Ocean Europa

by E.S. Strout

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Changes in Jupiter's moon Europa's magnetic field, detected during last week's Galileo spacecraft flyby, point to a subterranean ocean. NASA website

1.

Friday, 5 April 2019. 0915 hours.
Microbiology grant and research Section, National Institutes of Health, Bethesda, Maryland.

39-year-old Professor Stephen Neufeld was a tall man with premature graying of dark sideburns and dark rimmed glasses that enhanced his professorial bearing. He wore a white lab coat over a green polo shirt and tan slacks.

He handed a Fax to his senior technologist, Linda Keating, She was a 40 year old blond woman dressed in blue scrubs and white laboratory smock.

"What do you think of this?"

Keating carefully read and reread the 3-page printout and returned it. She gave a skeptical headshake. "NASA won't have their new Europa probe ready to launch for ten years, Prof. The round trip could take fifteen years. Total a quarter of a lifetime."

He nodded and handed over another Fax. "From NASA."

She started to read, then gave Neufeld a questioning look. "Who is Paula Merchant?"

"One of their top subatomic particle physicists."

"She says the round trip from Europa with a prototype gravity engine could take only days. Do you believe her?"

"I spoke to Ms. Merchant briefly at a conference once. She's very young. Attractive in a geeky scientist kind of way. Gave a presentation on antigravitons. I understood about six words of it."

Keating nodded. "Geeky like you, Prof. Is she an item?"

He smiled. “She remembers me.”

Linda flipped a page and continued to read. “I like her. NASA will donate the vehicle if we provide the payload.”

“I’m flying to Orlando in a couple of weeks,” Stephen said. “I’ll find out what the heck a gravity engine is.”

2.

Monday, 22 April, 1445 hours. NASA complex, Cape Canaveral, Florida. Subatomic physics laboratory:

Paula measured about 5’6”. with dark brown hair fashioned in a ponytail. Her eyes were dark and piercing, set in an attractive oval shaped face. She wore a short white lab jacket over a blue and white print blouse and Levi’s, plus white sneakers. She gave him a bright smile.
“Professor Steve Neufeld. A pleasure to see you again.”

He winced at her firm handshake. “You too, Paula. Do I get to see your gravity engine?”

She pushed rimless glasses to her forehead with a fingertip. “Want some coffee first?”

“Sure.”

“Sugar, cream, shot of brandy?”

He smiled. “Just black for now.”

A grin. “For now.”

Paula clicked a remote. A view of the Delta Echo space station blinked to a 70 foot HDTV CD plasma screen. She pressed another key. A close-up view of a boxy structure with a large antenna dish appeared. “Not much for aerodynamic esthetics, Steve, she said.. “There’s no wind resistance in space.”

His gaze was thoughtful but confused. “How does this help me, Paula?”

Merchant said, “Stephen, I can get you to Europa and back in days. Watch this.” She took a sheet of plain white paper, laid it on the desk top and drew two small circles about six inches apart with a pencil. She pointed. “This first circle is us. The second is Europa. A whole bunch of million miles apart. Okay so far?”

Neufeld rubbed his chin, nodded.

She folded the paper so that the two circles were superimposed. “Antigravitons produce such a fold in space, like this. I won’t scramble your brains with subatomic particle wizardry but the prototype has passed initial trials.”

“Sample procurement could take a while, Paula.”

“No problem. I can maintain a geosynchronous orbit over your proposed site on Europa.”

3.

“How do you know Europa has water under the ice?” Steve asked.

Paula laid a color photo on her desk. “From the 2000 Galileo mission.”

Steve stood, leaned over the photo and studied it for several seconds. He touched a fingertip to a spot on the image. “What’s this?”

Paula nodded. “An ice volcano. Liquid water shooting through a crack in the frozen surface from an icebound ocean.”

“How does it stay liquid in such a frigid climate?”

“There’s a theory that tidal forces from Jupiter distort or warp Europa’s surface and produce frictional heat. My computer models suggest that this theory is accurate.”

Neufeld nodded. “Impressive.”

Paula motioned him to a chair by her cluttered desk. “Tell me about your experiment, Stephen.”

“We’re looking for extraterrestrial life, Paula. Bacteria or algae, maybe larger. Our landing module’s boring tool can cut through kilometers of ice. Then a robotic underwater device will collect a sample.”

“I have a concern, Steve,” Paula said. “Your sample will be very cold. Earth is warm.”

