Who Laughs Last

by Frank Clarke

Disclaimer

Save only for those persons such as Albert Einstein who are clearly 'historical figures', none of the characters in this story represent or are modeled upon real people. They are all fictional characters, and any resemblance to persons living or dead is entirely coincidental.

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1 — Deathbed

"I do not consider myself to be especially smarter than any other human, but I do have a particularly vivid imagination."

-- Albert Einstein

Nurse Lana Mackey tip-toed toward the nurses' station trying her best to be as silent as possible. Their one and only patient on this private ward was near death, she knew, and she intended to make his passing as undisturbed as it could be. How long might he have left? Hours or days?

Nurse Penny Collins put down her copy of LOOK magazine when she saw her friend and co-worker approaching.

"It's all right," Penny told Lana, "he's awake."

"Oh, good," Lana replied. "Has he eaten anything today?"

"Not much of anything," Penny reported. "He had some pudding earlier but other than that all he's wanted was water. I think it will be very soon..."

Lana padded softly down the hall and looked in on the aged, gray-haired man. He was snoozing contentedly, it appeared from the rhythmic lift and fall of the bed covers. She went back to the nurses' station.

"He's back to sleep again," she told Penny. "What's your estimate?"

"I expect I'll have another assignment by tomorrow, if that's what you mean," she confided to Lana.

Lana nodded. She was surprised the old man had hung on this long.

The two went through the ritual of 'turnover', then Penny gathered her belongings and headed for the stairs. As she pushed the stairwell door open she turned back for a moment to look down the hall and silently issued a prayer for her patient's safe passage. Exiting the building to the parking lot, she took a pack of Lucky Strikes from her purse, popped one out, put it to her lips, flicked her Zippo open, and lit it. The blustery April winds pasted her trench coat to her legs as she unlocked her '53 Ford Mainline and got in. A minute later she was on her way home.

Lana busied herself with paperwork for a while, then picked up Penny's discarded LOOK and riffled through it. She quickly realized this was an older issue and closed it to check the cover: Ed Sullivan. She tossed it aside. It was time again to check on the old man.

When she entered the room, her patient was writing notes on a pad. He turned and looked at her and nodded. Lana Mackey took the required data: pulse, BP, respiration and temperature.

"How do you feel?" she asked.

"I'm tired," the man admitted.

The shift-and-a-half she was working tonight was four hours of Penny Collins' shift and a full shift of her own: seven-to-seven. She knew what 'tired' meant and she wasn't looking forward to dragging her body out of there by the dawn's early light.

Add to that the possibility that she would be doing 'PM care' on this patient before the night is out.

Shortly after 1 a.m. Lana decided to check in on her patient again just to see how he was doing.

Slipping silently into the room, Lana looked at her patient and wondered whether she ought to bother taking his vital signs. If she didn't, there would certainly be questions — uncomfortable questions — asked after he died, something now all but certain. She took the blood pressure cuff from its wall rack and wrapped it around the man's upper arm, then started pumping. The old man stirred, then turned his head in Lana's direction as the pressure cuff cut off circulation to his hand.

"*Es isch nur aen Witz gsii*," he told her.

"I'm sorry...?" she replied. "What did you say?"

"*Es isch nur aen Witz gsii*," he repeated, looking for any flicker of understanding in her eyes. Lana looked back not knowing what to say. She understood not a word of German. He stared back at her as she placed the stethoscope to his arm and listened for the pulses as the pressure dropped in the cuff. At 100mmHg she still had not heard a pulse and opened the valve completely. Still no pulse. The old man's heart had stopped. She thumbed his eyelids closed and pulled the sheet completely over his head. Picking up the chart she wrote:

> *Attempted to take vital signs 1:15am, patient spoke to me in German (I think) and expired while his BP was being taken.*

and signed it '*Lana Mackey, RN, 1:17a 4/18/55*'.

She walked back to the nurses' station and called the hospital administrator to give him the news.

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"What did Dr. Einstein say to you?" the administrator wanted to know.

"I have no idea, doctor," Lana explained. "I don't understand German."

"None at all?"

"Well, '*ja*' and '*nein*' I suppose..."

"What did it sound like?" he pressed.

"ess ish... I don't know..."

"That's too bad," the administrator offered. "It might have been something important." He would have loved to have been able to tell the flock of reporters who would soon be here the great man's final words. Oh, well... He picked up the phone and began dialing the number for the President of Princeton

University. He had asked to be notified of any change in Einstein's condition, and this certainly constituted 'a change'. The phone burred softly in his ear telling him that another phone somewhere distant was ringing.

"Hello?" a woman's voice answered.

"Good evening," the administrator began, "This is William Pruitt from the hospital. Is Dr. Dodds at home?"

"Hold on, please," she told him, "I'll get him for you." A few moments passed before another voice, this time male, came through the phone.

"This is Harold Dodds," the voice assured the administrator, "Who's calling?"

"Dr. Dodds, this is William Pruitt from the hospital. I am the bearer of bad news... Dr. Einstein has passed on. He died about 1:15 this morning. I'm sorry."

"Ah," Dodds noted somberly, "a great loss..."

"Yes," Pruitt added. "The nurse who was attending him said he muttered something in German just before he died."

"What?" Dodds demanded.

"I can't tell you," Pruitt admitted. "She doesn't understand German, and she is unable to repeat it from memory. I'm sorry."

"Pity," Dodds concluded. "Well, thank you for letting me know. I'll take care of informing the trustees. Good night, Dr. Pruitt," and he dropped the line.

2 — Search and Rescue

Edmund Pruitt had always been fascinated by the story his father had told of the night Einstein died. Einstein had said something to his nurse, and because she knew too little German, she could not even repeat it, and had no idea what it meant. What a tragic loss!

Now, here was his instructor at that very same university, Princeton, discoursing on a topic not completely unknown to young Pruitt, but nearly so: past-life regression. His point seemed to be that this was a parlor-trick or the means of an elaborate hoax, but that all reputable psychologists discounted such stories to worthlessness. Pruitt raised his hand.

"Well," he began his question, "'past lives' may not be recoverable, if they even exist, but what about one's current life? Is it possible to recover lost or forgotten details from a person's past?"

"Thank you, Mr. Pruitt, for allowing such a graceful *segué* into my last point," Professor Edward Jervis answered with a smile. "Indeed, it is possible to unravel threads from the forgotten past. It is, in fact, this very ability that makes the past-life regression hoaxers believable to so many. But as we discussed last week when the topic of 'hypnosis' was first introduced, not everyone is susceptible to being hypnotized. What does this suggest for those who are susceptible?" He looked around the class at the upturned faces. "Miss Ellison?" he invited one student whose expression said, "I think I know..."

Dorothy Ellison turned in her seat so that her voice, which she had never learned to project very well, could be heard by the other students. "If a person is susceptible to hypnotic suggestion... able to be hypnotized... what else might they be susceptible to?"

"Precisely correct, Miss Ellison," Jervis congratulated her. "Does everyone understand what she just said?" he asked the class-at-large (rhetorically). "How much credence can we assign to the hypnotically-recovered memories of those who are capable of being hypnotized? It's an interesting question. We don't know. Those memories may be 100 percent accurate... or they may be complete fabrications generated by an unethical hypnotherapist. We'd like to think there aren't any of those, but we know that there are. So, the value of the recovered memories is a function of the credibility of the therapist. Questions?" he asked, looking around the room at the faces of the students.

"Have a nice weekend," Jervis wished them as he closed the folder holding his lecture notes.

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Dr. Edmund Pruitt loved teaching. He loved it more, he supposed, than the law ought to allow, but he wasn't about to write his Congressman and make a fuss over it. And it must have showed. Few instructors, if any, especially PhDs like him, could so proudly point to their numbers at www.ratemyprofessors.com:

across-the-board 4-or-better save only for 'easiness' where he managed only a '2'. Oh, well, you can't have everything.

'*If you want to learn: Pruitt. If you want an 'A', pick someone else*' one of those reviews said. *That was libelous*, he thought to himself. He'd given — no, he didn't give anything — he had issued plenty of A's in his career, and those who got them well-and-thoroughly deserved them. He had no pangs of guilt. Few complained about the quality of the education they got in his classroom.

The thought of a sabbatical was like an itch he couldn't scratch. He would have to leave the classroom for an extended spell doing research and writing... boring pursuits as far as he was concerned, only softened by the company of his companion of these last twenty-one years, Dr. Dorothy Ellison-Pruitt.

"What shall I do, Dot?" he asked her.

Dot shrugged. "You need to find something that grabs your heart," she told him. "Anything less and you'll never feel like you've done something worthwhile."

Edmund Pruitt nodded in agreement. No one knew his heart as well as Dorothy. He rested his chin in his hands, mindlessly emulating the Rodin sculpture both in pose and in meaning.

"What about 'repressed memory'?" Dot prompted.

"Hmm...," he grunted not moving from his pose.

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"*Hello. You've reached the answering machine for Phil Breitling. I'm not available to take your call, but if you leave your name and number, I assure you your message will receive all the attention it deserves. If this is a sales solicitation, please don't bother wasting your time... BEEP!*"

"Hello, Phil," Pruitt began as if he were really speaking to his star student, "This is Dr. Pruitt and I need your help. I need to locate a person who used to work at Princeton University hospital many years ago and I have no idea how to go about it. If you or your father can give me any advice I would very much appreciate it. You have my number. Call back anytime."

The one person Edmund Pruitt wanted to use as a subject might not even still be alive. Lana Mackey, if she still lived, would be creeping up onto eighty. Hell, he thought, she might even be older than that. Time was not on his side where Lana Mackey was concerned.

And would she be susceptible to hypnosis? As a nurse and thus scientifically attuned, she might be a poor subject. A good subject had to have a pliant mind and the scientific types usually did not fit that pattern.

For Phil Breitling Sr., his son's request was something he would typically route to a subordinate. It was such 'grunt work' it was very nearly not worth his time — or his talent. Still, if Phil Jr. thought it was important, his parental duty was to treat it as such. He dialed the number his son had given him and waited for an answer.

"Hello?" Dorothy answered the phone.

"Good morning," Phil Sr. started. "I'm calling to speak to Dr. Edmund Pruitt at the request of Phil Breitling. Is he at home?"

"He is," Dorothy assured him. "May I tell him who's calling?"

"I'm Phil Breitling's father and I'm also 'Phil Breitling'," Phil Sr. told her.

In a moment, the two were conversing.

"The person I'm looking for," Pruitt began, "is named, or was named, Lana Mackey. She was at the time... 1955... a Registered Nurse at Princeton University Hospital. She was the duty nurse attending Albert Einstein the night he died and is the last person known to have spoken to him before his death.

"I have no idea how old she might be now or even if she is still alive, but I need to find her fairly quickly."

Breitling was taking notes all this time and came back with a clarifying question: "So she was licensed to practice nursing in the State of New Jersey in 1955?" he asked Pruitt.

"I have to presume she was," Pruitt agreed. "The hospital wouldn't have taken her on without a current valid license."

This was too easy. This sounded like an assignment a still-wet-behind-the-ears P.I. could handle with a phone call or three.

"I'll need a retainer of five hundred dollars, Dr. Pruitt," Breitling told him, "but I can't imagine this costing more than that in total. On your verbal agreement, I can get started on this right away."

"Yes, please start immediately," Pruitt urged. "I'll get a check out to you this afternoon."

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Breitling paid a personal visit to the hospital's HR department so that he could present his identification and demonstrate his believability.

"A professional license is a public record in New Jersey," Breitling told the HR manager, although it was nothing she, herself, was not aware of independently. "If you can tell me what your records say about Lana Mackey — the license number, for instance — it will make my search of the State's records that much more precise. It's nothing I won't be able to discover just by browsing microfilm in Trenton, so you're not violating anyone's privacy."

"You might have better results, Mr. Breitling, browsing microfilm," the HR manager suggested. "All of our records from 1955 are in storage. I would have to call back a whole series of boxes and riffle through the paper myself to find what you're looking for. Before I could do that, you could drive to Trenton, look at the microfilm in the state archives, and you would have your information in your hand.

"Even if I did find you Lana Mackey's license number, you would still have to get her current information from the Division of Licensing in Newark, and you might need a subpoena for that. That information is <u>not</u> a public record."

At the State Archives in Trenton, Breitling spent the better part of a day before handing the task off to one of his employees. It took another day-and-a-half to locate the reel containing the record of the prior renewal. Then it was off to Newark to consult with the Division of Licensing. That provided only the

information that Lana Mackey's New Jersey Nursing license had expired in 2002, and that the last renewal was in the name of Lana Mackey Peel, 749 Clayton Ave., Bay Head NJ.

Bingo.

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The knock on the door at 749 Clayton Avenue was answered by a man in his forties.

"Good afternoon," Breitling greeted him. "I apologize for the interruption," he said, handing the man his business card. "I'm trying to locate one Lana Mackey Peel who lives or once lived at this address. Do you know where I might find her?"

"Mrs. Peel sold this house to us some years ago," the man told Breitling, "and moved to an assisted living facility nearby. I'm sorry, but I haven't kept in touch with her."

"Do you know the name of the facility?" Breitling asked him.

"I'm sure she told me, but I'm sorry to say I don't recall what it was. I think it was on Atlantic Avenue in Manasquan."

"Thank you very much for your time," Breitling told him as he turned to leave.

Of the two assisted living facilities in Manasquan, neither was on Atlantic Avenue, but the one on Sea Girt Avenue did play host to a Mrs. Lana M. Peel.

Breitling phoned ahead for an appointment.

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Lana Mackey Peel guided her motorized wheelchair into the lobby waiting area and toward its only occupant. Phil Breitling rose from his chair and extended his hand.

"Lana Mackey Peel, I presume," he greeted her with a smile.

"Well, I'm certainly not Dr. Livingstone," she quipped back at him. "You are Mr. Breitling?"

"I am," Breitling admitted.

"What can I do for you, Mr. Breitling?" she asked.

"I represent Dr. Edmund Pruitt who is very anxious to speak with you, Mrs. Peel," Breitling informed her.

"Pruitt?" she asked, her head cocked to one side. "From Princeton University Hospital?"

"I have to admit, Mrs. Peel, that I don't know all the details," Breitling begged off. "I merely know that Dr. Pruitt is very interested in meeting you and talking with you."

"I'm amazed," Lana spoke softly. "I would have assumed Dr. Pruitt to be long-dead."

"I don't know why you might think that," Breitling told her. "Dr. Pruitt has been teaching at William and Mary College for many years and the one time I met him I had the impression he was in his forties or early fifties. That was just a

few years ago."

Lana shook her head. "Then that certainly can't be the Dr. Pruitt I knew. Pruitt was older than me, and I'm seventy-six.

"What, if you know, does Dr. Pruitt want to talk to me about?"

"Not the faintest idea, ma'am," Breitling admitted, "but my instructions are to ask you whether you will speak with Dr. Pruitt and if so, I am to call him immediately. Ma'am, may I call Dr. Pruitt?"

"Please do," Lana Mackey Peel nodded her agreement. "I'm anxious to speak with Dr. Pruitt."

Breitling dialed Pruitt's number on his cell phone. Not unexpectedly, Dorothy answered the phone.

