It's About Time: A Space Story in Slow-Mo

It has been a crazy month.

Just before midnight, UTC, on New Year's Eve, the James Webb Space Telescope had picked up a millisecond eclipse of a distant galaxy. An hour later, the Hubble Space Telescope confirmed the JWST sighting as it saw a blip crossing the K2 star it was observing. Scientists across the globe, from Australia to China, India and Africa, from Europe to South America, the US and Canada, took off their New Year's Eve party hats, put down their party horns and glasses of champagne, and grumbling got to work. The JWST and HST sightings were analyzed and triangulated. There was no doubt about it. Something was heading our way. Fast. All available telescopes on earth were trained at its predicted path and almost immediately the Very Large Telescope in Chile picked it out, or, rather, the operators of the VLT saw a series of occultations along the path of the incoming object. The data was unambiguous. What ever it was, it was an extremely small, non-luminous but gravitationally dense object—it could only be a small black hole! And it was headed right for the Solar System. And our planet, the Earth, was going to be right in its path as it plunged toward the Sun in a few week's time.

We—all residents of Earth—were doomed!

Everyone at NASA, ESA, Roscomos, JAXA, CNSA, and ISRO quickly put their egghead heads together to come up with a plan to avert the imminent destruction of our planet. As the black hole was estimated to be perhaps only 10 trillions of kgs—1/8 the weight of our moon—someone came up with the idea that if we could launch a sufficiently dense object into orbit it could gravitationally deflect the incoming black hole away from the earth and directly into the Sun. When Ellyn Méndez, a new trainee in NASA's Astronaut Selection Program, heard of this idea, she immediately thought about the Graviton Creation Device she had worked on when she was getting her Ph.D. in engineering at Stanford. Although the GCD was still in testing, Dr. Méndez was convinced that it could be used to increase the gravitational attraction of whatever object was launched into orbit to deflect the black hole from its destructive rendezvous with earth.

The next few days were a flurry of activity. Dr. Méndez' idea was floated approvingly up the chains of command and the GCD was flown from California to Houston. Meanwhile, CNSA, Roscomos, ISRO, and SpaceX launched a series of rockets

with payloads of osmium (the densest element naturally occurring on earth) that were sent into an orbit where they were to combine into a sphere of osmium weighing nearly a half a million kgs. And NASA and ESA retrofitted a spacecraft and produced G-suits specially designed to counter the expected increased gravitation effects of working near the osmium sphere.

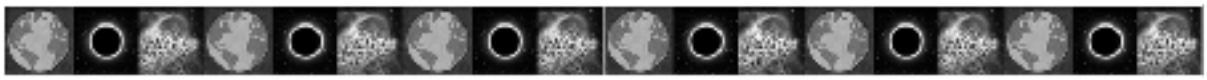
And in the meantime, of course, word of the coming disaster had leaked out in spite of the fact that the world space authorities had tried to keep a lid on the story. The Beast, as the mini black hole came to be called, was hailed by many as their god's retribution for the wickedness of humankind. All hell began to break loose across the planet. There was rioting and looting and general lawlessness as people prepared for the end of time, but there were also last minute reconciliations of long estranged family members and friends, and many tearful declarations of love. And the announcement of the Megiddo Mission, which is what some clever soul named the divert-the-black-hole project, went a long way to calm the situation. But time was running out and it wasn't clear whether humanity was going to destroy itself before the planet was shredded by the Beast.

By the end of the first week, which seemed like a blink of an eye, it was launch time for the Megiddo Mission.

Captain Tom Bowie, a veteran astronaut who held the US record for most time in space, was commanding the spacecraft. The GCD was loaded on board and Dr. Ellyn Méndez was strapped in beside it, even though she was nowhere near to completing her astronaut training. Bowie and Méndez knew each other as Ellyn had recently moved into a house two doors down from Tom's home in the Cinco Ranch suburb of Houston, and her six-year-old son went to the same school as Tom's eight-year-old daughter.

"Megiddo spacecraft. This is mission control. It's T minus one minute. We all know that this might be a suicide mission, but unless you are successful, there won't be an Earth to return to anyway. So go get that Beast, Tom and Ellyn, and godspeed."

"Ten, nine, eight, seven . . . . . ."



Everything went off like clockwork in the Megiddo's first week in space. Ellyn had been exhilarated by the weightlessness as the spacecraft reached outer space on its way to the osmium sphere. She laughed with glee when, while she was floating above

her seat trying to eat a spoonful of jello that wiggled above her, Tom came drifting by to gobble it up on his way to the back of the spacecraft. After their busy first few days in space, checking and rechecking all systems, Tom and Ellyn fell into a pattern, each one spending alternating eight hours of sleep/rest time in their respective cubbies, and eight hours together in the cabin. While Tom was always respectful towards Ellyn, never intruding upon her space and never complaining when she took what seemed to him an inordinately long time in their shared loo, Ellyn felt that sometimes Tom seemed to be almost flirtatious, like with that flying jello-eating stunt.