He nodded. “At Lake Vostok Research Station in Antarctica, their winter is coming in a month or so. Wind chill then can approach minus 150^{o} Fahrenheit. They have a sub-zero lab setup.”

She touched his arm. “I’m impressed, Steve. Let’s go get a drink. I’m buying.”

“Only if I can get the next round.”

“Are you married, Steve?”

“Divorced. She said I was married to the job”

Paula smiled. “Me too. Same situation.”

4.

Monday, 14 June.
Russian-American research station, Lake Vostok, Antarctica.

Microbiologist Natalia Ivanova was clad in a fur-lined parka and quilted down filled cold weather gear. She pushed through the double sealed airtight hatchway and stomped ice crystals off her boots. She pushed back the parka’s hood and removed her ski mask and dark shades to reveal an attractive face, short blond hair and bright ice blue eyes.

Christopher Mohr, the American communications tech, reached in a fax tray, removed a printout and handed it to her.

She read, “From National Institutes of Health. NASA is attempting to retrieve a specimen from beneath Europa’s ice sheet. If it works, Professor Neufeld will come here to look for extraterrestrial microorganisms.”

Mohr was a tall 35-year-old red haired man wearing a heavy gray UCLA sweatshirt and Levi’s. He donned reading glasses, perused the page, and nodded. “We’re going to be famous, Nattie.”

“We should celebrate, Chris. I’ve got lots of vodka.”

He smiled. “Sounds good. Only minus 78 degrees outside. Are you a warm person?”

“Come with me.”

5.

One week later. Microbiology Section, National Institutes of Health.

Dr. Neufeld opened a manila envelope with CONFIDENTIAL stamped in red on its cover. “A NASA courier delivered this by hand. From Paula.” He read, “Probe Ocean Europa arrived at Space Station Delta Echo at 0122 hours. Specimen intact, container sealed in liquid nitrogen. Good luck, Steve. Let’s get together for another drink soon.”

“She’s an item,” Linda said.

Steve smiled, flipped a page. “I’m going to Lake Vostok. I’ve got approval; from the

Russians and Natalia Ivanov, the Vostok microbiologist."

"Don't forget thermal underwear," Linda said.

6.

Wednesday, 14 July. Lake Vostok.
"How was your trip, Professor Neufeld?" Natalia asked after he had stripped off his cold weather gear.

"Chilly. 80 miles in a drafty Sno-Cat from the landing strip."

"You're lucky. Last year we put the airstrip in. Nice for supplies and visitors, otherwise it's a week long trek from the coast."

"Why no closer?" Stephen asked.

"The terrain is too rough here, mostly ice and shallow crevasses," she said. "Have you eaten?"

Neufeld laughed. "A peanut butter sandwich and a Thermos of tepid coffee twelve hours ago."

"We can do better," Ivanova said. "We have Stolichnaya and an American chef. Drinks and dinner, then. I'll show you where you can crash. Your gear is stowed in our cold laboratory. The specimen is safe outside, on ice."

7.

July 15. Microbiology Cold chamber. 0730 hours, local time:

"Moves slow, like glycerin or syrup," Ivanov remarked as she turned the thick reinforced glass Europa specimen container with insulated gloves.

"The probe sensors detected liquid water," Dr. Neufeld said. "I'll get a sample." He inserted a slender, sterile steel needle through the container's resealable aperture. His eyes widened in surprise.

"Good God. Something's moving in there." He shone a strong light through the glass to reveal a translucent, bluish ten-inch cylindrical structure with flagellated ends. It had a small defect on one surface.

"You got a little piece of it, I think," Natalia told him.

“A biopsy,” Neufeld said. “And plenty of fluid for a chem analysis. Run one now, please.”

Natalia placed a milliliter of Europa ocean water in the multichannel analyzer and pressed RUN. It spat out results seconds later. “It’s like sea water. Electrolytes, iron oxides and traces of carboxylic acid. No sugars,” Natalia said.

Neufeld nodded. “Okay. A cryogenic organism could metabolize carboxylic acid. See if you can get hold of it.”

“I’ll try.” She reached through the narrow aperture with a thin steel forceps, jumped back. The forceps clattered to the deck. She shook her hand, blew on her fingertips. “It shocked me.”

“Perhaps the instinctive reflex of an alien lifeform,” Neufeld wondered.
“Let’s get DNA typing and light microscopy on the biopsy.”

8.