"Hello, Mrs. Pruitt," Breitling started, "I have some good news for Mr. Pruitt. I've located Nurse Lana Mackey and I'm sitting here in Manasquan, New Jersey, talking with her."

"Edmund will be so pleased," Dorothy gushed. "Hold the line and I'll get him right away."

In a moment, Edmund Pruitt was holding the phone. "You found her!" he called into the phone. "That's wonderful. Where is she? Let me speak to her."

Breitling handed his phone to Lana.

"Dr. Pruitt?" she queried. "From Princeton University Hospital?"

"No, ma'am," Pruitt answered. "You're thinking of my father, Dr. William Pruitt, who was the administrator-on-duty with you the night Dr. Einstein died. I am Edmund Pruitt, his son, and I would very much like to meet you."

"For what purpose, Mr. Pruitt?" Lana probed.

"Mrs. Peel," Pruitt started then hesitated. "I would like to talk to you about undergoing hypnosis for the purpose of recovering some memories only you possess."

"Einstein's last words," she offered.

"Exactly," Pruitt confirmed.

"You don't think you'd be wasting your time, Doctor?" she asked. "Those memories are a half-century old, and I know no more German today than I did then."

"It could easily be a waste of time," Pruitt agreed. "It could also be quite an interesting and valuable effort. I'm ready to give all the time that's needed to this. Of course, if you've got a date you can't break..."

Lana Mackey Peel laughed into the phone. "No, Doctor, you can be my date. When do you want to start?"

"Dot and I will leave in the morning. We'll be there tomorrow afternoon. Any time after that."

"I look forward to seeing you tomorrow, Dr. Pruitt. By the way, how is your father?"

"Passed in 1979, Mrs. Peel."

"My condolences, Dr. Pruitt."

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Dorothy heaved her bag into the trunk of their car and took a deep

breath. She always packed as if she were going on safari, a habit her husband had been unable to break for all the time they were married. It wasn't a terrible problem, because they didn't travel all that often. When they did, Dot often drove because Edmund tended to let his mind wander. That's not a good trait for a driver.

"Are you all loaded up, Pru?" she asked.

"Ready," he informed her.

Dot took her place in the driver's seat and backed out of their driveway. A few minutes later she turned onto the I-64 entrance ramp headed west for Richmond and her connection to I-95.

"I'm so excited, Pru," she bubbled. "After all these years to finally be meeting Lana Mackey. I do hope it works out for you."

"I hope she'll be a good candidate for hypnosis," Edmund Pruitt admitted. "She could just as easily be unhypnotizable, and then we're... that is: I'm back at square one. Worse, actually. At that point, I would have nothing left. She's the one and only link I have. If she can't be put under, the project will have to be scrapped."

"Well, let's keep our fingers crossed, shall we?" Dot comforted him.

At half-past three in the afternoon, Dot turned their Crown Victoria into the driveway at Sea Girt ElderCare and found a parking spot near what seemed to be the front entrance.

"We're here, Pru," she informed her husband who roused himself from a very much needed snooze.

"So soon?" he asked. He seemed startled. "How long have I been asleep?"

"Since before the last toll booths, I think," Dot chuckled.

He shook himself awake, brushing his palms against his cheeks to help the process along. "Alright," he said, "let's go meet Lana Mackey."

Inside the lobby the receptionist greeted the Pruitts and called Lana Mackey Peel's room to let her know her expected visitors had arrived. A few minutes passed before Mrs. Peel rolled into the lobby to meet them. The Pruitts moved toward her and Edmund extended his hand.

"I'm delighted to finally meet you, Mrs. Peel," he said.

"A doctor like your father!" Lana Peel remarked. "It's very good to see you. as well, Dr. Pruitt. I think we ought to be on a first-name basis for this, don't you? I think 'Mrs. Peel' and 'Dr. Pruitt' may become a little unwieldy, so I suggest you substitute 'Lana' when addressing me."

"I wholeheartedly agree, Lana. Allow me to introduce my wife, Dorothy, whom everyone knows as 'Dot'. As for me, I've never liked 'Edmund' and can't stand 'Ed' or 'Eddie'. You can call me 'Pru'. Everyone else does."

Lana turned to Dorothy. "Dot, are you here to assist your husband?"

"If he needs me, certainly, but my interests run to a different branch of medicine," Dot explained.

"Ah, then you're a doctor as well?" Lana asked.

Dot smiled and linked arms with Pru. "Yes. We were classmates, then study partners, graduated together, interned together... Now we both teach at William and Mary, except that Pru is on sabbatical leave alone, until I join him in that next year."

"So," Lana looked back at Pru, "I'm your 'research project', am I?"

Pru cocked his head to one side. "You're that, certainly, but, Lana, you are so much more."

"Then let's get started," Lana said, putting her wheelchair into reverse. "I'm not getting any younger."

3 — Under

Inside room 173 of Sea Girt ElderCare, Pru opened his 'little black bag' and extracted a syringe and a collection of other objects.

"I'm going to give you something to help you relax, if that's alright with you, Lana," he explained.

Lana smiled. "Which of you is the better 'stick'?" she asked with a wink.

Pru wrinkled his mouth and admitted: "Dot is the one with 'the hand of a woman'. Would you rather she injects you?"

"I'm a big girl," Lana answered. "I can take it."

Dot gave Pru a soft slap across his shoulder and, with a smile, reached over and took the syringe from his hand. She palpated Lana's arm to find a candidate vein, then quickly swabbed the spot with an alcohol wipe before slipping the point smoothly into the skin and squirting the drug slowly into Lana's bloodstream.

In seconds, Lana felt the world smooth out and any cares or worries she may have had when she entered the room melted away.

"How are you feeling, Lana?" Pru asked.

"Just fine," she replied.

Pru began twirling a faceted crystal in front of Lana. "I want you to try to concentrate completely on this crystal," he told her. "Let it become your entire world except my voice.

"Try to relax your muscles as if you were going to sleep." Lana nodded. "No," Pru cautioned, "don't acknowledge any of my instructions. Just do your best to follow them. Stay on the crystal.

"Let yourself slip into sleep, Lana, but not so deep that you can't hear me... relax... stay on the crystal... stay on the crystal..."

Pru watched Lana's pupils begin to dilate and contract erratically and continued speaking to her in a soft, soothing voice until without warning, her pupils dilated and stayed that way. He stopped twirling the crystal and gently put it aside. He arranged a tape recorder on the bedside table, pointed the microphone at Lana and quietly pressed 'record'.

"Lana, are you asleep?" he asked her.

"...Yes," she answered hesitatingly.

"And do you know where you are?" Pru continued.

"...New Jersey?" she suggested.

"Yes," Pru confirmed, "Princeton, New Jersey, and it's the evening of April 17th, 1955. Do you know where you are now?"

"What time is it?" she asked.

"It's about six thirty in the evening," Pru told her.

"I need to relieve Penny," Lana sounded anxious. "She has a date tonight. I can't be late because she can't be late."

"You won't be late," Pru assured her. "You've got plenty of time. When does she expect you?"

"A little before seven," Lana told him with a relieved tone in her voice. "We'll do turnover and then she'll go home and change." Lana smiled. "Mark may pop the question tonight."

"Ooh," Pru cooed, "no, she can't be late for that. Why don't you two do turnover so she can get going. Let me know when you're done, okay?"

"Okay," Lana agreed dreamily. There followed a few moments of mumbled speech and then Lana grew quiet.

"I hate night shifts," she told Pru.

"I know what you mean," he agreed. "Do you have many patients tonight?"

"Just one," Lana told him. "Dr. Einstein. He's famous, you know. He worked on the atomic bomb."

"Yes," Pru confirmed, "I know. Lana, if Dr. Einstein says anything to you tonight, it might be important. You should pay attention."

"He doesn't have very much time left, I think," Lana confided to Pru.

"Even more reason... Let's let the clock roll forward to about one in the morning, okay?"

"Okay," she agreed. "I think I had better check in with my patient," Lana said abruptly.

"How does he look?" Pru asked.

"I think he's sleeping. This will be a good chance to get a relaxed BP," Lana remarked offhandedly.

"I'm sorry..." Lana said to no one in particular.

"Did he say anything?" Pru asked her.

"Yes," she told him. "It sounded like German. I wish I knew some German. This might have been important."

"What did he say?" Pru asked. "Can you repeat it?"

"He said: '*Es isch nur aen Witz gsii*'," Lana repeated Einstein's words.

"I didn't catch that," Pru prompted. "Can you say it again?"

"Sure. '*Es isch nur aen Witz gsii*'."

"I think I know what you mean, Lana," Pru told her, "I wish I knew more German than I do.

"Well, let me let you get back to your work..."

"Oh!" Lana exclaimed. "He's dead! His heart stopped while I was trying to get his BP. I have to go and call the administrator."

"Lana, go and call the administrator, and as soon as you do that, I want you to gradually awaken. Can you do that for me?"

"Oh, yes... sure. Give me a few minutes and I'll be right back."

A few moments later, Lana's pupils began to contract to their normal size and she looked at Pru.

"I don't think this is going to work," she told him. "I don't feel at all sleepy. Maybe I'm just not a good candidate for hypnosis."

"Well," Pru told her with an air of resignation, "it was worth the effort, and I want to thank you for being such a good sport about it."

Lana smiled.

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"What is it?" Dot asked as they listened to the tape back at their hotel room.

"I haven't the faintest idea," Pru admitted. "This is what she heard from Einstein, but I can't make heads or tails out of it... 'it is only a joke something'. I would think it would be '*Es war eigentlich ein Witz sein*'... or something of that sort. I'm sorry. My German is really weak. Maybe her memory is bad," Pru continued. "Maybe she's babbling and she really doesn't remember what she heard."

"But you said your father only got two words from her the night Einstein died: '*es isch*', and that's what she repeated today along with four more words no one has ever heard from her lips before." Dot leaned back in her chair. "I think you did it. Whatever Einstein said that night, even if it was nonsense, I think you've got it on that tape."

"Even so," Pru mused, "we're going to have to find someone much more practiced in German to help us with this."

They had said their good-byes to Lana Mackey Peel that afternoon and planned their return to Williamsburg the following morning.

While Dot piloted them home, Pru called ahead to find a language expert at the college. Once the words had been successfully translated — if indeed they were not gibberish — the work on his research paper could commence.

And the sooner it got started, the sooner it would be completed, and the sooner he could get back to his beloved classroom.

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Alice Longley listened to the tape, then backspaced it and listened again, then backspaced it and listened again. A smile spread across her face

"It sounds like German, but it's not," she told Pru.

"So, it's really gibberish?" he offered dejectedly.

"It may be gibberish," Alice admitted, "but it could be a dialect that doesn't conform to the norms we have for formal German. You came to the wrong person for that, I'm afraid, but I do know someone who can confirm that supposition or refute it, and you know what they say: 'knowing who knows is the same as knowing'."

She flipped open a small address book, picked up the phone, and dialed a number. After a few moments, she began speaking:

"Liesl, it's Alice Longley. I'm so glad I caught you at home. Do you have a few moments?"

There was a pause and Alice continued:

"I have a phrase in what sounds like some dialect of German and I can't make it out. May I play it for you?"

Alice backspaced the tape again and held the phone near the speaker as Lana Mackey Peel spoke: "Sure. '*Es isch nur aen Witz gsii*'." Then she backspaced the tape again and replayed it.

"Were you able to hear that, Liesl?" Alice asked her friend.

"Well, you're right, Alice," Liesl Krueger agreed, "it's not German. It's *Schweitzerdeutsch*... Swiss-German. I presume you also wish to know what it means? The speaker said: '*It was supposed to be a joke*'."

"'It was supposed to be a joke'?" Alice repeated the words so that Pru and Dot could hear.

"That's what she said," Liesl confirmed.

"Thank you so much, Liesl," Alice gushed. "I don't know what it signifies, but my friends will be very happy to have the translation." They exchanged a few pleasantries and disconnected.

"Well," Alice told Pru and Dot, "there you have it. 'It was supposed to be a joke'. Please don't keep me in suspense any longer," she begged. "What was supposed to be a joke?"

"I don't have the first clue," Pru admitted. "Dot and I put a subject under hypnosis and regressed her to a moment in her past when she was told that phrase in... *Schweitzerdeutsch?...* and it's been repressed, hidden in her memory since. We just mined it from her memories."

"If you don't have anything but this," Alice asked, "why bother?"

"Because of who said it," Dot interjected.

"And who is that?" Alice asked.

"Albert Einstein," Pru told her. "It's the last thing he ever said."

"Are you telling me that Albert Einstein's last words on Earth were 'It was supposed to be a joke'?" Alice demanded.

"Apparently," Dot confirmed.

"But what was it that could have been 'supposed to be a joke'?" Alice exasperatedly asked no one in particular.

"I don't know," Pru admitted, "but since this will be core to my research paper, I'd appreciate it if you didn't spread it far and wide."

Alice nodded. *Damn it, this would make great gossip at the bridge club,* she thought, *and now I can't use it.*

—==++==—

Dr. Edmund Pruitt's "*Reconstructing The Past — Mining Memories for Clues to History*" got as much 'critical acclaim' as one might expect for a research paper in the social sciences by a tenured professor on sabbatical leave.

That is to say, it very nearly disappeared into an Orwellian 'memory hole'.

Very nearly.

The library at The College of William and Mary, of course, had a bound copy, three in fact, as it did for all published works of its faculty and the expectation of the staff was that it would collect its share of dust in the fullness of time. Dear friends of the Pruitts also did their part by purchasing their own bound volumes as 'coffee table books' suitably autographed by the author, and complimentary copies also went to all of the national organizations concerned with the mental health disciplines as well as the Library of Congress and the National Institute of Health, along with one sent at Dot Pruitt's request to Mrs. Lana Mackey Peel of Sea Girt, New Jersey, that one with a Post-It tab on page 21,

chapter 2, 'Albert Einstein's Last Problem'. There were, to be sure, more 'complimentary copies' than there were purchased copies, a fact that surprised no one.

One copy was purchased by the Stanford Linear Accelerator Center in Menlo Park, California, and another by the Department of Physics at Princeton University. In total, fewer than 400 copies were produced.

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An excerpt from Chapter 2 of "*Reconstructing The Past — Mining Memories for Clues to History*" by Dr. Edmund Pruitt, College of William and Mary — Albert Einstein's Last Problem:

...

In mid-April of 1955 at age 76, Albert Einstein was rushed to Princeton University Hospital for treatment of internal bleeding after the rupture of an abdominal aneurysm. He argued with the staff about the treatment plan and strongly resisted the idea of a second surgery to repair the bleeding vessel. This, alone, probably doomed Einstein and his death early on the 18th was easily predictable.

On duty that night were two nurses, Penny Collins (later Laliberte), and Lana Mackey (later Peel). About seven in the evening, Lana Mackey relieved Penny Collins halfway through her shift and continued to be the charge nurse through to seven the following morning.

Several times during the night, Nurse Mackey checked her patient, the one and only patient on that private ward, and tended to his needs. About one in the morning of April 18th, Nurse Mackey entered Einstein's room for the last time and attempted to take the great scientist's vital signs. The last nurse's note reads as follows:

> *'Attempted to take vital signs 1:15am, patient spoke to me in German (I think) and expired while his BP was being taken -- Lana Mackey, RN, 1:17a 4/18/55'.*

When questioned later, Lana Mackey was unable to repeat the words Einstein spoke to her. She was not fluent in any foreign languages, and because of this, Einstein's last words were lost to history.