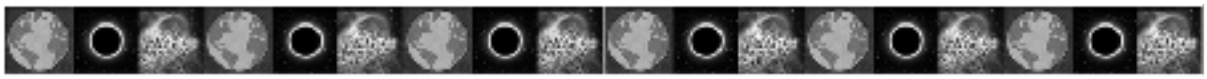
But then they were at the rendezvous with the orbiting osmium sphere and things got serious. Deadly serious.

There were those tense few hours when Tom donned his space suit and took an EVA to check out the status of the osmium sphere. Although Tom was tethered to the Megiddo the whole time, Ellyn's heart was in her throat from the moment he left until he climbed back into their spacecraft. But everything checked out just fine. The sphere had formed as planned, and the SpaceX thrusters were firmly attached, ready to fire when the Beast came near and to pull it into the Sun. And Ellyn started up the GCD, which seemed to working, sending 2-spin bosons on elliptical orbits into the center of the earth that were coming back as gravitons.

As the days passed and the gravitons began to be absorbed by the nearby osmium sphere, things began to change on the Megiddo. The weightless that had first so amused Ellyn slowly ebbed. Pencils that used to float above abandoned notepads now began to fall, albeit as if in slow motion. And as the Megiddo began to creak a bit and their G-suits felt increasingly tight, Ellyn and Tom's conversations during their eight hours of together time became more and more serious. What had previously been light banter, joking about NASA nerds, telling each other the worse things that had happened to them in their lifetimes, playing interminable word games, now became more somber. They each reflected on what they would miss most if their mission failed—they both agreed it would be missing seeing their children grow up.

And after a week of orbiting next to the osmium sphere as it became heavier and heavier with absorbed gravitons, the gravity on the Megiddo spacecraft was nearly the same as on earth. Tom and Ellyn turned off the magnetics of their boots and clomped around as if they were back home. And after a few days more, it became a struggle even to get out of their seats or cubbies.

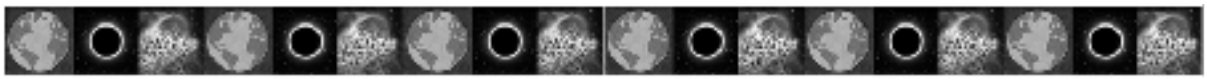
Then it was D-Day. The Beast was approaching.



The Beast seemed to be just a shimmering halo as it raced towards them. Then it seemed to slow down and hover next to the osmium sphere while the spacecraft's panels lights flashed on and off and a high, tinny, buzzing filled the craft. Then, suddenly, the thrusters on the osmium sphere fired up and it and the black hole sped off, directly towards the sun.

Success! Tom and Ellyn were able get out of their seats. But the panel lights kept flashing on and off, and the tinny buzzing only became more insistent. Tom had the insight to record the buzzing sound and play it back at the slowest speed possible. Yes, although it sounded like Alvin the Chipmunk, that was definitely a human voice: "Mission control here: Congratulations! You did it. How are you two holding up? We're going to get you back on ground as soon as possible." Tom turned to Ellyn, with a puzzled look on his face: "What's going on, Ellyn? You're the one with a Ph.D. here." Ellyn shook her head: "As far as I can tell, we're experiencing some sort of time dilation. Dr. Carroll at JPL predicted that time would go slower for us when we were in the vicinity of the black hole. But no one expected that the effect would last after it and the osmium sphere flew off. Our bodies must have absorbed some of those gravitons."

The next few hours (days on Earth) were a blur. The lights on the spacecraft blinked and blinked in a pattern that Tom recognized as the return protocol, He flipped the "go" switch and barely had time to yell to Ellyn to strap herself in before the engines suddenly fired. The spacecraft hit the upper atmosphere with a jerk. Almost immediately (or so it seemed) the parachutes deployed with another jerk and they splashed down. Seconds later (or so it seemed) the hatch popped open and shadowy figures squeaked at them and pulled them up. Then there was a blur of boarding a ship, being put into a helicopter, sitting in an examination room, getting into a NASA jet, another examination room, needles, and then sleep.



When Tom opened his eyes he was sitting in his living room chair in his Cinco Ranch home. And, two doors down the road, Ellyn similarly woke up in her bed. For

both, squeaking shadowy figures kept flashing by. Suddenly (or so it seemed to Tom) a notepad and pencil appeared on his lap. He picked the notepad up and wrote "hungry" on it. And, similarly, two doors down, a notepad and pencil suddenly appeared on Ellyn's bed. She wrote "I love you."

The (for Tom and Ellyn) next few hours were another blur. Tom must have been snoozing for a few (for him) minutes when suddenly the aroma of coffee and, his favorite, a charcoaled T-bone steak wafted up to his nose. But, by the time Tom reached down to pick up the food, the coffee and steaks were cold. The next thing Tom was aware of, the coffee and steak had been whisked away, replaced with a glass of water and a foil of K-rations, besides which was a written note "Sorry!" Tom tore into the rations and gulped down the water. Then he got up to go to the bathroom. His body felt fine, even if his muscles felt a bit stiff. But by the time that Tom got back into his living room chair, he noticed that, although it had been a bright, sunny day when he had gotten up to go to the bathroom, it was already nighttime and someone had turned on the light next to his chair.

