kevin snatches the flying pawn out of the air and places it gently on the table. Rising from his chair, he says,  
"Come on we are due back at Chaucer's office in a few minutes and you have to tell us more about DNA.

And with a petulant look on her face, she says,  
"Why bother if you already know it all?"

“I don’t know everything, my pouty little handmaiden.” He says. “It’s an uncontrollable talent that works sometimes.”

Unconvinced, she says, “Yea...I bet.”

After a short walk to Chaucer’s office, the briefing resumes with Jeeves activating the display with Diana’s material:

“Now let’s examine the sequence of steps that allow each gene to perform its function. To begin, the double-helix must unwind and separate temporarily into two single strands along a gene.

“And at each of these unzipped sites, one side of the DNA acts as a template to create a single-strand of RNA.

“So each cell is constantly making from a few hundred to several thousand different strands of RNA.

The screen freezes as Kevin interrupts,

“Wow, now you are in my house, Diana. You said we have a hundred trillion cells and almost every cell is making hundreds of RNA strands from its DNA?

“That means if you could unravel all the DNA in all your cells and put it end to end. You would end up with billions of miles of DNA.”

And she confirms his calculation,

“Yep... enough to stretch from the sun all the way to Jupiter many, many times.”

And as usual, Chaucer doesn’t allow the digression to go on for long as he says, “OK, Diana Let’s get back to the story – tell us what does RNA do that DNA doesn’t.”

And she complies, asking Jeeves to resume:

”OK...Crank it back up please, Jeeves.”

And Jeeves promptly restarts the display:

“Each of your RNA genes can make its own set of unique proteins...The human body can make about 100,000 different proteins

“Here is how RNA genes make proteins. First, the RNA strand drifts out of the cell nucleus into the main body of the cell. There it is trapped in a structure called a ribosome.

“Then a molecule called tRNA feels the shape of the letter-molecules three at a time and looks for an amino acid that can fit into that shape like a piece of a jigsaw puzzle.

“As each correct amino acid is fitted into place, it joins itself to the one in front of it in the sequence.

“Thus we have an ever-growing chain of amino acids.

Again Jeeves freezes the display as Kevin interrupts,  
“Wow, an organic Turing Machine!”

Kevin is surprised at the brief but definite stunned look on Chaucer’s face. But it is gone as fast as it appeared. Before Kevin can think more about it, Diana asks,

“Huh? What’s a Turing machine?”

“Sorry,” Kevin says, “didn’t mean to interrupt. Alan Turing was a mathematician who lived in the early 1900’s. In the 1930’s he theorized a general machine that could simulate the logic of any computer. It would read an instruction, perform the instruction, and move on to the next instruction. His algorithmic concept was the basis for the first electronic computer some 20-30 years later.

“Your ribosome does exactly that—reading an instruction, fitting the correct piece, moving on to the next instruction,

“And the DNA ladder itself is really just a lambda calculus.”

Diana surprises both men when she says,

“Now that I know what you are talking about, you might be interested to know that the preliminary work was already done back in our era to build organic computers from DNA molecules...but I don’t know what ever became of it...”

Kevin looks at Chaucer strangely as he says,  
“Hmmm...I wonder...”

“...wonder what?” asks Diana.

But Kevin chooses not to pursue it at the moment,

“Nothing, he says, “sorry for the interruption Diana... back to your chain of Amino Acids.”

Diana snaps her fingers at the screen but nothing happens. She looks startled for a moment then smiles as she says,

“Come on, Jeeves, you know I was just kidding.”

And Jeeves replies with good humor,  
“Indeed I do, Diana, and I, in turn was just teasing you. Here we go.

“These large groups of connected amino acids from twenty or thirty to several thousand molecules long are called proteins.

“Each of the 100,000 proteins in the human body has its own unique shape and function.”

The display reveals a beautiful young lady sitting in front of a mirror combing her hair...

“When you look in the mirror, what you see is mostly proteins. Some proteins provide structure as in our teeth, ligaments, fingernails, and hair. Others aid in digestion as in stomach enzymes. They can serve as hormones and neurotransmitters. Our muscle fibers are collections of thousands of proteins. Other proteins are building materials in our bones. Even the lens of our eye is 90% pure crystalline protein.

Jeeves freezes the display as Kevin puts fingers at the corner of his mouth and emits a wolf whistle at the figure on the screen.

And Diana looks at Kevin and exclaims,  
“HEY!”

Feigning innocence, Kevin says  
“What???”

And she says  
“Like you don’t know!”

Kevin grins at her and tries to rescue himself with a question,  
“The lens of our eyes are made out of mostly protein?”

Shaking her head at his maneuvering she says,  
“Yep and here’s another thing about eyes and proteins...”