...

In July of 2008, a private investigator located Lana (Mackey) Peel in an adult congregate living facility (ACLF) in Sea Girt, New Jersey and contacted her on my behalf to ask whether she would be amenable to an attempt to recover her lost memory. She agreed. I traveled to New Jersey with my wife and assistant, Dr. Dorothy Ellison-Pruitt to see Lana Mackey Peel to attempt to

recover the last words of Albert Einstein.

Lana Peel, it happened, was an excellent subject. With very little 'coaching' she slipped into a hypnotic state and demonstrated an easy acceptance of the fluidity of time. With little difficulty, I was able to regress her to the evening of April 17th, 1955 when she relieved Nurse Penny Collins, and then 'walked' her forward to the point of Einstein's death including, of course, the moment when he spoke to her in what everyone had always assumed was German.

...

Einstein spoke a mere six words to Nurse Lana Mackey: '*Es isch nur aen Witz gsii*'. Readers will certainly note that the orthography presented here is not typical German orthography. What Einstein spoke that night was not German *per se*, but rather *Schweitzerdeutsch*, Swiss-German, a spoken-only variant/dialect of German for which there is no widely accepted orthographic standard. The orthography presented here is that suggested by Liesl Krueger who also provided the translation into English: '*It was supposed to be a joke*'.

...

Precisely what was 'supposed to be a joke' is, for now, unclear. It seems unlikely Einstein was referring to his own work that today forms the concrete basis for almost all the advances of modern Physics.

The phrase was spoken twice identically by Lana Mackey Peel while under hypnosis, so it is clear she <u>believes</u> them to be the words Einstein spoke. Whether the young nurse <u>heard</u> the words correctly or whether she <u>recalls</u> the words correctly are problems for another day. An error either in hearing the words or in recalling the words are each entirely within the realm of the possible.

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Dr. Elaine Pollard and Dr. Lawrence Klee were the resident 'oddballs' on Princeton's Mathematics faculty and had lately taken to not sharing any more of their theories and speculations with their colleagues until they were fully-ready for peer review. It would have been easier on Klee and Pollard had their ideas been more 'mainstream', but where's the fun in that? Pollard and Klee more than once had the Mathematics faculty scratching their heads over these 'speculations', first to try to understand what the mathematics said, then trying to figure out what the mathematics meant.

No one doubted that Pollard and Klee were geniuses, but as one wag put it *"That fine line between genius and insanity is finer in their case than for anyone else I know."*

Elaine Pollard had entered MIT's Mathematics program at age 16 and graduated summa cum laude on her 19th birthday. She then applied to Stanford for their doctoral program, was accepted, and received her PhD three years later, also (coincidentally) on her birthday. Princeton had offered her a part-time teaching position and she had gleefully accepted, vowing never again to set foot in her birth-state, Iowa.

Larry Klee, two years older than Elaine Pollard, graduated at the top of his class from the International Baccalaureate program at Deever High in Terre Haute, Indiana. His route through academia was exactly the reverse of Elaine Pollard's: his undergraduate degree was summa cum laude from Stanford whereupon he headed for MIT to complete his doctorate.

The thought of asking Elaine Pollard for a date had never crossed Larry's mind.

Without notable exception, every one of their presentations over the past four years had ended with almost everyone in attendance holding the same view: *it's interesting, but whatever could we use it for?* Those who didn't hold that opinion were those who didn't understand the mathematics in the first place.

There was now a Klee-Pollard Transform, a Klee-Pollard Inversion, and a Pollard-Klee Integral, for none of which anyone could find a practical use despite the charming techniques each introduced.

What they were working on now would split the mathematical world open like an over-ripe melon.

A year ago, a psychologist at William and Mary had extracted Albert Einstein's last words from the mind of the nurse who was there when he died. Einstein, the published paper said, told the nurse that *'it was supposed to be a joke'*, and when Elaine first read that her heart nearly stopped.

Less than a month prior she had pointed out to Larry that Einstein's mathematics in his General Theory of Relativity contained at least two unsubstantiated assumptions. Could it be possible that Einstein had constructed GTR as a giant mathematical 'Chinese interlocking-block puzzle'? What would happen if the right puzzle piece were to be pulled clear? Would GTR fall apart without the keystone piece or pieces keeping all the other pieces in their place?

Pollard and Klee were making mischief again by recasting the General Theory without reference to those two unsubstantiated assumptions, and they were getting some very scary results.

For one thing, GTR without those assumptions was a very different animal. It wasn't merely 'a horse of a different color'; it wasn't even a horse anymore. Their revised GTR did not predict any 'apparent increase in mass' as an object approaches the speed of light, yet experimental evidence existed that the phenomenon was present. Nor did their revised GTR predict any time-dilation effect, and there was also experimental evidence seemingly substantiating its existence as well.

There seemed to be few explanations adequately fitting the results they were seeing. Either those two unsubstantiated assumptions were, in fact, true (even though unsubstantiated), or the 'apparent increase in mass' and the 'apparent dilation of time' had other causes.

The fly in the ointment was that Einstein had promulgated GTR long before there existed the tools by which it could be proved or disproved, and therefore long before he could have known how a particle behaves at near-light velocities. It was a SWAG: 'somebody's wild-ass guess' when Einstein first proposed it. How could he have picked these two assumptions cast exactly as they were with no knowledge of what physicists might — many years later — discover by their experiments.

It was just possible — unlikely, but possible — that experiments architected to examine GTR would rely on the same unsubstantiated assumptions and therefore show the results that those assumptions authorize. Or it could be possible that Einstein was just lucky — make that 'extraordinarily lucky' — to pick just the right pair of assumptions that would later turn out either to be true or just to predict that which some other factor might replicate.

Either way, Pollard and Klee were going to have to identify that other factor (or, God forbid, those other factors) that deliver exactly the behavior predicted by a flawed General Theory of Relativity.

Of course, there was one other possibility.

Larry Klee and Elaine Pollard might simply be out of their minds.

4 — Higher Mathematics

Henry Deming laughed. He had just had a highly humorous thought and the implication of the Klee-Pollard Inversion suddenly became clear to him. *It was the very model of a modern 'Eureka moment'*, he thought. And his next thought was that Elaine Pollard and Larry Klee were certifiable nutcases. Either that, or Albert Einstein was a moron.

Or both.

Or neither. He would have to do some research to see which of these was true. *Truer*, he mentally corrected himself.

One thing was clear, however: photons were not particles if the K-P Inversion had even a shred of validity, and no one in the four-and-one-half years since Klee and Pollard first presented it had been able to find fault with it. Perhaps if more than fifteen or twenty mathematicians understood it there might be some who could point to its hidden flaw. Deming felt he understood the Inversion and he had not yet been able to see anything wrong with it.

Oh, God, he thought, *we've barely scratched the surface of the Einsteinian universe and now we're all faced with the possibility of an even more bizarre Klee-Pollard universe.*

Henry Deming didn't know it yet, but it really was all that bad. He closed the door of his study and began erasing the white board that occupied an entire wall of the room, corner-to-corner and floor-to-ceiling.

He then copied the basic K-P Inversion in the center of the leftmost panel and began working it, guiding it gently in the direction of the core of the General Theory of Relativity: $E=mc^2$.

Between pauses to think about each succeeding step and the time required to write, then double-check, then triple-check what he had just written, Henry Deming lost all track of time. When he finally thought to look at the clock on the wall, it said '4:32' and he thought it was 'PM'. He was mistaken.

He looked at the clock because he had just gotten to the point of drawing a conclusion from all his scribblings.

Klee and Pollard were sane. Einstein was mistaken, or he was a moron, or he was insane, or he was a fraud. For all the experimental evidence that the General Theory described a real, physical universe, the mathematics here on his board said that it was an illusion. *How... Zen*, he thought.

Klee-Pollard required a very different world-view, one substantially at odds with that accepted — and proven, by God — by physicists over the past more-than-a-century. Proven in experiment after experiment, consistently, time after time with never a hint that anything might be amiss. How could this be? Over and over, experiments specifically designed to—

Oh, no.

—experiments specifically designed to reflect the mathematics of the General Theory. Self-fulfilling prophecies, each and every one of them. The experiments were designed with the expectation that they would reflect the

mathematics of GTR — and they did. They were designed based on a lie, and they lied.

Alright, then; what is the truth? Is there such a thing as truth? Deming photographed the contents of the white board and erased it again. Faced now with a clean white board, he sat in the soft leather chair behind his desk — and fell instantly asleep.

At 9:00 AM his housekeeper became worried that Dr. Deming wasn't awake and having breakfast, so she knocked gently on his bedroom door. Then she knocked again, this time a little more forcefully. Then with great trepidation over what she might find, she twisted the doorknob and pushed the door open. Deming's bed had not been slept in. The housekeeper began a methodical search of the house looking for her employer — or his corpse.

When she knocked on the door of the study and again had no answer, she opened the door and found Deming leaned back in his chair, not snoring, clearly dead. She screamed. Deming woke up and looked around, startled.

"What's the matter?" he demanded.

The housekeeper, still not completely over her initial fright, and as yet only barely believing Deming was really alive, temporarily lost her tongue.

"I — I thought you were dead, Dr. Deming," she explained finally.

"How long have I been asleep?" Deming asked.

"I don't know, doctor," she told him, "but I think you were here about eight last night. I was going to bring you dinner but your instructions are to never disturb you in your study. I only did so this time because I thought you might be — dead."

Deming now realized that he had worked through midnight until near five AM. No wonder he was still exhausted. He had had only four hours' sleep.

"I'm skipping breakfast, Margaret," he told the still-distraught woman. "I'm going to bed. Let me sleep as long as I sleep."

"Yes, sir," she acknowledged.

When Deming finally awakened a little before three in the afternoon he was famished. The last time he had eaten was an early lunch the day before. He got up, brushed his teeth, put on slacks and a shirt, and wandered down to the kitchen where he hoped Margaret might be able to make him something to calm the gnawing in his abdomen.

Margaret, ever watchful for signs her employer might be stirring, had already heard the water running in his bathroom and had set out the makings for several different kinds of sandwiches, as well as getting a fry pan warmed in case the verdict were 'eggs'.

"Breakfast or lunch, doctor?" she asked as Deming sauntered into her domain.

"Breakfast, I think, Margaret."

"Bacon and eggs, coming up," she assured him cheerily as Deming took a seat at the kitchen table. "Is everything alright, Doctor Deming?"

"As a matter of fact, Margaret, I believe the world is about to come to an

end," he told her. Margaret's face took on a somber look. "Oh, not that way," he assured her, "but the way physicists have seen it for over a hundred years... that's all gone. I don't think anyone will be jumping out of any windows, but many of my friends are going to be very disappointed if what I found last night turns out to be true."

"And what is that, doctor?" Margaret asked, hoping against hope that she would understand his answer. Doctor Deming was very good at making difficult concepts understandable by ordinary people. Often.

Deming thought about her question a while before answering. "Suppose I told you that you weighed only fifteen pounds?" Deming started.

Margaret laughed. "I haven't been fifteen pounds since I was a toddler."

"Suppose I told you that you weighed nothing?" Deming continued. Margaret laughed again but didn't say anything.

"I know what you're thinking," Deming asserted. "You're thinking 'If I weighed nothing, why don't I just float away like a soap bubble?' Well, you would except for an innate 'stickiness' that keeps things together. We call that sticky-factor 'gravity'. Unfortunately, calling it 'stickiness' is wrong because it might lead you to think that two things might stick to each other and stay that way, but that's not how gravity works. The stickiness means that those two objects have a connection of some sort and the wider the connection the more they want to be connected — more connected, yes?" Margaret nodded. "Blow bubbles in a glass of milk and you can see something like what I'm saying: the bubbles have a flat surface where each bubble touches another, and the size of the flat surface is dependent on the gas volume inside each bubble. Those bubbles are static and don't want to do anything. That's where they're not like gravity. Gravity bubbles want to grow that flat area in proportion to the size of the flat area, to grow more and more connected. It's that desire, for lack of a better word, of things to be more connected that makes you think you have weight. If we can find the right kind of detergent, we can break the surface tension of those bubbles and you would, indeed, just float away."

"I'm not sure that would be a good thing, doctor," Margaret told him.

"Hmm," Deming said, biting into an English muffin. "You may be right," he agreed trying to talk through the mouthful of food. "The fascinating part is that this is true of everything, including things we are certain have no mass, things like photons. Photons sometimes seem to be particles and sometimes seem to be waves, and you just pick the definition of 'photon' that most closely fits the behavior you're seeing from this particular photon. Well, they're not particles. Unfortunately, they're not waves, either. That's why I said it's the end of the world. Gravity shouldn't affect photons because they're massless, but it does. We have experimental evidence of it. So, physicists will sometimes explain the observed behavior as evidence of a photon's wavelike properties. If a photon isn't a wave, why does it behave like a wave?"

"Not a particle, not a wave," Margaret reiterated, "so, what is it?"

"I don't have a clue," Deming told her, "but I will."

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Elaine Pollard's desk phone rang and she ignored it. After six rings, she reached behind the device and unplugged the cord that fed it. The ringing stopped.

On the other end of the line, Henry Deming held onto his phone waiting for someone to pick up. After several rings, the call was routed to Elaine Pollard's voicemail.

"E P," Elaine's voice-prompt said, "Leave a message." The phone beeped and Deming began talking:

"Henry Deming, JPL. You know the number. I just figured out what the Inversion means. I know you don't consider that a big deal, but I think I might be the only person besides you and Klee to understand it this fully. Now here's something that's a really big deal: the Inversion undermines Einstein. Call me if you want to know how." He hung up.

Elaine finished what she was working on a few hours later and picked up her phone to see if Larry were starting to get hungry yet. No dial tone. She held the handset out and looked at it like it was an old moldy banana. Then she remembered that she had unplugged it. She reattached the cord and the device came back to life. The display said she had two messages. She took a short pause to calculate the probability that one of the messages might be important enough to delay lunch.

"It'll only take a minute," she rationalized and then dialed in to her voicemail.

Deming's message was studiously curt. She liked that. She didn't have time to devote to verbal niceties and appreciated people who didn't waste her time. She smiled as she listened to Henry Deming say the words that let her know he really had developed a deep understanding — comparable to her own, perhaps — of the Klee-Pollard Inversion.

The second message was from Larry.

> *Plug your damn phone in, Elaine. How the hell are people supposed to get in touch with you if you keep unplugging the damn thing. I'm hungry. I'm headed for the cafeteria in five minutes.*

She glanced at the display to see when the message had been left: over half-an-hour ago. Oops. She grabbed her backpack, flung it over her shoulder and headed off to the cafeteria at a trot.

She found Larry mindlessly playing with a plate of food while he read somebody's term paper. She sat down next to him. He looked up at her as if she were a stranger.

"Aren't you eating?" he asked.

"Yeah. Wait for me." She dropped her backpack on the next chair and headed back toward the food line. She was back in ten minutes with a tray of food and proceeded to wolf it down as if she hadn't eaten in weeks.

"Got a call from Deming at JPL," she told Larry between bites.

"And?" Larry prompted.

"Says he understands the Inversion," Elaine told him.