The next afternoon:
Neufeld slipped a stained slide of the biopsy under a high-powered light microscope. “Natalia, this organism has over two thousand genes in a single chromosome.”

Ivanov pounded computer keys and pulled up a photo of a rod-shaped bacterium. “It’s similar to this one. *Psychrobacter arcticum*,” she shrieked. “A cryophilic Earth bug.”

“I’m looking at part of its chromosome. It’s huge. What could account for this bug’s enlarged size?”

“My guess is adverse climactic conditions, Professor,” Natalia said. “It probably needs increased surface area to absorb the minimal nutrients filtering down through softer sun-exposed ice of Europa.”

Neufeld nodded. “Yes, of course. Thank you, Natalia.”

“I wonder if our specimen could be one of more similar adaptive lifeforms. A colony of psychrophilic organisms under that ice sheet.”

“You think? Very interesting, Prof. Let’s see if your bug survived the biopsy.”

Natalia took a forceps and grasped an insulated copper wire, touched it. The meter read 50 volts, 0.05 amps. As she began to withdraw the wire, Dr. Neufeld said, “Wait, Natalia. Leave the probe wire in the fluid near the organism. There’s something odd here.”

She took a closer look. “I see it. There is still some electrical activity in the fluid. Very

faint."

"Move the probe further away, Natalia."

She did so. There was still faint electrical activity when the copper wire probe was moved to the edge of the containment. "What do you think it means, Professor?" Natalia asked.

"I don't know. I'm going to try something. Leave the probe in the fluid close to the Europa bug." Neufeld pressed computer keys and a straight white line appeared across the dark screen. Several clusters of activity spikes appeared. They were of varying levels of intensity and were separated by gaps of no activity. "This might represent the bug's attempt to communicate with other organisms of its kind."

"You mean they could talk to each other?"

"I'd like to think so.. Of course I may be way off on this. I'll let Paula know. She's due to call tomorrow."

9.

The next morning. 0830 hours:

Natalia answered her page and said, "Communication from NASA for you, Professor Neufeld."

Merchant's voice was chipper. "Cold enough for you, Steve?"

"Minus 75^{o} Fahrenheit this morning. The penguins and skua gulls love it."

"Brr. I'm a warm weather person. Is your Europa bug's electrical activity constant? "

"So far, and the faint intermittent traces as well. Why?"

"There has been some unusual fluctuation of Europa's magnetic fields."

"You lost me, Paula. What does that mean?"

"The magnetic fields of Jupiter and Europa have a delicate spatial relationship, Steve. They are no longer counterbalanced."

"Meaning what?"

Silence. He could hear her soft breathing.

"Paula?"

"Europa could break out of its Jupiter orbit."

"You're kidding. Where would it go?"

Another longer pause. "Unknown. Our astronomy mavens are working on computer models. I believe a minimal loss in your proposed colony's electrical capability could have upset it. That disturbance in the magnetic field balance might be due somehow to the specimen you removed."

Neufeld said, "Suppose we return the organism to Europa. Reestablish the balance."

"Worth a try, Steve. I have the exact coordinates. I'll ask the Air Force to send a C-130 to pick up the specimen."

10.

July 19. Vostok Microbiology Lab:

"Try the copper probe again, Natalia."
She touched the organism with it, It registered decreased electrical activity and the intermittent faint traces have ceased. She unleashed a heartfelt burst of Russian expletives. "What do we do now, Professor?"

Dr. Neufeld sat, chin cupped in one hand. "We have to return it to Europa before it dies. Perhaps it will recuperate on its home world."

"I'll install a chip so Paula can monitor its bio readings," Natalia said.

Thursday, August 1:

Ivanov and Neufeld huddled over the screen, watching the NASA real time feed from Dr. Merchant's lab. "Looks good so far," Paula told them over the satellite link.

"My probe has inserted the organism at the precise location from which it was obtained. Voltage and amps constant but the faint intermittent spikes are not present. Let's hope your bug will connect with its colony mates, if you're right about that."

Ninety minutes later:
"Dr. Merchant on the scrambler, Professor Neufeld," Chris said as he rushed into the lab. "Says it's urgent."

Steve picked up the phone. "Paula?"

Her voice was low, tremulous. "No electrical activity. The chip shows that your bug is

dead, Stephen."

"Damn. What about Europa's orbit?"