She gestures at the screen and this time says formally,  
“Jeeves, my dear friend, would you be so kind as to restart the display?”

A chuckle comes from the air as Jeeves replies,  
“My pleasure, Diana.

“The color of your eyes is determined by how much pigment is in front of your iris. And that amount is determined by the proteins that make and degrade that

pigment. Several different genes are responsible for making these particular proteins. If there is no pigment at all, your eyes appear to be a pure blue. This is why babies are often born with blue eyes. As the baby ages, eye-color genes begin making proteins that make color pigments in the eye. If the genes that make the protein that make eye-color pigment are defective. The blue eyes remain blue.”

Kevin looks suspiciously at Chaucer as Chaucer says.

“Wow, I didn’t know that! I always thought of blue-eyed blondes as perfect and it turns out that their eyes are blue because they have a defective gene?”

And Diana smiles as she says to him,

“That’s true, Chaucer. And you’ll notice Kevin’s eyes are definitely not blue!”

“OK, Chaucer says, “Nice summary Diana.

“Kevin have you made progress in determining from your brain studies whether a reconstruction of the brain is affected by Quantum Mechanical uncertainties?”

“Not really,” Kevin replies

“I started with the basic question of whether everything that humans do --from designing skyscrapers to composing symphonies -- could be the product of brain chemistry.

“And it could be...because everything that humans do (or think or feel) is the result of the basic units of brain structure - the neurons.

”The human brain contains more than a hundred billion neurons. Just like a single ant could never build an anthill, a single neuron can't think or feel or remember. A neuron's power is a result of its connections to *other* neurons. Each neuron is connected to as many as a thousand of its neighbors. These trillions of connections provide the playing field upon which the complex activity of the brain takes place. Each neuron can turn its neighbors on or off depending on the signals it sends, and the resulting stable patterns of neuron firing represent memories...and images... and thoughts.

”I don't yet understand the relationship between neural activity and mental experience. I don't yet know what the precise pattern of a *memory* or an *image* or a *thought* looks like. I don't know how to read the cerebral 'code' of the neurons.

“And I need to understand all of those before I can answer your question.”

Pressing him, Chaucer asks further,

“And what about your other inquiries into relativity and space-time?”

Kevin replies,

“You are a slave driver, Chaucer...all I can say is I am working on it.”

“OK,” Chaucer says relenting a little. “As you know we have all the TIME in the world.

“Next week I’ll give you two a preliminary briefing on the Standard Model of Physics.

“If we are going to manipulate space-time, we need to have an understanding of the forces at our disposal.

“Meanwhile, let’s get to it!”

Back in the lounge once more, Kevin and Diana are sitting on the overstuffed sofa watching the fire in the huge fireplace. Diana is sitting with her back to one end of the sofa and has her bare feet in Kevin’s lap. Unable to resist the temptation, Kevin runs one finger along the bottom of her left foot, tickling her.

“HEY!” She says trying to jerk her foot away.

Grabbing the retreating foot to keep it from escaping, Kevin says appeasingly, “OK...OK...I won’t do it again.

He smiles at her and says, “...I promise.”

Although dubious of his sincerity, she relaxes and leaves her foot where it was.

Kevin reprises his favorite subject as he says, “Since I have given you an eye into my soul, Diana, how well do we know each other now?”

“What?” she says pretending not to know what he is talking about.

So he patiently explains, “You keep saying you will tell me more about yourself when we know each other better....so how well do we know each other?”

Diana gives up trying to misunderstand him and laughs easily as she says, “Pretty well... what do you want to know?”

“Well,” he says, “When you were naked in my pickup truck the night we were transported here you knew that clothes wouldn’t survive time-travel.”

Diana laughs again and says, “See you already know lots about me.

But Kevin argues his case, “Not nearly enough... How did you know that? Have you time-traveled before?”

“OK, Diana says, “The truth is I had never time-traveled before that night, but I have had long discussions with someone who has. It was that person who told me about the clothes issue.”

Intrigued Kevin asks, “Who was it? The guy that owns this company – Chaucer said that HE had time-traveled?”

“No,” she says, “I have never met him, though I would like to one day.”

He persists, “Well who then?”

But she isn’t going to tell him. Changing her position on the sofa, she leans over and kisses him firmly and passionately and then says,  
“That’s all you get for now...more when we know each other better.”

Pursing his lips and enjoying the fading sensation of the kiss, Kevin says,  
“Wow! If that’s what I get when I still don’t know you well enough ...I can’t wait til I do know you well enough to know more!”

Laughing at that tongue-twister, Diana says, “You can say that again.”

And Kevin says, “No, I don’t think I could.”

He puts his arm around her, and she puts her head on his shoulder. The fire in the fireplace isn’t the only thing burning in the lounge tonight.

## End Chapter 6