"And?" Larry prompted again.

"Yeah, he probably does," Elaine offered. "He says it undermines Einstein."

Larry dropped the paper he was reading and stared at her.

"Did he say how?" Larry asked.

"Nope. Said if we wanted that we could call him."

"Well? Did you?"

"No. I decided to wait for you. You're the one with the Physics background," she mumbled and continued eating.

"Okay," Larry said, gathering his stuff. "Let's go call him."

"I'm not finished eating," Elaine protested.

"Yes, you are," Larry insisted, tugging on her arm.

"*No. I. Am. Not,*" Elaine enunciated each word as if it were a separate sentence while she glared at Larry. Larry sat down, convinced that at the rate she was pushing food into herself she would be done in just a few minutes.

Finally, Elaine put her fork down and wiped her mouth with the napkin. "Now I'm done," she told Larry. "Now we can go."

"Fine," Larry snarled.

In Larry's office, he pushed the button for the speakerphone and dialed the operator.

"How may I help you?" a pleasant female voice asked.

"Get us Dr. Henry Deming at JPL," Elaine ordered.

"Please," Larry added. It would never have occurred to Elaine to add that one word to her request.

"Certainly," the operator replied. A few moments later, the soft burring issuing from the speaker told them a phone somewhere was ringing.

"Deming," a voice from the other end announced itself.

"Klee and Pollard," Larry answered. "Good morning, Dr. Deming. I hear you have made a breakthrough. Congratulations."

"Well, thanks," Deming replied, "but I think you two are the only ones who'll be particularly pleased."

"Why is that?" Larry asked.

"I inverted some of the General Theory's math and... oops. The Klee-Pollard Inversion should always deliver a form that can be re-inverted back to its pristine original.

"That's correct," Elaine confirmed.

"That's why the mathematical community scratched their heads over the Inversion when you introduced it," Deming posited. "It didn't seem to do anything special: start with form A, invert to form B, invert and get form A."

"Uh-huh," Elaine said with a smirk that Deming couldn't see.

"Well, that doesn't happen in two instances with the General Theory," Deming continued.

"And?" Larry prompted.

"And that shouldn't happen," Deming announced proudly. "When it does... if it does... it says there is something wrong with the original. Now I

know what the Klee-Pollard Inversion does. It locates unsupported assumptions."

Elaine clapped three times softly. "Well, doctor, it seems you do understand the Inversion."

"So," Larry interrupted, "you've discovered that photons are neither particles nor waves."

"You knew all along?" Deming asked, surprise clear in his voice.

"For about a year," Larry admitted. "Neither Elaine nor I can imagine what a photon is if it isn't a particle or a wave or some combination of the two, but it's clear that it isn't any of those. Have you figured out what, yet?"

"No," Deming admitted. "I was hoping one of you would develop an insight once you knew where to look, but now that's out. You've known where to look for a year and you haven't found anything. Maybe you should publish partial results," Deming suggested.

"Oh, no," Elaine nearly shouted. "We did that once—"

"Twice," Larry corrected her.

"—and got our asses handed back to us on platters. No, no, I ain't goin' there, doctor. Not again."

"Well, would you mind if I publish? I'll give credit where it's due."

"If you publish, you do not mention our names," Elaine insisted.

"That will be hard to manage," Deming suggested, "since I'm relying on your protocol."

"Oh, man, we're going to be in trouble all over again," Elaine whined.

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In the end, Deming settled for a longish letter to the Journal of Physics and Chemistry in which he outlined the two places in GTR where the Klee-Pollard Inversion didn't do what it was supposed to do, and followed with the suggestion that the K-P Inversion had just uncovered unsupported assumptions that, if they were eliminated, also eliminated any possibility that photons were either particles or waves.

In the space of a single paragraph, a mere six sentences, one entire branch of GTR crumbled away and threatened the remainder with a slow, agonizing death.

The two months it had taken Deming to prepare the letter had also given him time to contemplate alternative solutions.

> "It may be possible — these results, in fact, leave little in the way of options — that photons may be merely fields — not matter at all, at least not in the way we have heretofore defined 'matter'.
>
> "What we may find should we adopt this view is a new way of looking at the universe. We will have moved from Einsteinian space to Klee-Pollard space and no one can now say what we will find there.
>
> "The only thing anyone can predict with certainty is that there will be plenty of surprises."

5 — Commercial Interruption

Henry Deming stared back at his friend, as yet unable to understand the question he had just been asked: "How did you get mixed up with those cuckoos?"

"And I can't believe you fell for their parlor tricks," his friend continued the rant. "That 'Inversion' they put out a couple of years ago is nonsense. It's worthless. It doesn't do anything. It has no purpose."

"Okay," Deming countered, "if it doesn't do anything, why does it work sometimes and not others? It's not doing anything, right? It's not changing anything in the original, but always the alternate form is so different as to be practically unrecognizable until you run the same process on it and get back to the original. It's doing something, so don't say it's doing nothing. What's it doing? And why does it sometimes fail at not doing anything?" His friend's jaw hung open and his face had a blank expression.

"C'mon," Deming pressed, "either it's doing something or it's not doing anything. One of those must be true. 'A' is not 'not-A'. Which is it?"

"I don't know," his friend admitted.

"Well, then," Deming closed in for the kill, "if you don't know, don't claim to know. If you can't say what the K-P Inversion is doing wrong, don't claim that it's doing anything wrong." He turned and walked away, headed back to his office.

The letters in response to Deming's article — the editors decided it was a little too long for a letter — were universally scornful of Deming's reliance on what some of them called 'nonsense mathematics'. No one had actually provided anything by way of proof to counter Deming's hypothesis and the number of *ad hominem* attacks set a new record for the Journal, something Elaine Pollard pointed out prominently in a scathing indictment of what she called "a 9th-century grip on the scientific method; that is to say: none at all."

The only positive letter came from a trio of doctoral candidates at MIT who acknowledged that the K-P Inversion may do something (or not) and basically took a "so what?" stance on the outcome: "Just because an oddity of mathematics fails to work as advertised proves nothing," their reply said, "except, perhaps, that the mathematical oddity is flawed in ways difficult to determine." This, also, was presented as mere opinion unsupported by anything resembling 'proof' and was written off as such by all the proponents.

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Henry Deming sat across from his boss, JPL's Director of Research, and listened as he was 'counseled'.

"You know, Hank, you don't get paid for jumping into the deep end. Many of the other Directors are wondering why you seem to have enough free

time to dabble in what they all consider 'black math'.

"I'm a little concerned, myself, that you've so little regard for your own career that you would question well-established tenets as you did in the Journal. Is there something I should know?"

Deming paused a long time, formulating his answer. "You should know that I think Pollard and Klee are not crazy. You should also know that I think, far from being crazy, they may have shown us a doorway into a new and fascinating world. You should probably know that I think in thirty more years, Einstein will be seen as 'brilliant but deluded', and you should know that I think the General Theory of Relativity is crap.

"Oh, not all of it, certainly, but enough of it that we should all be questioning whatever is left over.

"If you know all that, that's probably enough to give you all the reason you need to fire me, if that's what you're aiming at."

"Now, Hank," his boss' tone softened, "nobody's trying to get rid of you. Stop trying to be a martyr. We just want you to not do things that cause spotlights to be pointed at our academic assets — of which you are one of the best. Even an outfit like JPL must maintain a public face. Our 'public' is the academic and engineering communities. When they start pointing their fingers at us and snickering — because one of our people has put on a clown nose and big floppy shoes — we get an economic penalty levied on us: we find it harder to recruit the new people we want to be working with us.

"Do you remember when you started at JPL?" Hank nodded. Yes, he remembered. "Suppose at that time we had a researcher on staff who claimed the Earth really was flat and that Columbus got it wrong. Would you have given us a second look?"

Hank looked at him with a startled expression.

"I can tell by your face that the thought never entered your mind that you could be the reason why some freshly-minted PhD might read our letter of invitation and drop it directly into his shredder. You need to start thinking along those lines, Hank. You could be depriving us of bright new minds.

"And let me be blunt: if the trustees ever see evidence that you have cost us one candidate, you will be flushed so fast you'll wonder if you ever worked here, whether it might have been just a pleasant dream. You will be gone, *outahere*, so fast the Air Force will be scrambling interceptors to get a closer look at that UFO. We'll all miss you but absolutely nobody will shed a tear over your departure. Am I getting through to you?"

"Yes, you are," Deming acknowledged. "I'll start updating my résumé right away."

"You're over-reacting, Hank," his boss assured him.

Deming shook his head. "Look, it's as simple as this: every true thing was first believed by one person, then by two, then by sixty, then by fifty thousand, then by everybody.

"I have come to believe that the world really is round," Deming stared him down. "All of you persist in believing that it's flat. I'm not going to stop trying to convince you of the error of your ways. One day you will have your own

Eureka-moment and realize that you can't fall off the edge.

"Until that happens, I don't see that I have much of a future here. My only fear is that I may not have much of a future anywhere."

"You don't have to quit," his boss assured him. "Stay until you get another offer or until the trustees kick you out. In the meantime, please try to maintain a low profile? Don't go looking for trouble, okay?"

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The housekeeper brought the morning mail in and laid it on Deming's desk in three neat piles: junk mail, the largest; personal correspondence, almost always at least one; commercial mail and bills.

Normally Henry would handle the personal correspondence first. Usually, it was another mathematician/physicist passing along an interesting tidbit or positing a new point of view for Henry's consideration.

Now, since he was actively looking for a new employer, he always attacked the commercial mail first in hopes someone was ready to make him an offer he couldn't refuse. That would be 'any offer'. So far, he had been bitterly disappointed.

The letter in today's mail from Vereign Corp. lifted his spirits. Somebody was interested enough to offer him an interview. That was a substantial improvement over the zero the past few weeks had netted him. True, it was a phone interview; they weren't offering to fly him in for a face-to-face, but it was something.

"Vereign is seriously considering exploring the questions you raised in your recent article for the Journal of Physics and Chemistry," the letter said. "Our independent research leads us to believe our goals have considerable overlap and we would appreciate any opportunity to share insights. Please call to arrange a convenient time for a conference call with a team of our top researchers."

Cool. Considerable overlap. Even better. He lifted the receiver and began to dial.

"Vereign Corporation. Good morning. How may I direct your call?"

"Good morning. I would like to speak with Erik Svensen."

"Thank you, sir. I am connecting you to extension 3047. Please hold."

"Svensen," a pleasant voice tinged with a Scandinavian accent answered.

"Good morning, Mr. Svensen," Henry began. "I am Henry Deming. I have here your invitation to call to arrange a time for a teleconference with some of your researchers. I'm hoping you can also give me some advance information as to what, specifically, Vereign is looking at that might require my expertise."

"Dr. Deming, thank you so much for calling. My instructions are to gather the proper team members when you call. Can you hold for just a moment while I check to see if the team is available? Thanks." Svensen put Deming on HOLD and switched to another line.

"I have Deming on the line," he told Per Hoglund, the team leader. "When can you talk to him?"

"If he's free now, we can spend up to forty minutes before any of us has another commitment," Hoglund told Svensen. "Let's talk to him if he's free."

Svensen switched back to pick up Deming's line. "Dr. Deming, if we get disconnected, please call back to 804-555-1133. That's a direct line into the conference room where our quantum mechanics are gathering as we speak. If this is an inconvenient time for you, we can reschedule to a more convenient time."

"No," Deming assured him, laughing at the job title 'quantum mechanic', "this is just fine. I have at least a half-hour I can devote to this." Moments later he was speaking with a team of four Vereign researchers.

"We've been going over your paper, Dr. Deming," Per Hoglund told him, "and trying to understand what it says between the lines. Frankly, none of us feel up to it, and so we're looking for a mentor, someone who can bring our mathematical skills up far enough to appreciate what your work implies, as opposed to what it says. Would you be interested in a position that is part-researcher, part-teacher?"

"It's what I do now," Deming offered. "I teach one session and one seminar, both at Caltech. The remainder of my time is spent on topics that JPL throws at me."

"So, JPL originally set you to looking at the topic for your paper?"

"No," Deming admitted, "not exactly. I do have some free time — nights and weekends — and what I do with that is strictly my business. I developed the paper in my own time."

"Ah, I see," Hoglund replied. "I was surprised that JPL would let such a radical thesis loose on the streets. Now it's clear: JPL had little to do with it. I also see that there has been a fair bit of negative reaction to it, as well. Has JPL weighed in on its political aspects yet?"

"'Negative reaction,'" Deming repeated thoughtfully. "Yeah, I suppose you could call it that. And, yes, JPL has weighed in on the political aspects. They're worried that having a loose cannon could make their ship less attractive to new sailors. They've told me in no uncertain terms to zip my lip lest I interfere with their recruiting."

"Well, Dr. Deming, this is not 'the VASA'. Our ship has a very low profile, and loose cannons tend not to roll around and do damage here. My opinion is that you'd find this environment very conducive to research into unorthodox topics. I'm going to recommend to my Director that they make you an offer, and I hope it will be one you can't refuse."

"Me, too," Deming agreed.

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No one was really surprised when Henry Deming resigned his position with JPL. Everyone there sincerely wished him well even if they were at the same time secretly pleased that he was moving on.

His house he placed with a rental agent because Deming couldn't bear the thought of not returning to California eventually. He packed his car full of all the things he thought he would need for his new job and started the long drive to Richmond, Virginia, most of it on a single road, I-40. For the next five days, he would rise with the sun and drive eastward until the glare in his rear-view mirror

became annoying, then find food and lodging in the nearest town, resting until the dawn announced it was time to repeat the cycle.

When he exited I-64 onto I-295 for Glen Allen, he started his cell phone and dialed the number Hoglund had given him at Vereign Corporation.

"Good afternoon, doctor," Hoglund greeted him after a quick glance at his caller-ID. "Shall we hold lunch for you?"

"That would be much appreciated, Per," Henry agreed. "I think I'm only a few miles away at this point, so I should be there in no time at all."

"Good," Hoglund told him. "I'll send someone to meet you at the reception desk." Then he called the rest of the team.

"Deming's here," he told them. "Anybody ready for lunch?" A murmur of approval rippled through the group. "Let's all head down to the reception desk to welcome our new teacher."

Deming guided his car, still packed with household belongings, to a visitor's spot near the unassuming four-story building set back from Staples Mill Road and shut off the engine. As he entered the building, Hoglund approached him.

"Dr. Deming?" he inquired. Deming smiled and held out his hand. Hoglund signed him in and clipped the visitor badge to Deming's lapel, then the whole group moved off toward their cafeteria.

"One good thing I can say about four and a half days alone on the road," Deming said as they all sat down at the table for lunch. "It gives you some great opportunities to roll thoughts around in your head." Everyone at the table leaned in a little closer to hear what Deming might follow this with.

"If a photon is neither a wave nor a particle, what is it?" Deming asked rhetorically. "That's what I've been wondering for the last five days. Well, longer than that but it's only in the last five days that thoughts have started to congeal, to become more than just random electrons flitting hither and yon.

"In fact, it was that thought that triggered something, I think. Suppose for a moment that a photon is actually just a field."

"A field around what?" Maud Eriksson asked.

"No," Deming objected, "not around anything. Just 'a field'."