A pause. "Worst case scenario, Steve. We've run the models two dozen times. Same result. Europa will leave orbit 1603 hours on Saturday November 14 at high speed, assisted by Jupiter's centrifugal force. It will sideswipe Earth on Thursday May 21, 2020, close enough to draw away most of it's atmosphere. Europa will enter a decaying orbit and impact Earth a year later. We will have more accurate numbers on its trajectory as it approaches Earth. NASA has alerted all appropriate parties

"Responses?"

"Horror, resignation and blame. Threats by the usual lunatics."

"What can NASA do?"

"We have the capability of deflecting a rogue asteroid, but nothing for something the size of Europa."

Silence.

"Steve?"

"Hush. I'm thinking."

11.

Vostok, the same day:

"What's happened, Dr. Neufeld?" Natalia asked. "You look awfully worried."

"Listen." He played back the recording of the conversation he'd just had with Paula.

Natalia covered her mouth with a hand to stifle a gasp. Her eyes grew wide and her face went pale. "What will happen?"

"I don't know, but we have till Saturday November 14 to fix it before Europa leaves it's Jupiter orbit."

"What can I do," Natalia asked, her voice a soft stammer.

"Do you have any cultures of *Psychrobacter arcticum* on hand?" Neufeld asked.

A vigorous nod. "We do. You have an idea, yes?"

“Do we still have the liquid portion of the Europa specimen?

“About a liter.”

“Good. Here’s what we’re going to do.”

Sunday 25 August: Natalia swirled the cold culture flask in gloved hands. “The Europa fluid is still clear, Professor.”

“So our bugs aren’t growing?” Dr. Neufeld asked.

“Remember they proliferate very slowly,” she reminded him. These are hardy bugs from two million year-old Siberian permafrost. We need to give it another month.”

September 19. Dr. Neufeld held the culture flask up to bright light. “I see movement, Natalia. Look here.”

Natalia rotated it again. “Oh wow. It’s alive and Europa size. The others are gone.”

“Survival of the fittest,” Neufeld said. “Some peculiar element in Europa Ocean water has given our local bug similar growth capability. What about the electrical responses?”

Ivanov inserted the copper wire probe through the flask’s resealable opening. The dial lit up right away.

“What about in the fluid, not touching the organism?”

Natalia moved the probe to the edge of the glass containment, shook her head and tried several other areas. “No traces of activity.”

“Damn,” Steve said. “Can we do gene splicing. We need an exact copy of the Europa bug?”

Natalia nodded. “Best equipped cold weather lab on Earth. I’m on it.”

Thursday October 19. 0730 hours:
The copy was like a clone. A perfect match. The faint, intermittent electrical impulses were present as well.

“You’re a microbiological Dr. Frankenstein,” Natalia said.

They tapped fists. “You’re a cryogenic Igor, Natalia.”

She grinned. “Too bad we couldn’t find a brain for it.”

Steve grabbed the scrambler phone, tapped in Paula's Cape Canaveral number.

12.

"Hi Steve. Got some good news, I hope. We have some new computer models based on a slight deviation in Europa's proposed track due to its proximity to Mars as it passes. NATO wanted to hit it with nuclear missiles. I screamed and yelled. All that would do is break Europa into a bunch of asteroid-sized missiles aimed at us. They agreed. Do you have an answer for me, Steve?"

"Natalia and I have engineered an exact duplicate of the Europa organism, Paula. It is transmitting some faint intermittent electrical impulses into the surrounding water. Perhaps it will be able to communicate with that Europa colony."

"You still think they are sentient entities?"

"It shocked Natalia. An act of self-defense and preservation. Those faint impulses I reported before are present, perhaps a form of communication."

"You believe this, I think," Paula said.

"One way to find out. The organism is packed in liquid nitrogen and ready to fly."

"I'll have an Air Force jet to Christchurch, New Zealand within twelve hours to meet the cargo plane they are sending to your site."

"They had best hurry. We've got a huge snow and ice storm moving in, Paula. These can last for weeks, sometimes a couple of months."

Her voice was apprehensive, fraught with stress. "The plane will pick up you and the specimen in 24 hours, Steve."

"I have the organism packed in a compact cold chamber small enough to fit in your Europa probe's cargo space."

"Good luck, Steve."

"For all of us," he whispered as he replaced the phone in its cradle.

13.

The next morning,. 0600 hours:

“Natalia, please get a Sno-Cat gassed up for me. I’ve got to get to the airstrip with the specimen to meet the plane.”