Meanwhile, over at Ellyn's house, a similar set of events unfolded. She opened her eyes after a (for her) short nap only to find her K-rations and water and a pile of papers next to her bed. Her dear husband Coe had written a note for every (for him) day that of the month (for him) that had passed. Ellyn picked up the papers and read: "Every day, either I or Joshua will sit as still as we can for an hour in this chair next to the bed. Maybe that way you can at least get a glimpse of us." Ellyn glanced up at the chair and, yes!, there, for just a second, was a flash of Coe, a worried look on his face. A few minutes (of Ellyn's time) later, Ellyn glanced up again and there was a flash of her son Joshua in the chair, trying to hold a big smile.

And so it went on in Tom and Ellyn's homes in Cinco Ranch, with K-rations and water coming and going. A stool had been set up next to Tom's living room chair, and he too got fast glimpses of his wife Imam and his daughter Deborah, both straining to keep smiles on their faces. A few days (for Tom and Ellyn) after they first woke up at home, a Time magazine appeared in their laps. "People of the Year: The Megiddo Heroes Pay with Time Dilation" splashed on a cover featuring both of their faces, below which two headlines appeared: "Divine retribution for thwarting the will of God?—the Pope" and "No, it's just physics!—Dr. Sean Carroll."

"I can't just sit in this chair all day" thought Tom, as he got up and headed out the door. As soon as he opened his front door, he saw a flurry of squeaking shadows and pops of light. "Damn paparazzi. Let them go to hell!" Tom thought as he walked on down the steps. By the time that he got to his front gate, the sun had raced half-way across the sky. Tom trudged on towards Ellyn's house, only two hundred meters away, but the sun had set and a half-full moon had risen before he made it there. He shouted out "Ellyn" at the lit window by her bedroom. The window opened and Ellyn's head appeared.

"Hey there. How you doing?" she shouted down.

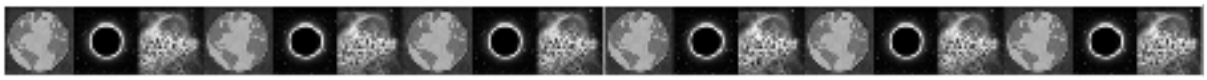
"Hanging in there. This time delay thing sucks!"

"Yeah, tell me about it! But reading Dr. Carroll's article in Time, there's hope that the gravitons may be slowly evaporating, and that in a year or two we'll be back to normal."

"That's a year or two our time?

"Yeah, I know. It sucks."

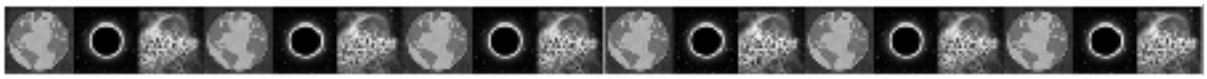
The sun had risen again as Tom and Ellyn had this conversation and had set again by the time that Tom trudged his way home.



And so, for Tom and Ellyn, their weeks and months dragged on. There was still the routine of K-rations and slow trips to the bathroom, and hand-written notes piling up by chair and bed. But their brief glimpses of their spouses and children seemed to last just a bit longer each time. For Ellyn, Coe's face seemed to be getting more and more haggard and his hair was turning whiter and whiter with every glimpse; and her little boy Joshua was turning into a gangly adolescent with a pimply face! Tom's wife Imam didn't seem to change much, though she did appear a bit stouter with each glimpse; and his little girl Deborah was now clearly becoming a young woman.

Tom noticed that the numbers on the digital clock in the living room were beginning to flip over a bit more slowly with each passing day. And in Ellyn's bedroom, the hands on the analog alarm clock by her bedside table, which used to sweep around in a blur like those cheesy sci-fi films showing the passage of time, were starting to become discernible as the hours passed.

And then there was that day when a hand-written note appeared on Tom's lap. "Deborah's off to college. She got into Oberlin!" Weeks later, a note appeared next to Ellyn in her bed: "Joshua got into Yale!!! He's off to New Haven tomorrow!" And two Tom-Ellyn months later, more notes: "Josh graduated *summa cum*!!! And he's taking a job here in Houston!" and "Deborah's getting married tomorrow! David is a nice guy, her sweetheart she met at school."



And then, a (Tom and Ellyn) year later, they're back!

Tom woke up to sound he hadn't heard for long time: the ticking of his bedside clock. But also on the bedside table was a framed photograph of a tomb with Imam's name on it and Tom's now fully grown daughter placing flowers beside it. And over at Ellyn's house, she too heard the ticking of her clock. But next to her pillow was a note from Joshua dated two days earlier saying that Dad had had a heart attack and was in the hospital.

Ellyn ran over to Tom's house. Deborah was there and she took them to the hospital where they got the news that Coe would survive but would be confined to a wheelchair for the rest of his life. Ellyn, who looked (and was) just thirty-three years old, pushed a wizened, white-haired seventy-one year old Coe out of the hospital. A few days later, a car from NASA came and picked up Tom and Ellyn. A bureaucrat told them that, no, they couldn't come back and work for the agency, although the good news, he said, was that they were officially at retirement age and would receive full government benefits.

The End?