"A field has to have a center, a locus," Erik Johansson objected. "A field can't not be 'around something'. It must be around something. What?"

Deming smiled and shook his head playfully. "In an Einsteinian universe that may be true," he said and a look of dawning realization began to creep over their faces. "In a Klee-Pollard universe that may not be true. In fact, I'm slowly coming to believe that Klee-Pollard prefers fields without centers. It may even forbid fields to have centers.

"More than that, I think Klee-Pollard is actually more true than our traditional understanding. I'm starting to wonder if everything we see around us isn't just a collection of fields."

"What about mass?" Maud challenged him. "Is mass a field?" She folded her arms and sat back, satisfied that she had just delivered the *coup de grace* to Deming's theory.

"I don't know," Deming admitted, then added: "yet. Mass may be a manifestation of something else which is a field."

"Well, if mass is just a manifestation, what about matter?" Erik asked.

When he didn't answer, everyone turned to look at Deming.

After a moment, Deming realized they were all looking to him for an answer. "Me?" he asked. "I'm just a mathematician."

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They escorted Deming to his apartment not far from the Vereign building, helped him unload the car, ordered Thai food to be delivered to the office, and then they all trooped back to Vereign to continue the discussion that had occupied them throughout the afternoon as they worked.

By that time, Deming had more-or-less convinced them that 'matter' ought, at least, be considered an echo of something else, although none of them could imagine what, in that case, might constitute 'something else'.

"Suppose," he said while looking thoughtfully up at the ceiling of the conference room, "inertia is just a manifestation of field strength. To get something moving, you must overcome the resistance of other, nearby fields, probably by adding energy to the field that, if there's nothing else, simply goes directly into 'more field strength'. To slow it down or stop it, you must steal energy from the field. Failing that, the field just keeps trucking. Newton is validated as far as that goes. Einstein doesn't have a problem with that."

"What about the apparent increase in mass as speeds approach 'c'?" another asked.

"What about it?" Deming challenged.

"If you're constantly pouring more and more energy onto a field, that field should soon become the dominant entity in the neighborhood, pushing everything aside as it approaches 'c'. The speed of light shouldn't be a limit."

"Yes," Deming agreed, "but a collision between two fields is not an effect-less event. Maybe those fields are spilling energy when they collide. As speeds go up, the collisions happen much more often and there's more energy to be spilled. What happens when you pour energy into a field?"

"The field strengthens," one of them replied.

"Yes, exactly," Deming winked, "the field strengthens in exact proportion to the energy added. Except photons. Photons, regardless of their energy-state always travel at the same speed dependent only on the medium through which they're traveling." All the others nodded. "Why? The conventional wisdom is that (a) they're massless particles and thus inertia-less, and (b) they're waves: just a jiggling of the medium through which they're moving.

"What if photons and other massless particles are massless because the nature of the field that constitutes the particle is such that it is inertia-less? That is: they are massless because they're inertia-less, not inertia-less because they're massless."

"What's the difference?" the first demanded.

"The difference is in how you think about them," Deming explained. "We associate 'mass' with something physical, therefore real. We associate 'inertia'

with something metaphysical, therefore ethereal. What if it's the metaphysical that is real and the physical that is ethereal?"

"That's deep," Per Hoglund muttered.

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Larry Klee picked up the phone on the second ring. "Klee," he announced himself.

"Deming," Henry answered.

"More breakthroughs, Henry?" Klee asked playfully.

"Not 'breakthroughs', exactly," Deming responded, "but something interesting is happening. The team and I were wondering if you and Elaine would care to take a day off and spend it here in Virginia looking at mathematics?"

"Maybe," Larry agreed. "When?"

"Your convenience," Deming told him. "Sooner is better than later. The level of excitement here is delightfully high right now. I think you'd enjoy being part of it."

"So, there's a party going on down there, huh?"

"No noisemakers, no confetti, no funny hats, but I heard somebody say 'champagne'," Deming told him.

"Yum, champagne," Larry responded with a chuckle. "What's the celebration all about?"

"Not on the phone," Deming's tone turned somber. "Eyes only."

"I'll check with Elaine and let you know."

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Their escort led Larry Klee and Elaine Pollard through the double doors and into the large conference room the team had appropriated for their long-term use.

"Everybody, say 'hello' to Larry Klee and Elaine Pollard, inventors of the Klee-Pollard Inversion," Deming introduced the newcomers. There was a muttering of greetings around the table.

Maud Eriksson rose and moved to the speaker's position. The laser pointer in her hand came to life.

"Dr. Deming tells us you are already aware that photons are neither particles nor waves," she began, her remarks clearly addressed to their guests.

Elaine nodded. "Yes, we've been aware of that for a year and a half or so. Is that what this is all about?"

Maud smiled. "It is," she confirmed. "Like you, we've known for some time what photons aren't. Just this past week, we learned what photons are." Larry and Elaine sat up straighter in their chairs. "Photons are fields," Maud announced confidently.

"Around what?" Elaine Pollard asked.

Maud shook her head. "Around nothing," she asserted. "Photons are pure fields. There is no center. There is no anything associated with the field. The photon is the field, and the field is the photon. Allow me to show you how we

came to that conclusion." The bright green dot began orbiting a section of the conference room wall that had been replaced by a huge white board.

"We began by asking ourselves how photons differ from other particles — and I use the word 'particles' here merely as a convenience — and discovered this." Larry and Elaine stared at the writing on the board, appreciating its concise beauty.

"Well, all that says is what we've known all along: it's not a particle," Elaine scoffed.

"True," Maud agreed. "Then we inverted it." The green dot moved across to a different area and Larry and Elaine followed it with their eyes. "That says 'field'," she announced triumphantly.

"Maybe it does," Elaine retorted, "but an inverted form isn't a useful form. All it's good for is re-inverting back to the original — if there are no embedded unsupported assumptions."

"Not true," Deming interrupted. "The product of a K-P Inversion is as true as the original when a re-inversion is possible, as it is in this case. The inverted form says 'field'."

"What happens when you do this same process for non-photons?" Larry asked. "Protons, electrons, neutrons?"

Per Hoglund smiled and rose from his seat to answer on Maud's behalf. "All fields," he said, grinning.

Larry Klee smirked and shook his head. "You just told me we live in a totally ethereal universe. It's one thing to suggest that photons are immaterial, but this?" He rapped his knuckles on the table. "This is no field."

"As a matter of fact," Deming answered him, "it's a very large, complex array of fields and nothing but fields. Show them, Per."

In response, Per Hoglund produced what looked like a projector with a collimator as a front end, along with several other objects. He placed two ring-like devices on the conference room table and between them a metal plate standing upright, placing them all so their positions matched small strips of masking tape already stuck to the table top. At the far end, a piece of poster board served as a make-shift projection screen. He turned the projector on and a circle of light appeared on the metal plate.

Maud Eriksson flipped the switch on the farthest ring-like device, then did the same to the nearer one. When she did so, the center of the circle of light on the metal plate went dark, and appeared on the projection screen at the end of the table.

Elaine Pollard gasped.

"What are we seeing here?" Larry Klee asked. "Is this something more than a magic trick?"

"The first question we asked when we started thinking about the problem of massless not-exactly-particles was 'how is this field different from fields representing massive not-exactly-particles?'," Deming began his answer. "The answer lies in the way they interact with other fields. Initially, you saw a beam of light on the metal plate because light interacts with that plate by having its energy partially absorbed but mostly reflected. You're seeing that reflected

energy. Of course, you know that some beams are not reflected, but pass right through such metal plates.

"So, our second question was 'what about beams that aren't reflected?' and what we found was our first introduction to how strange things can be in a Klee-Pollard universe.

"Things that don't get reflected have a slightly asymmetrical field. We think this means those fields can change their shape as necessary — and this is really the wrong way to look at it, but it's as good an intro as we can manage — and because they have a flexible shape, they can slip between other fields without transferring energy. That is, they tend not to collide with other fields quite as regularly.

"You asked 'what are we seeing here?'," Deming wrapped up. "These rings produce rotating microwave fields. As the beam of light passes through, the fields of the photons in the beam are set spinning in sympathy with the rotating microwave fields, and we believe they become asymmetrical, at least with respect to their former shape. At that point, they slice through that metal plate as if it weren't there. On the other side, the second ring damps the spin and the beam becomes ordinary light again just before it impacts the projection screen."

"Would this work with something other than light?" Elaine asked.

"We believe it might," Maud Eriksson answered with a smile.

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"'Hoglund—," Elaine asked Per. "Is that Swedish?"

"Yes. We're all Swedes except for a few people you haven't yet met," Per explained.

"Vereign is a Swedish-owned company," he continued. "All the officers, directors, and senior managers are here on work visas—" he swept his hand around the table. "—just like all of us."

"—and the company does—?" Elaine prompted.

"Research," Hoglund answered.

6 — Faster

Carefully — oh, so carefully — Maud guided the pipe through the microwave rings.

As the pipe entered the precincts of the first ring, it began to emerge from the second ring four meters away.

A trolley had been fitted to the rod and a string-and-pulley arrangement allowed the trolley to be pulled back and forth along the rod. A small video camera hung from the trolley. With the camera running and the team watching the operation, Maud rotated a crank on one of the pulleys and pulled the trolley slowly along the rod through the two rings until it emerged on the other end.

Deming took the camera from the trolley, shut it off, and plugged a computer cable into a port on its bottom. The team gathered around the laptop to see what the video would reveal.

The video showed the first ring approaching the lens, and as the camera passed through the ring, the image was replaced by a picture of the area beyond the second ring.

"Hypotheses?" Per Hoglund asked the group.

There was a long pause. "No one will laugh," Hoglund assured them all. "Let your imaginations run wild."

"There is no space between the rings," Jan Erlander offered. "We think there's four meters between the rings, but that's only because our fields aren't spinning. For objects whose fields are spinning, those rings are coincident.

"Viewed another way, perhaps time flows much more quickly beyond that ring, or perhaps time doesn't exist at all. I think the latter is more plausible. I think our notions — and possibly our perception — of 'time' are meaningless in whatever environment we have generated with the rings."

Several of the others muttered what may have been agreement.

"I think we need to try another experiment," Erlander continued. "I'd like to know what happens if only the first ring is operating when the boom is inserted. What will happen to the boom?"

With only one ring active, Maud slowly slid the boom through the ring. As it passed the ring it disappeared as did the camera that hung from it. After a few seconds, Maud drew the boom and camera back out of the ring until it was clear. It appeared to be intact.

Hoglund connected the cable between the computer and the camera and began to play the video. The whole team gathered around the screen to watch. They saw the ring approaching, then four seconds of 'snow' before the image cleared and they could see what appeared to be stars. Several of them gasped. A few seconds later, the snow resumed until the laboratory reappeared on the screen. The video was 9.1 seconds longer than the video from the lab's camera that had been recording Maud's movements.

"I don't get it," Deming muttered. "How can one video be a different length than the other?"

"The difference in length seems to be accounted for almost completely by the visual static we saw," Maud suggested. "I think if we edit out the snow, the videos will be the same length."

"And which stars were we seeing when the image cleared?" Deming continued, ignoring Maud's hypothesis. "Clearly, there's some natural phenomenon that mimics the effect of the rings and that brought the camera back into 'reality'. What in the name of all that's holy..."

"I think we need to answer your second question first, doctor," Jan Erlander offered. "We need to *spec* those stars and see if they match anything we already know about.

The spectroscopic analysis Jan Erlander had suggested did, indeed, yield interesting results.

"This star," he pointed at a dim point of light, "appears to be Vega, except that its spectrum has been slightly shifted. It has all the right absorption lines save two that we might expect to go missing sometime in the next million years or so. If this image were from a spot, say, a million light years closer to Vega, that would account for such a discrepancy and, in fact, that's why I think it's Vega.

"This star," he indicated another, "seems to be Alpha Crucis, part of *Crux Australis*, the Southern Cross. This one," he continued, "could be Betelgeuse. To get those three stars in this orientation, one would have to be in the vicinity of the Andromeda Galaxy, and one would, because of that, be a million or two light years away from us. There are other stars whose spectra lend credence to this hypothesis.

"I don't know why we're seeing realspace images from Andromeda, but it strongly suggests there may be a realspace/hyperspace re-entry point somewhere nearby."

"Why Andromeda?" Deming asked no one in particular.

"I've been wondering the same thing," Heikki Larsen, their newly-hired astronomer chimed in. "I think the answer may be that on the day and at the time the experiment was run, the equipment was oriented — perhaps exactly and coincidentally — toward Andromeda. It might have been a pure accident."

"That's a very worrying speculation, Heikki," Deming answered. "It means, if true, that we stumbled accidentally on a... what shall we call it? A 'rotational sink', a place where the spin we imparted to our equipment got damped adequately to bring it back into realspace from spinspace. If it weren't that we had a physical connection — the boom — to our equipment, that equipment might have been trapped... how far did you say it was?"

"1.72 million light years, give or take..." Heikki answered.

"Yes," Deming continued, "and we might never have figured out what happened to our lost equipment. What's the likelihood we found — by pure chance — the one-and-only rotational sink that occurs naturally?"

“Ah, I see now why you might worry,” Heikki nodded. “We may have to catalog every vector to see if the phenomenon is replicated elsewhere, which, as you pointed out, it almost certainly has to be. I'll get started putting the experiment together.”

“Does that mean we can't use any vector without probing it first to see if it's safe?” Jan Erlander asked.

Everybody paused their thoughts to concentrate on what they all recognized as an important question.

“I mean, one of these days we're going to want to launch a ship in some direction, get all its fields spinning in sync, and damp the spin after a suitable interval, right?” The whole group nodded in unison. “What happens if our spinship simply jumps to parts unknown the instant they spin up because the helmsman picked the wrong departure vector? Will they be able to return? How? How will they know which vector will return them to the place they started from? That crew has to be prepared for the possibility that they will never find their way home, that they will die of old age, dehydration, starvation, suffocation, or something equally awful, just because there's no way to know for sure where 'home' is.”

“There are only a few plausible answers to that problem,” Maud began thoughtfully. “One, there is one re-entry point and it doesn't matter which direction we point the equipment; we'll re-enter at 'point A' — the vicinity of the Andromeda galaxy — regardless.

“Two, there are multiple such points and aiming near one of them causes re-entry at some defined 'point B'. That seems to me to be the most likely scenario.

“Three, there are an infinite number of such points, and any vector we choose will result in re-entry at some seemingly-random 'point Z'. If that's true, then Dr. Deming's speculation that we found the Andromeda galaxy by pure chance would have been true, but we did that twice identically, so this seems extraordinarily unlikely, verging on 'impossible'.

“So, we should be able to disprove the first alternative relatively quickly if, indeed, it's untrue. If we can disprove it, a few more trials should give us a reasonable handle on how many additional point-Bs exist, if any.

“Heikki, when can we start?”

“Give me a week or so to sketch out the outlines of the experiment and let's plan on starting our survey... the middle of next week?”

“Let's plan on Thursday morning to start,” Per Hoglund agreed. “Everybody, please make yourself available in case Heikki needs help.”

The meeting broke up.

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“So, Heikki, where's Andromeda right now?” Deming asked as the equipment was being set up.

Heikki peered at the laptop screen before him and pointed at the floor. “Roughly, straight down below us.”