Natalia rubbed sleep from her eyes, yawned shook her head. “Professor Neufeld, it’s not that simple. It’s eighty miles over rough terrain, blowing snow and ice crystals. You will need extra fuel and provisions in case you are trapped by the storm.”

Stephen turned to communications tech Mohr. “How close is the storm, Chris?”

“Less than 48 hours, give or take six hours according to the closest weather satellite. It’s moving slow right now, maybe ten miles per hour but that can change in seconds. We’ve seen them reach as much as 80 miles per hour.”

“I must take the chance,” Stephen insisted.

Natalia said, “Very well, I will go with you. I know the topography. We can spell each other driving. Our vehicle has a GPS locator and radio to contact the aircraft.”

The storm held up and they made decent time. When they were within fifteen miles of the airstrip, Natalia entered the C-130’s frequency and identified herself and Stephen Neufeld.

No response.

“Isn’t there a code or password?” Stephen asked.

Natalia chuckled. “I’m not some kind of a spy. The Russian and American pilots all know me.”

“Secondary frequency?”

“I’ve tried it.”

“Keep trying. I’ll drive now,” Steve said
Natalia repeated their identification several times, muttering curses after each failure. When they reached the landing strip another snag arose.

“The strip looks clear, Steve, except for a snowdrift across the center of it.”

“I’m shutting off the Sno-Cat’s engine I think I hear something,” Steve said.

They stepped out and listened. The wind was not strong and Natalia picked it up right away. “Four turboprops. It’s the C-130.”

She got back in and heard a staticky voice. “We heard you, Nattie. Please toss out some flares. It’s starting to get a little dark.”

“How’s your fuel supply?” she asked.

“We have an extra tank in the unused cargo space. Why do you ask?”

“There’s a snowdrift right in the middle of the landing area. Dr, Neufeld and I will remove it. I estimate about 45 minutes.”

“Copy that. We’ll circle. The storm is two hours away but its speed could pick up.”

Stephen said, “We’re going to do what?”

Natalia smiled. “This happens a lot. There are two snow shovels in the back. Grab them and follow me.”

Stephen was not much of a hand with a snow shovel, but he and Natalia managed to clear the drift in an hour. It took another thirty minutes to illuminate the landing strip by tossing out flares from the Sno-Cat.

“We can land and there’s some good news. Nattie,” the co-pilot radioed.

“It’s about time.” She said.

”The storm has bypassed you and just missed Christchurch. A tropical storm with winds of 60 to 75 knots is hitting Sydney, Australia with flooding and considerable property damage. The courier jet is encountering isolated pockets of the storm will try to meet you within a week or ten days.”

“Cutting it awfully close,” Steve said, “but I’ll take it.”

“Roger that. We’re on final approach.”

The C-130 landed in a cloud of snow and ice crystals and the passenger ramp came down in seconds. Steve grabbed the specimen package and hesitated for a moment. He stepped back and gave Natalia a long embrace. “Thank you for everything, Natalia. If this works out, I’ll arrange for you to visit us at Cape Canaveral and NIH.”

She returned the hug. “I’m looking forward to that.”

Ten minutes later the C-130 was airborne. They dodged small remnants of the storm and finally landed in Christchurch on the morning of October 16.

Dr. Neufeld rang up Paula on his iphone. She was relieved but concerned. “I’m so glad you are okay, Steve, but there’s still a problem.”

Stephen’s sigh was one of frustration. “Tell me.”

“There are pockets of the storm causing some heavy weather over the Pacific and Coral Seas. The Air Force is guesstimating another ten or fourteen days before they can reach you.

The Air Force jet arrived late on November 10 after flying around and above the storm remnants plus in flight refueling on its way to Cape Canaveral.

14.

Subatomic Physics Laboratory, NASA, Cape Canaveral, November 14. 1550 hours :

“How’s it going with our specimen, Paula?” Dr. Neufeld asked.

“My probe has reached Europa and established a geosynchronous orbit over the icebound ocean at the site where we took the original specimen. Your ice cutting device has penetrated the ice shield, Steve,” Paula said as she held his arm.

She clicked a remote to show a real time view of the Europa injection site, then pressed more keys. “Your Vostok organism is being implanted as we speak. Its electrical voltage and amperage remain constant according to the implanted chip.”

“What about Europa’s orbit?”

“No change so far. The instability still remains.”

“Damn. Can you keep the probe over the injection site for constant monitoring of the chip? Any variations in electrical activity will be important.”