“So,” Deming pressed on, “if we get the same result as last Tuesday,

Maud's 'option 1' is proved: we always wind up near Andromeda." Heikki nodded. "If we get a different result, what are you predicting?"

"The equipment is pointing toward Ursa Major. If my calculations are correct, in about seven minutes that boom will be pointing between *Dubhe* and *Merak.* If we find a return point, I predict it will show us the sky in that direction. Shall we wait?" Everyone seemed to shrug their shoulders. Seven minutes ticked by.

"Okay, push it," Heikki commanded. Maud cranked the boom and camera forward through the first ring, the only one operating, and it disappeared. She waited fifteen seconds and cranked it back out, then shut it off and plugged in Heikki's connector cable.

Heikki started the video playback as everyone huddled around his computer. All anyone saw was snow, and there was almost 47 minutes of it.

"Ideas?" Deming prompted.

"Our camera was on a 47-minute trip to somewhere, didn't encounter a return point, and possibly wouldn't have if we left it there longer," Per offered. "Maud's 'option 1' is disproved, along with 'option 3': there are <u>not</u> an infinite number of return points."

"Agreed," Maud finished.

"We need to reorient toward Andromeda, and probe on several nearby vectors to discover how wide such a 'window' is. Once we know the approximate size of the tunnel — for lack of a better word — we can start a more methodical survey of the entire sky." Heikki nodded.

It took all of the following week before Heikki Larsen felt comfortable announcing that the Andromeda 'tunnel' was between 2.3 and 2.5 degrees wide, and did not encompass the vector aimed directly at the nebula. Another eighteen weeks of probing along various vectors revealed eleven more "return points" that would manifest within fifteen seconds exposure to hyperspace. It had been an extremely fortuitous event, a lucky and almost unbelievable accident, finding the original phenomenon. Without that accident, some probe someday in the future might simply have disappeared with no explanation, its crew lost forever.

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While the main mission of Vereign Corporation slowly morphed over the course of the next eight years into "satellite communication and vehicle design", there remained a largely-unsung group of old-line employees whose work never really generated much in the way of publicity.

When Vereign's turn finally came to be lifted into orbit, their package included more than just a satellite for orbital insertion. There was also a small rocket engine and several hundred pounds of exotic fuel as if the package were to be capable of altering its own orbital characteristics.

"That's correct," Hoglund explained to the review board during its review of the Vereign proposal. "With all the debris currently in orbit, we think it's prudent to be able to adjust the orbit to avoid collisions and, naturally, when the satellite's life is over, we will want to de-orbit the package in a recoverable

fashion. This should all have been covered in our proposal."

In the end, the package was approved and on launch day, Per, Maud, Jan, Henry, Heikki, and both Eriks watched the lift-off via a special link on the big TV in the conference room before monitoring the signals coming back from 'the device'.

With the communications satellite safely installed in its orbit, the device reoriented itself toward Epsilon Indi, a 'safe' vector as far as anyone knew, and the rocket engine fired briefly, just enough to give the device about 1/20th of a G in the desired direction, as the rings surrounding the capsule came alive for 1/1000th of a second. The image from the device's camera instantly turned to 'snow'.

Then the team settled down to wait for the snow to clear.

Aboard the device, the rings immediately reversed the spin after the timer had allowed one millisecond to pass, and the rocket engine shut off.

Two minutes crept by before the snow on the monitor gave way to a recognizable image.

Heikki leaned in closer to his instruments. A smile spread across his face. "That," he chortled, "is Epsilon Indi. Wherever this image is coming from — and I suspect it's two light minutes further away — the device is still oriented properly. I'm going to 'ping' it."

A signal was sent to the device commanding it to confirm receipt of the signal, just a simple acknowledgement that the signal had arrived. The time between sending the command and receiving the acknowledgement would confirm the distance to the device.

Three minutes and 56 seconds later, the return signal arrived at Vereign Corporation in Virginia. The device had leapt nearly two light-minutes in the twinkling of an eye.

"Again?" Heikki asked.

The team looked from one to another as if silently deciding. "5/1000ths?" Deming suggested. The team nodded almost in unison.

Heikki reprogrammed the rings and sent the command. "Two minutes for the signal to get there... jump 5... add another ten light-minutes, maybe... twelve minutes for the signal to get back... Unless something goes very wrong, we'll have a picture before any of us can get down to the cafeteria to get coffee. I'm going to wait."

Heikki and Maud chatted about this and that while they watched the stopwatch display on the monitor showing the time elapsed since the last command. At 3 minutes 56 seconds, the image display had turned to snow, probably because the device had jumped to hyperspace 1:58 earlier. As the stopwatch closed on 13m36s, Maud's eyes were riveted on the image display.

36... 37... 38... 39... The snow continued unabated.

"What can have gone wrong?" Heikki asked with a note of desperation.

53... 54... 55... 56...

The image suddenly cleared showing a distinct star within the viewfinder's central aiming spot. Heikki looked closely still holding his breath...

“It's Epsilon Indi,” he announced to the nearly empty room, “but 12 light-minutes closer, I suspect, than we are.”

A few minutes later, the rest of the team arrived and gathered around the monitor.

“It looks like a success to me,” Deming chortled. “11.6 light-minutes away, I'm guessing?”

“No, actually,” Heikki began his reply. “There seems to be about a 2-second lag as the fields spin up and spin down, maybe one second up and one second down, but that's a guess. What that means is: one one-thousandth of a second gets you two light minutes minus two light-seconds. Five one-thousandths of a second gets you ten light-minutes minus two light-seconds. Each jump costs two light-seconds, more-or-less.

“I think.”

Deming thought silently for a while. “So, if we were to spin for 30 milliseconds, we would jump two light-seconds short of sixty light-minutes, one light-hour?”

“I think,” Heikki reiterated.

“Okay,” Deming continued, “can we bring it back?”

“We had damned well better be able to bring it back,” Jan Erlander remarked, “else it's going to be impossible to recruit our first crew.” There was a ripple of nervous laughter through the room.

“Okay, Heikki, swing it around and let's see how close we can get to our starting point.”

Heikki issued a few commands from his console but he had to wait almost a half-hour to see if they were obeyed. When he was finally convinced that the star just slightly off-center in the viewfinder was, in fact, Sol, he commanded a six millisecond jump.

“Twelve minutes for the command to reach the device, and it should be within about two light seconds of Earth, 370,000 miles give-or-take. I think I'll relax until then if no one objects...”

When the image again cleared, with a brilliant star dead ahead, Heikki began reorienting the camera to discover where the device was. A few hours of observation and plotting the device's motion gave the team confidence in their ability to navigate through hyperspace.

“Where to next?”

“We had always talked about sending a probe far out, having it take video, and then bringing it back. That's what I'm voting for,” Erik Johansson piped in. “If we do that, we have to have all the programming in place, ready to operate independently, because we won't be alive to watch it from here. Jump, video, reorient, jump back. It's a trip we can have the probe make in the course of minutes...” He pressed some keys on his calculator before resuming. “Four and a half minutes of spin-time is more than a light-year. That would put the device as far out as the Oort cloud. Would it be worth making a jump that far out, grabbing some video, and bringing it back? It would be four minutes out, four minutes back, twenty minutes or so of video time... It's a half-hour in total

of mission time if it's even possible."

"It would be a spectacular achievement if we can pull it off," Per agreed. "I'd vote to try it. Any objections?"

The team muttered their agreement, so Per turned to Heikki: "Will the device still be working when you get the programming pulled together?"

"Oh, yes, I have a good handle on its trajectory. It will be months before I'll need to adjust its course. I'll be ready to jump on Monday."

"Put it together and let's reconvene after the weekend."

Between reviews of the operational plan and necessary adjustments and corrections, it was Wednesday before the program could be uploaded to the device, then checked and double-checked and triple-checked for accuracy. When Maud and Per and Henry had all given their 'thumbs-up' to the final program, Heikki invited the team to the 'jump party', as he called it.

The program started and the video showed stars panning across the frame until one in particular appeared in the central aiming spot. The image paused briefly before turning to snow, an indication that the device had jumped.

"That's all for another forty-five minutes or so. Everyone can relax."

The device's camera panned slowly to examine what might be nearby. There was little in the way of 'material' within view, the vicinity of the device being largely deep vacuum, but there was one object discernible by its obvious movement, oddly-shaped as if two gigantic bowling balls had been glued together. The camera swiveled to track it against the backdrop of stars and caught another object as that rock's rotation brought a facet into alignment with the weak light of Sol such that its albedo became significant.

The camera continued panning and scanning for another fifty minutes until the onboard software detected the camera's battery starting to wane. The device reoriented itself toward Sol, stabilized its forward motion at 0.05G, and jumped.

Emerging into realspace from spinspace, the device took bearings on several objects it could identify, computed its position as 87,000 miles above Earth's south pole, and sent a signal to announce its safe return. It reoriented itself and burned fuel for 4 seconds to position itself for re-entry sometime in the next few days.

While it coasted toward its next de-orbit burn, it transmitted 51 minutes and a few seconds of video down to Vereign's antenna.

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The video claiming to be the first close-up from within the Oort cloud drew its fair share of skepticism.

"I can *CGI* a replica of that in a few days," one critic blared. "What proof is there that this video isn't exactly that?" But most of the reviews on YouTube held the position that if it were a fake, it was an excellent fake, and most people wanted more.

NASA demanded a little more in the way of explanation before they would give Vereign a preference for another lift into orbit, and Vereign offered to take whatever package, software and hardware, NASA wanted to go along on the next ride. Erik Johansson wrote the spec document identifying the semaphores Vereign's second craft, *Knarr,* would issue to indicate various conditions: jump, arrival, and a few others; to the NASA equipment so their equipment could know when to perform its preassigned tasks.

"We jumped into the middle of the Oort cloud last time," Heikki Larsen addressed the NASA board of inquiry, "We're certainly willing to go there again unless you have a destination you'd prefer."

"How much lead-time do you need before launch?" one particularly skeptical member asked.

"I don't need much," Heikki offered. "It's a matter of calculating the jump duration and deciding on the departure vector. I'd say if you gave us twelve hours, that would be plenty. You should know that there are several destinations that are on our 'Do Not Fly' list because jumps on those vectors seem to go to never-neverland. That is, whatever you send isn't coming back."

"Do you know why?" another probed.

"We suspect but do not know with certainty," Heikki admitted. "Vereign does not share that suspicion as a matter of policy, and I, personally, have no further information on that topic or that policy."

There was a pause, then... "And if NASA were to demand Vereign share that information as part of the fee for passage?"

Heikki smiled. "Then Vereign would find another vendor with sufficient capability. We're not sending twenty tons into orbit; we're sending eighteen hundred pounds and most of it is fuel. We could probably do it ourselves if we were willing to pay the inevitable fines. This is not exactly 'rocket science' anymore. It's becoming much more prosaic, and you no longer have the monopoly you once enjoyed."

In the end, NASA agreed to do the heavy lifting in exchange for Vereign mounting several NASA-owned cameras and related devices on their framework, and Vereign gleefully agreed. *Knarr*'s payload had by now grown to nearly 3,000 pounds, still mostly fuel. NASA was quite open about their purpose: they wanted to see on their own equipment that what Vereign's equipment reported was true. That Vereign was so willing to let NASA see for itself spoke loudly to their probable honesty.

Deming had used his *cachet* with *JPL* to get them to sign on as vehicle designers, so *Knarr* was beginning to look like something professionals might put together — because now it was.

Three days ahead of launch, NASA announced its desired destination: Epsilon Eridani, 10.5 light-years distant. Heikki set to work computing vectors and jump time, finally settling on 46 minutes and 1 second.

"It's long been suspected of having exoplanets," Heikki briefed the team, "and if it does, one of them may look something like *Tatooine*: rocky and with two

suns to light it up." He ran several simulations on the lab's computer, then loaded the parameters into the vehicle's memory.

Launch went flawlessly as everyone expected, such events being now well understood to the point that they had become very *ho-hum* affairs. Once in a stable orbit, *Knarr* pointed itself at εEridani, set its internal timer for 2,761 seconds, and jumped.

The professionally-designed vehicle now sported solar panels that it could unfurl to supply the craft with electrical power for its many experiments. *Knarr* was programmed to go home whenever the battery state reached a certain critical level or eight weeks, whichever came first. Since it was likely that nothing would be heard from *Knarr* for quite some time, everyone except a skeleton crew busied themselves about other tasks.

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To say that NASA was pleased with the data *Knarr* brought back would be an understatement. They were rendered speechless with joy, and they immediately convened a team to plan a manned mission to a destination they declined to share with any others.

Among the early subcommittees was the vehicle design committee. When humans finally ventured out to the stars, it wouldn't be 'jump for two hours, look around, and head back home'. It was going to be *'jump to someplace new and exotic, survey it thoroughly, send back periodic reports, establish a beachhead, and not come back for <u>years</u>'*.

One of their choices was easy: naming the ship. Everyone agreed it would be called *'Elaine Pollard'*, but they kept that information quiet as well.

7 — Finesse

"Ready to jump?" the pilot queried. The other nine all gave 'thumbs up'.

"Orient to Epsilon Indi and set timer for one millisecond... Checkpoint all axes... Start."

The ship slowly turned toward Epsilon Indi before stabilizing its motion. For a long time, it hung motionless while the crew double-checked that the navigation computer had done its task correctly. The engines started pushing with a 0.03G thrust, barely enough to register on human senses.

"Jump."

The bands surrounding the ship chirped as they first set all the fields that made up the ship spinning in one direction, and then a millisecond later damped their spinning.

To the crew of four who had volunteered to sacrifice their lives for the chance at eternal glory, it all happened so fast none could say they even were able to identify the moment itself. There wasn't even much change in the views from the portholes except that the Earth and Moon and Sun seemed to have disappeared.

"Checkpoint," the pilot ordered. Crew members peered into their optics trying to locate something familiar.

"That might be Sol," one suggested, pointing toward the closest star. "It has the right spectrum and it's in the right place, dead astern."

"How far?" the pilot asked.

The crewman — woman, actually — performed a quick 'back of the napkin' calculation and offered: "10.3 light minutes, more or less."

"We started out 8.3 light minutes from Sol and now we're 2 light minutes — 120 light seconds — further away in one millisecond. We just traveled at 120,000 times the speed of light. Tighten up those numbers so we have a very good handle on our current position. We don't want to overshoot on the way back.

"Broadcast our position... just in case we do."

Two minutes later, the signal, crammed with diagnostic data, arrived at launch control to the delight of everyone present. Over the next several hours, fresh bearings on various stars enabled the staff astronomers to very precisely identify the location of the ship, and to recommend a course for their return trip.

Understanding that if the ship actually did what everyone expected it to do, the return trip could leave the explorers quite far from their origin, the ship had been designed to hold quite a lot of fuel and quite a lot of food against the possibility they would have to travel for a very long time at less-than-light-speed to get back to Earth.

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A light-second, 186,282 miles, is a long distance by any measure, and with Vereign's original equipment that introduced a one-second delay at jump-start and another at jump-end, it was possible for any jump to be short by twice that, and all of them were. A returning patrol could find itself 370,000 miles from its intended destination, having to fall for as much as a week toward its home planet.

"We have to find a way to avoid that," Deming fumed. "We can't send living persons on a trip whose destination is described as 'give or take 370,000 miles'. I know we can't hit a target exactly, but this level of precision is not just embarrassing, it's hazardous."

"It's the best we can do given the state of our art," Maud offered apologetically.

"I understand that," Deming replied. "Our art has to operate at a higher state. That's mandatory. How do we make it happen?"

The others looked from one to another as if trying to read thoughts from their facial expressions. "I don't know how we're going to get significantly better than we already are," Erik Svensen said somewhat somberly, "and we've all agreed that the details of the technique won't be shared outside the current group, and I'm including Klee and Pollard parenthetically here as well. What might we do to get suddenly and significantly better?"

"I hate to say it," Deming muttered, "but we may <u>have</u> to go outside the group to get the right kind of expertise. Who might we have to have approve something like that?"

"That's certainly 'board of directors' territory," Maud muttered back at Deming.

"I'm an outsider," Deming explained. "One or more of <u>you</u> is going to have to make that happen."

"Well..." Maud began, then paused in her reply, "actually... we <u>are</u> the board of directors..." Deming had a stunned look on his face. "Vereign is a self-funded research operation. Per is the 'major stockholder', but all of us are in this, financially, up to our necks."

"How..." Deming began and paused, not knowing exactly how to phrase the question.

"We're all quite wealthy," Per began his explanation. "Not in our own right, of course. We're indebted to our parents or, in my case, grandparents for leaving us all in such a condition that we have significant income to invest in an enterprise like Vereign. We are also all scientifically educated in physics, chemistry, mathematics, or similar fields, and it was that commonality that first drew us together, that and the publication of a paper by a scholar on sabbatical leave that hinted the General Theory of Relativity might be fatally flawed. We," he indicated the group sitting at the table, "saw that as something worth pursuing. If you look at the history of the Vereign Corporation, you will note that it began leasing this building a mere three days after your speculations were published in the Journal of Physics and Chemistry. You, Dr. Deming, are the reason Vereign has a branch office in the New World. If you're telling us that we have run to the end of our expertise, I, for one, am ready to accept your

judgement that we must find more brainpower to make our investments start paying us back. The key question now is: where?"

"We really need another physicist, I think," Deming mused, "but we may not want to throw our lot in with an organization as big as JPL.

"On the other hand, we might be able to poach some talent from them... Let me make a few calls."

Jerry Mingus' phone rang and he grabbed the handset. "Mingus."

"Hello, Jerry, it's Hank Deming. How's everything?"

"I should be asking you that question," Jerry responded. "Is the new job working out okay?"

"The new job is providing some intriguing problems for me to work on, Jerry, including a few that far exceed my ability or are outside my expertise. That's why I'm calling you. We, my employers and I, are seeking to bring aboard someone with a better grip on physics than any of us can manage. I know you wouldn't be interested in leaving JPL, but you might know someone who would be a candidate."

"Maybe. Before we go there, I'm dying to find where you finally landed. Tell me how it's been going since you left."

"I went direct from JPL to a research lab in Virginia run by Vereign Corporation," Deming began.

"Vereign? Never heard of them," Jerry interrupted.

"Vereign's pretty low-profile," Deming explained, "but they're way out there on the bleeding edge of some new technology..."

"Like... what?" Jerry probed.

"Have you heard anything new from NASA?" Deming asked.

"I've heard rumors that they're looking much more seriously than ever before at FTL," Jerry offered.

"Much more seriously than ever before," Deming repeated, "in fact NASA and Vereign just jumped a ship and crew FTL about a week ago."

"You're not serious..."

"Dead serious," Deming assured him. "When we brought them back from two light-minutes out, they missed their return mark by 410,000 miles. 410,000 miles for two light minutes is a 2% error, and that's a problem we really, really need to solve: how to jump a little more accurately than that. We're looking for someone who can look at the technology and suggest a way to tighten up our — for want of a better word — navigation."

"Why not just 'jump again' to get closer. Is a jump that expensive?"

"It's more complicated than that, Jerry, and that's why we think we need to acquire some serious multi-disciplinary talent. So, do you know anyone who might be worth a telephone call?"

"I'll ask around and pass your number along."

"And, of course, if you want to use it yourself, Jerry..."

Jerry laughed and hung up.

It was another three days before Deming began receiving calls from

interested candidates.

"Jerry Mingus hinted that the rumors about NASA might be true."

"Which rumors are you talking about?" Deming parried.

"There are whispers that NASA has figured out how to go faster than light. Is that what this is about?"

"I can assure you that NASA has not figured out how to go faster than light... but would you be interested in working on something like that?"

"That's why I called," the other replied. "If someone's trying to break the light barrier, I'm definitely interested in being on that team."

"Then you don't think Einstein was correct when he said it's impossible?" Deming probed.

"I think the nature of science is that we're always looking for the next answer. Einstein was good enough for his time, but there's always more knowledge out there just beyond the horizon. I'm an explorer by nature."

"Send me your resume." Deming gave her his email address and the call ended.

In the end, Vereign took on two more headcount, both recently-minted MS's from well-respected universities, and got their signatures on armor-plated non-disclosure agreements. Maud Eriksson and Erik Johansson teamed up with Henry Deming to give the two newcomers, Gail Farley and Darlene McSimmons, their first real introduction to 'Klee-Pollard space'.

As the three-week seminar drew to a close, Deming wrapped it up for them:

"So that's our one remaining critical problem: how to navigate with enough precision that we're not forced to travel for weeks or months at Newtonian velocities because we can't drop out of K-P space near enough to our desired destination. That's your job. You are now more-or-less-officially 'our fresh pair of eyes'. We need you to deliver the ideas none of us can imagine because we're all too bound up with our assumptions.

"Welcome to Vereign's Interstellar Exploration Unit."

Gail and Darlene often joined the quantum mechanics when lunch time rolled around, but there were also plenty of occasions when the two just sat together in a corner of the cafeteria Vereign shared with the three other companies that occupied the building and batted ideas back and forth. They were always careful to keep their voices low against the possibility someone might be eaves-dropping.

"It's that one-second spin-up/spin-down that's killing us," Darlene mused, and Gail nodded in affirmation.

"Yup," she agreed, "if we can get past that, we can adjust the jump time in microseconds or nanoseconds and put the craft, for all practical purposes, on a bull's-eye. That's what I see our job as: eliminating spin-up and spin-down. I think we should stop worrying about peripheral problems and concentrate on that one to the exclusion of everything else."

"I wonder if the frequency the rings induce has any bearing on this?" Darlene wondered aloud.

The room the two newcomers shared had a window, but the other three walls were scribble boards from the floor to the ceiling. They were covered in diagrams and mathematical formulae so thickly that it was becoming difficult to find a clean space to write anything new.

"I doubt it," Gail muttered, wandering over to a well-scribbled section. "See this?" she indicate a series of related lines. "It almost demands that wavelength — which is equivalent to frequency — is irrelevant."

Darlene pursed her lips. "Hmm. Could the math be wrong?"

Gail glared at her. "No. I checked it twice. It's good."

"Even so," Darlene pressed, "I'd like to test it experimentally."

"Why?" Gail demanded.

"In theory, there's no difference between theory and practice," Darlene lectured, "but in practice, there is."

"How? Our next scheduled lift is almost a year away."

"I don't need a heavy lift for a simple test like this," Darlene explained. "I can do it with a drone. I'll reconfigure the spinners from 22cm to 30- or 40cm, program the equipment to do a one-millisecond jump, and send back a signal. The time it takes for the signal to get here tells us whether or not frequency makes any difference."

As Gail had predicted, it didn't make any difference.

"Why is there a one-second lag?" Darlene asked the walls.

The walls didn't answer, but Gail heard the question, too. "You know, that's an interesting question, but I think there's a more interesting question we're not asking." Darlene turned toward Gail. "Where is there a one-second lag?" Gail finally asked the question. "If the equipment lags at turn-on and turn-off, we would get the full millisecond worth of travel in K-P space, but that's not happening. The 'lag' is happening after the equipment turns on." Darlene's eyes lit up. "The lag," Gail finished, "happens in spinspace. Now you can ask your question."

Obligingly, Darlene responded "Why is there a one-second lag... in spinspace?"

"That's the right question," Gail nodded. "Why is it happening after the transition to K-P space? We've been looking at this all wrong. No wonder we haven't been able to find anything."

Darlene looked at her partner glumly. "The fact that we have no idea what K-P space is like is going to make that a rather difficult question to answer," she told Gail.

The drone Darlene had used for her first experiment was disposable. It was never meant to return to Earth. Decades from now, it would be pulled into the orbit of Venus or it would plunge into the Sun and be immolated. It had cost a few thousand dollars, no more, and Darlene now prepared another just like it.

The first drone had simply pinged its home base on arrival. The delay in

receiving the signal represented the jump distance in light-seconds. Her second drone would send back telemetry of the instruments before, during, and after the jump. She expected it would be a short message.

It was, but it was chock full of odd information.

Gail and Darlene examined the readings with their jaws slack.

"Wow," Gail muttered finally, "*that* was a surprise..."

"The entire lag happens when the spin reverses," Darlene mumbled. "1.9787 seconds... divided by 120,000. That may be the answer we're looking for."

Gail looked at her questioningly.

"The spin of all the ship's fields is being torqued in one direction, and after one millisecond, it reverses the spin."

"I don't..." Gail began.

"The lag is the lag necessary to stop the spinning and reverse it. As long as we architect it this way, there's no way to avoid that lag."

"So you're saying we're stuck with it?" Gail asked.

Darlene paused, thinking. "Maybe not. I said 'as long as we architect it this way, there's no way to avoid it'. We don't see the same thing when the process starts or stops. Why not? We don't see the same effect at process-stop because we're just turning the power off. We don't see the same effect at process-start because we're just turning the power on. We only see this effect when we reverse the spin from forward to back."

"I'm still not seeing what you're driving at," Gail told her. "We have to reverse the spin to bring the vehicle back into Newtonian space from Klee-Pollard space. If you don't..."

"Nope," Darlene stopped her, "you missed it. Our procedure so far has been 'spin in direction-A until it's time to reverse the spin, then reverse'. It's the reversing that's causing the lag." Gail crinkled her mouth. "What we have to do is 'spin for a millisecond to establish field-asymmetry then cut power'. When it's time to come back, spin in direction-B to reestablish field symmetries then cut power. It's like putting your car in reverse while you're moving forward: you can blow up your transmission if you do that, but if you come to a stop first, everything works as designed."

Gail shrugged. "It's worth a try," she said.

The two started preparing their third throw-away vehicle.

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"As you all know from our interim report, the cause of that 2-second lag seems to be the act of reversing the already-active spinner. The lag is actually 1.9787 seconds, but we call it '2' for convenience. We have found that a millisecond of spin is adequate to put a vehicle into K-P space. It's possible a shorter spin may be adequate, but we haven't investigated that.

"Regardless, spin the fields for a millisecond, shut the spinner off, coast for however far you want to travel, reverse spin for a millisecond, and you're back in Newton-space having traveled at approximately 120,000 times the speed of light for however long you coasted. It looks like you get a millisecond-or-so as a

bare minimum. Whether that's the shortest possible jump or not, we haven't yet figured out, but you won't be plagued by that jump-lag for jumps longer than that, certainly."

The team applauded the end of the report by Darlene McSimmons and Gail Farley, and Deming turned to look at Heikki Larsen.

Heikki smiled. "It's a 'SMOP'," he said in response to Deming's unspoken question, "a simple matter of programming."

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Heikki's 'program' was a simple one: a throw-away drone was ordered to spin for 500 microseconds and jump, then to check if it had actually moved. If it had moved, the next instruction was to reorient toward Earth and jump back. The timer would then be shaved by half of the last-used time, and the test would be repeated. If it hadn't moved, the timer would be increased by half the last-used time, and the test would be repeated. When the last-used interval became less than 10 microseconds, the test cycle halted.

All these subroutines had already been written and tested and it was a SMOP to lash them together in the proper order. A few dozen jumps quickly enabled the team to confidently assert that 334.2 microseconds was the approximate minimum spin interval.

As long as the field spinners were powered-down rather than 'shifted into reverse', the 2-second lag disappeared. It also appeared there was no 'minimum coasting distance', so jumps in the nanosecond range, approximately 23 miles, were — theoretically — possible.

8 — Long Jump One

The spinship '*Elaine Pollard*' with its crew of 17, rotated in space until it was pointed almost directly at εEridani, then stabilized its orientation. Its main engine gave it a soft 0.03G acceleration just before it jumped into spinspace. Forty minutes later, the ship popped back into realspace still somewhat distant from its target. The crew set about inventorying the nearby celestial objects to make sure they weren't in danger of colliding with anything.

Another seven-minute jump put them cleanly inside the εEridani system. Again, they checked for imminent collision danger.

Satisfied of their general safety, they dispatched a message drone back to Sol to report their safe arrival. The device jumped into the Sol system, broadcast a preliminary message, got a rough bearing on Earth, jumped again for a few hundred microseconds to put it closer to the planet, and finally transmitted its stored information back to NASA and Vereign Labs

"It's a guess at this point," the chief navigator told the captain and XO, "but we seem to be about 7 AU from the plane of rotation, 650 million miles or so below the star's south pole. I don't think we could have been better positioned if we had tried. There's some local debris, but we're not going to have a collision except by the most improbable of accidents. We're already searching for planets in the plane of rotation. There's nothing left for us to do except keep watch and track things that move."

The crew aboard *Elaine Pollard* spent 20 days exercising their four telescopes round-the-clock to locate and examine the six major planets of εEridani: two gas giants and four rocky planets, only one of which was in 'the Goldilocks Zone' where liquid water might be expected.

A message drone, one of seventy disposable vehicles carried for just such purposes, was sent on its way with the crew's observations so far and its plans for the next phase of the exploration. *Elaine Pollard* pointed its nose toward εEridani and jumped for 29 microseconds. One more short jump put it where its reaction engines could easily install it into a stable orbit around εEridani B that the crew had already named 'Tatooine' because it had two stars in its sky.

A planetary probe got much closer to the planet than the spinship dared venture, and did several hundred orbits close enough to photo-montage nearly all of the surface, roughly 40% land, 60% water. This Tatooine was much more lush than its arid fictional namesake, with substantial red, yellow and green foliage. Gravity was a puny 3% greater than Earth, there was a substantial planetary magnetic field, and a moon, large but not quite as large as Luna, tidally locked so that one face constantly faced its planet. This did not surprise the astronomers in the crew.

Most importantly, the atmosphere was oxygen-nitrogen, in different but

not worrisome ratios.

A second message probe was dispatched to Sol with an urgent request for a second mission equipped for planetary exploration.

"This sucks big-time!" Theresa Borden, a botanist by trade, almost shrieked. "We're staring at an alien planet that is almost implausibly Earth-like, and we have no way to get to the surface! All we can do is send a probe down to get images and telemetry. What friggin' asshole decided we absolutely wouldn't need or want to explore this place in the first person?"

"Terri," Captain Vasily Brokaw soothed, "nobody expected we were going to find anything like this on this trip. Our whole mission is just to observe and catalog. Exploring the interesting stuff we found was to be done by the next mission — if we actually found anything interesting. Even Christopher Columbus had to go back and outfit a second mission because Ferdinand and Isabella were not going to bet their whole bankroll on what everyone thought was a risky bet. Like Columbus, we just tripped over a miracle. Enjoy the miracle. You're famous. We all are."