She clicked computer keys. A graph came to the screen showing voltage and amperage of the Vostok organism in one second increments. “Strong and steady, Steve.”
She punched another key. “This shows external readings of Euopra’s ocean water that surrounds your implant. Very faint. Were you expecting any changes?”

Dr. Neufeld said, “I was hoping for increased activity. That might indicate some reaction in similar organisms.”
”Like if they were communicating?” Paula asked.

“Too much to hope for, I guess. How long until Europa breaks out of orbit?”

She glanced at the digital time on her computer screen. “Three minutes. Our probe will follow maintaining geosynchronous orbit until Europa arrives here on Thursday, May 21. Then as I told you ,it will cross our Moon’s orbit at 1436 hours. About thirty minutes later our atmosphere will begin to leak away and completely gone within another six hours.”

Dr. Neufeld exhaled a resigned sigh “We can watch on the closed circuit feed from the probe until the end. I suppose we should give daily releases to the media.”

Paula said, “We won’t have to go far. All the major news services have been camped outside for weeks. I’ve provided Air Force MPs to escort our technical personnel.”

“Any major incidents?”

“Not so far. We have nuclear missiles targeting certain Middle Eastern military installations just in case. There has been a quiet but uneasy calm, like stunned acceptance. We’ve even had Russian and Chinese techs volunteer to work with us.”

“What about the civilian population, Paula?”

“Churches of all denominations, mosques and synagogues are overflowing. Some companies are converting larger scale zeolite adsorption oxygen converters for underground shelters. Euthanasia clinics have been set up and drugs for such purpose will be provided for individual usage. An amazing ninety-five percent of the world’s faithful are determined to stay till the end.”

15.

Europa left its Jupiter orbit as predicted. Daily press releases reported no change in electrical activity detected by the accompanying probe. The track of its approach to Earth remained unchanged over the remaining six month interval. Incidents of civil unrest were very few and were handled quietly and efficiently by local law enforcement and clergy.

16.

1230 hours Thursday May 21, 2020.
Only a few reporters remained outside the Cape Canaveral lab. Television was given over to religious services except for CNN and Fox News. They showed live feed from Dr. Merchant’s probe without commentary.

17.

At 1430 hours, Dr. Merchant said to Steve, “We’ve got oxygen generators down below in an underground chamber. You should go there now.”

He shook his head. “I’ll be staying, Paula. Got anything to drink?”

"Glenlivet Single Malt scotch. For special occasions. Enough for us to get totally shitfaced. Ice in the fridge."

They clinked glasses, took long swallows. "Wish I could have gotten to know you better, Paula," Steve said.

"Me, too. Warning alarm will sound when CO_2 levels become toxic."

Neufeld took a long swallow, then another. "We won't hear it."

"Hold me, Steve."

18.

There was an annoying beeping sound. Steve blinked. "What?"

Dr. Merchant lay beside him, eyes closed, breathing softly.

"Paula? Is that the alarm?"

She stirred, rubbed her eyes, and looked around, disoriented. "Oh God, my head. Steve? What the hell? My cell phone."

"Merchant here." She glanced at her wristwatch. "Yes, we can breathe. An hour ago? Oh, holy crap. Wait one."

"What is it, Paula?"

She turned to her computer console and pressed keys. "Yes, I'm looking at it now. We have lots of work to do, people."

"Paula? What about Europa?"

She punched up an enlargement. "There."

He massaged his temples, groaned. "It's just sitting there."

"The track deviated again. It's stabilized itself in our Moon's orbit."

Paula pressed more keys. "Oh, wow. Here's your biosensor readings. A threefold increase in the amount of intermittent electrical activity. Your bug convinced that colony. They are still conversing."

Neufeld managed a faint grin. "Group instinct for self preservation and survival."

19.

They stood together, watching the double moonrise. “Europa’s a tad smaller,” Steve said. “Weird. This is sort of romantic.”

“There will be magnetic field changes, different tidal configurations,” Paula said with a soft sigh. “I’ll be consulting on what kind of climactic changes we can expect. There’s NASA and their plans to land astronauts with electronic coding experts and linguists. There will be debriefing by the military and all those 3-letter agencies . . . ”

“Nobody can accuse you of being a hopeless romantic, Paula.”

She smiled. “I hope you can get used to a geeky nerd scientist person hanging around, Steve.”

He caressed her cheek. “Any of that scotch left?”

The End