"For Pete's sake, Vasily, we wouldn't even need pressure suits except for the transit. Have you seen the numbers? 22.4% oxygen, 76% nitrogen..."

"...and microbes no one has ever imagined," Dan Minter, the team's microbiologist, interjected. "You might be dead before you realized you were sick. Terri, you're the only one on the team crazy enough to breathe alien air without analyzing it first."

Terri snorted, then smiled. "But that's why we have you aboard, Dan. You protect us from ourselves."

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The atmospheric probe had been fitted with several kinds of Petri dishes that were exposed to unfiltered air at the perigee of the probe's path, and the compartment sealed before returning to the ship. A robot removed the dishes from the probe and placed them in isolation for later examination under extreme magnification. Dan Minter was disappointed but not surprised to detect right-handed DNA in every sample. Life on Tatooine was on the same genetic path as life on Earth.

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Vasily Brokaw spoke to whomever would be watching this video when it got back to Earth:

> To get right to the executive summary, Long Jump One has hit the jackpot. Epsilon Eridani B, as you know from earlier status messages, is solidly in the Goldilocks Zone where liquid surface water is possible. It gets better: the planetary surface is roughly 40-60 land and water, and the atmosphere is 22.4% oxygen and 76% nitrogen. Surface acceleration due to gravity is estimated at 10.1 meters per second per second. The planet seems to have a

> molten iron core that gives it a magnetic field and protects it from high-energy particles emanating from the stars. There's a substantial moon that produces tides. Planetary day seems to be about 26 hours and 11 minutes. If it were any more Earth-like, it would be in an episode of the Twilight Zone.
>
> Unfortunately, and again as you already know, we do not have the ability to put a manned vehicle on the surface and recover it. That turns out to be a good thing. Dan Minter has isolated over a dozen microbes taken in a low-altitude sampling pass that he believes are identical or closely related to several known terrestrial pathogens. A separate report by Dan is attached. Although the surface conditions would enable us to operate without pressure suits or re-breathers, these germs, unless we're vaccinated against them, will likely kill us all in short order.
>
> As you prepare Long Jump Two to chase after us, you'll need to take these alarming surface conditions into account.

A separate report described the 16 Eridanian microbes Dan found most alarming with microscopic images as illustrations. When the message drone was sent on its way, it also carried 16 vials containing samples.

Long Jump Two went into a six-month 'hold' while teams of researchers developed equipment LJ2 would need to deal with Eridanian lifeforms, and engineers revamped the actual vehicle to accommodate the new equipment. Hardware and software for a rudimentary gene sequencer forced the vessel to grow from its already-quite-large size and this, in turn, forced a change to a more robust launch vehicle. While all this was happening on Earth, LJ1 was exercising its telescopes and providing frequent — and sometimes daily — updates.

"My eyes must be getting tired," Sheila McCarthy announced as she pushed herself away from the photo-recon table. "Somebody else needs to look at this to make sure I'm not hallucinating."

Vasily Brokaw kicked off from his exercise equipment and floated toward her. "What do you think you're seeing?"

"I'd rather not say," Sheila demurred. "You look and tell me what you see."

Vasily pulled himself closer to the monitor and began adjusting the controls. "Where?"

"Right there," Sheila pointed at the screen.

Vasily enlarged the image until it started to break up from pixelization, then squeezed it back down. "Is this the only picture we have of this spot?" Sheila nodded.

The image was not quite clear enough to guarantee that what it *seemed* to show was what it *actually* showed, but it *looked like* a campfire, and it was surrounded by five irregularly-spaced dots that — if it <u>were</u> a campfire — might be warming themselves.

"Dan," Vasily called to their biologist, "take a look at this for us, please?"

Dan Minter sealed off what he was currently working on and floated over to the photo-mapping section. Vasily pointed, and Dan focused his attention on the image on the monitor.

"No way!" he exclaimed after a few moments of close examination. "Are those 'inhabitants'?"

"That's what it looked like to me," Sheila admitted.

"Let's schedule another pass to that vicinity and get another set of images to make sure it's not simply an optical illusion. How close to the surface was this image taken?"

Sheila checked the image's metadata and reported "32,600 meters, a shade over 20 miles."

"I'll want images from much lower," Vasily mused. "Can we get the probe closer?"

"Maybe 30,000 meters, but we're running a risk that we may not be able to retrieve the probe at all. Of course, we can have the probe transmit the images back and then it doesn't matter if we lose the probe. Captain's call..."

Vasily rubbed his chin, obviously deep in thought. "No, not yet. Do another pass at 30,000 and if it gives us more hints of population, then we'll trade a probe for a very close look."

Sheila got to work planning another low-altitude mission.

The images returned from 30,000 meters were not on the same orbital path as the first image, but it deliberately covered the spot that caused Sheila's initial consternation. Re-examining the image of that same spot taken several days later revealed no dots around a campfire, but a smudge that could have been an old campfire still remained. In addition, a second interesting image an estimated 90 to 100 kilometers from the supposed campfire looked invitingly like a hunting party surrounding a large animal, possibly elephant-sized.

"Well?" Sheila demanded.

"Okay," Vasily agreed after a suspiciously long pause. "The probe can go as low as you want, but you have to save enough fuel to bring it out far enough that its subsequent re-entry will incinerate the vehicle completely. I don't want to be responsible for introducing Earth microbes or technology to whatever form 'Eridanian life' takes."

Sheila crinkled her mouth. "Any re-entry into their atmosphere, including the initial descent, will sterilize the vehicle of all living things. I wouldn't worry about that. How about if I crash the vehicle into deep ocean when it runs out of fuel? The technology will be buried under miles of ocean and out of reach of a primitive civilization — which is what it appears we are seeing on the surface. That would allow the probe to go much lower given that it wouldn't need enough fuel to bring it back for a final suicide dive."

Vasily paused again for a long time. "Maybe," he agreed finally. "I'll think about it."

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As Sheila had predicted, the probe's initial plunge into Tatooine's slightly

denser atmosphere heated the vehicle to near-incandescence, burning away the ablative material that protected its radios, antennae, telescopes, and cameras along with any Terran microbes that might still have existed. The probe's extra-long wings, deployed during the late stages of the descent, allowed it to glide like an albatross using minimal fuel while its telescopic cameras scanned the surface 12,000 meters below.

Vasily's XO, Richard Sternhagen, and the crew's chief pilot, Lt. Colonel Karl Langeweiss, took turns operating the probe and they did so well that they managed to stretch the vehicle's small fuel supply into a 9-day mission that circumnavigated the planet multiple times before they finally admitted defeat and crashed the glider into what they felt sure was deep oceanic water. As a result, *Pollard*'s memory arrays now contained a treasure trove of video and still images of the surface, as well as 'tastings' of the atmosphere from a cluster of specialized sensors. The crew was already hard at work reviewing the massive data store, and filing report after report on their findings.

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Topological findings — part 1 — McCarthy, S.

Tatooine's land surface presents as four large continents, each approximately the size of Earth's Africa, girdling the planet's north- and south-temperate and equatorial regions. There do not appear to be any polar continents (although ice at either pole could be covering a small land mass). As a result, the planet has a North Circumpolar Ocean and a South Circumpolar Ocean with four connecting seas.

The planet's rotation gives it a day of approximately 26 hours and 11 minutes. The star Vega is approximately 0.02 seconds of arc from the south polar axis.

There are three recognizable mountain ranges on each of the continents save one that has only two mountain ranges. The majority of the ridge lines run east-west indicating tectonic activity with a north-south movement, but there are four that are oriented north-south. Probably because of the increased surface gravity, the highest peak observed is only 8,360m (27,428ft) MSL. Six large lakes qualify as 'inland seas' and dozens of others easily rate being called 'great lakes'. All are presumed to be fresh water as they are fed primarily by tropical and sub-tropical rainfall.

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Anthropological findings — part 1 — Borden, T.

The primary purpose of the first and only low-altitude surface probe was to confirm signs of intelligent life. Over the course of nine days, Probe1 scanned approximately 62% of Tatooine's land surface and delivered several thousand images for later

examination. It will, of course, take more than nine days to examine in detail all of the images returned. Although many images can be discarded immediately as having no significant anthropological importance, even the fraction left will occupy substantial time. This effort is already well under way.

The preliminary findings confirm that 'life' is certainly present on Tatooine's land surface, but whether it is intelligent life is still an open question. The observed lifeforms are rarely seen singly, most often in groups as small as four and as large as two hundred (estimated). Circumstantial evidence invites the conclusion that there may be three or four different species, all of which are engaged in hunter-gatherer behavior. Thus far there has been no evidence uncovered that would suggest agriculture has begun in anything but minimal scale.

The total population of the three or four (or more) species observed in what is presumed to be hunting is estimated at several hundred million, although this number could be off by orders of magnitude in either direction due to any number of false assumptions.

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Atmospheric findings — part 1 — Minter, D.

During Probe1's nine-day tour of the planet we all now casually refer to as *'Tatooine'*, several types of gas sensors took several thousand samples for analysis. These routinely confirmed previously-taken observations regarding O_2, N_2, CO_2, and H_2O vapor content along with other gaseous components. No surprises have yet been found. Microbes previously detected at higher elevations are also present at lower altitudes and probably exist all the way to ground level along with others that are not so easily aerosolized.

LJ2 is expected to have facilities for analyzing the DNA of these microbes, and it may be that, if microbial life is universally patterned, we may already be protected against some of them.

9 — Long Jump Two

After 14 months on station orbiting Epsilon Eridani B, the crew of the spinship *Elaine Pollard* was thrilled by the arrival of their relief. In the time they had been researching the planet, communication had been almost totally one-way. Only two message drones had been sent to them, each with directions regarding the thrust of investigation the LJ2 prep team had specifically asked for, and with reports on the progress of the LJ2 construction.

Spinship *Lawrence Klee* took the same general route that *Pollard* had used: a 40-minute jump from which their navigator could plot a course to put them below the plane of rotation of Epsilon Eridani B's six major planets, and from there to inch their way into an orbit around the planet itself. Their second, shorter jump put them within 20 light-minutes of the *Pollard*. Their arrival message was greeted with jubilation and confirmation of *Pollard*'s exact position. Six hours later, the two ships began maneuvering to get close enough to dock, and within the day succeeded in linking up.

The first task after docking was to copy the contents of *Pollard*'s memory banks into the *Klee*. The second task was to have LJ1's crew debrief to LJ2's crew to bring them up to speed. Finally, four unused message drones that LJ1 would no longer need were surrendered to LJ2 for their use. The ships separated, LJ1 moved away, aimed for the Sol system, accelerated with 0.05G, and jumped. In less than an hour, they would be in sight of their own star.

The spinship *Elaine Pollard* was luxuriously large, mostly for having to store a great deal of survival gear, primarily food, water, and oxygen. The *Klee* was gigantic in comparison. Not having to accommodate the huge fuel reserves that would normally have accompanied such a large vessel automatically relaxed many of the constraints of pre-K-P travel and allowed provisioning for much longer missions.

With the LJ1 mission now departed and Captain Ann Findlay on station with her 23-person crew, the close-up-and-personal exploration of Epsilon Eridani B — with especial concentration on its inhabitants — could begin.

"I intend to open every staff meeting with a reminder to all crew members that we do have a 'prime directive', and it's this:

"There is no circumstance — short of preventing the extinction of the inhabitants of εEridani B — that authorizes any member of this crew to even become known to any of the planet's indigenous species. We will not harm them, we will not assist them, we will not prevent them doing anything no matter that it violates any of our cultural norms. We will observe and document. That is our entire mission: observe and document.

"I know you all understand this policy, but I want to get positive feedback just to confirm it. Please raise your hand if you both understand and support the mission."

Ann Findlay raised her own hand, and counted 23 others. She smiled.

"Dr. Sawyer, you're on."

Clyde Sawyer stood and took Findlay's place at the front of the gathering.

"Our first task on the surface is gathering genetic material from several specimens to determine whether there is one or more than one proto-intelligent species. Since we are forbidden to make ourselves known, our only option is to harvest genetic material from corpses. Our drone-drivers are tasked with locating suitable candidates by surveilling hunting parties. To enable adequate communication between this ship and the drones, we will begin by installing five communication satellites in geostationary orbit. After that, we will deploy solar-powered 'floaters' to survey the surface for candidate groups. When we find one, we'll establish an over watch in hopes that any casualties can be sampled. I'm sure I'm not telling you anything you don't already know."

The four equatorial continents of εEridani B had, as you might expect, similar climates: heavily forested around the equator, and relatively lush vegetation toward the north and south. Three of the continents extended far enough either north or south or both to have winter climates through part of the year that seemed to be nearly 600 of its 26-hour days.

The floaters could stay aloft essentially indefinitely and carried enough intelligence in their computers to detect possible life forms on the surface. Reports of such events were always flashed to the *Klee* with an alarm so that someone would be alerted to its arrival. When a floater began to fail, it would report that, as well, and a service vehicle would be sent down to recover it, and bring it aboard the *Klee*, where it would be reconditioned before being sent back to resume its patrol. Because the floaters rejected observations that failed its preprogrammed criteria for reportable events, the ones that passed always got immediate attention.

The *chirp* of the alarm earned a sidelong glance at the monitor from Dr. Juliana Sanchez. That quick peek was interesting enough for her to pull herself over closer to the screen. The image was arriving in real time from the surface, and it showed a hunting party — there was no doubt about that — attacking a cat-like animal. The attackers were of one of the species (if they were actually different species) the team had casually begun to call — and think of as — proto-hominids. They were bipedal, hunted in groups, and apparently used spears and clubs as weapons. As yet, there was no DNA evidence to support the assumption that they were hominid, but today might be the day...

As Sanchez watched, one of the figures took a vicious blow to the head from a paw and went cartwheeling off into the air.

Moments later, one attacker jabbed the cat from the front as another hammered the back of its skull, killing it.

The group quickly cobbled two litters, placed their wounded comrade on one and the dead cat on the other, and moved off toward the northwest.

The floater watching all this ejected a hexacopter from its after cargo bay and continued to loiter at 2300 meters. The hexacopter dived toward the scene and landed near the spot where the wounded hunter had landed. It located a

pool of blood and took a sample. Then it moved over to where the cat had been killed and collected a sample of blood there as well. With both samples stowed safely, the hexacopter returned to its mother ship and parked itself within.

The service vehicle homed on the floater and scooped it out of the air as it sailed along above the southern circumpolar ocean. Within the service vehicle, the hexacopter exited its floater, ejected its two blood samples, and re-stowed itself inside the floater. The service vehicle then expelled the floater to resume its surveillance mission just before the service vehicle boosted away to return to the *Klee* bearing its first genetic samples.

"Raise your hand if you're surprised that the locals are <u>not</u> hominids," Dr. Charley Potter offered. Nobody raised their hand. "Good. I'd be disappointed if anyone expected that or anything close to it. No, we've got both genomes sequenced and the hominid-looking one has 25 chromosomes. We have 23. The cat-like animal has 20. Despite that, the locals <u>look</u> like hominids and the cat <u>looks</u> like some sort of tellurian cat, more *panthera* than *felis*, though.

99 – End Mark

εEridani