

## Déjà Vu

by R Brent Smith

The young woman, Monika Tsu, carefully mounts the three steps to the podium. She is nervous to the extreme. To her, like many of us, public speaking is terrifying. For her, it is doubly so because she is speaking to an august group of the world's greatest physicists. These people are smart, no, smarter than smart, unimaginably smart at what they do. They are a tough group to impress and very, very critical of anyone who tries to pawn off radical ideas on them. There is a nervous buzz in her ears, or her brain, it sounds like it is coming from her ears. The much-dreaded time for her to make her presentation has come. She was called to the stage by the man running this session of the meetings. She is thinking in the moment, "Don't trip going up the steps." She makes it to the stage without incident and walks over to the lectern. The man running the session, a Dr. Schwimmer, greets her at the podium and gives the audience a short introduction of who she is. The introduction is exceedingly short by the standards of this meeting of past and future Nobel laureates. She is young, hasn't any publications to her name and has yet to receive her doctorate degree.

After the introduction which takes far too little time, it is time for her to speak. She steps behind the podium and faces the crowd. A microphone is held on a flexible stalk, about six inches too high for her. She reaches up and pulls the microphone down to the level of her mouth. As she does this, she brushes against the head of the microphone and a horrific squeal fills the small lecture hall. She apologizes, speaking into the microphone too loudly. She sees several dozen impatient eyes watching her. She suddenly has the urge to pee. She forces this into the background and collects herself as best she can. She looks out onto the audience, a lot of

impassive faces, expressionless, waiting. The majority are men, mostly in their later years, lots of balding heads and glasses.

Now it is time to get down to business. She looks down at her notes. Her hands are shaking and the notes are just so much scribble to her. She gives up on being able to make any use of them in her extreme nervous state. She will have to just let it flow. After all, she has rehearsed this a million times.

She begins, her voice halting, and thanks to a throat tight with nerves, at a pitch too high. “Good afternoon, ladies and gentlemen. I will start my presentation with a little review of gravity waves, please bear with me.” She remembers to click “the next slide” button on the remote in front of her and on the huge screen beside her is displayed an artist’s drawing of two red giant stars orbiting close to one another. She continues, “According to the theory of general relativity when massive objects interact,” she points to the image displayed on the screen, “like this collision, they create periodic disturbances in space time – our so-called gravity waves. These waves propagate through space at the speed of light and can be detected by instruments so precise that they can detect the minuscule shrinking and stretching of space time as the waves pass by.” She glances up at the audience, they are all looking at her expectantly. She imagines they are all thinking, “Yes, we know all of this, get on with it.”

She continues. On the massive screen behind her, she displays an image of a raw gravity wave signal – looking like a toddler’s attempt to draw a straight line – randomly wobbly and crooked. “I was employed analyzing the output of one of our gravity wave detectors. As you can imagine, this is tedious work, trying to extract signals that are often buried in noise many times larger in magnitude. One day, after extracting what looked like a possible gravity wave signal, I had a case of Déjà Vu.” She pauses for effect. This would be the first time anyone ever used this

term in a physics meeting. There are a few murmurs in the audience, some overtly loud sighs from those too rude and impatient. She continues, “I had seen this signal before in this precise circumstance. Yes, all gravity waves signals look similar but this was a clear case of the well-known but little understood phenomenon of Déjà Vu – experiencing the feeling, no the certainty, that this particular moment in time has happened to me before.” There is another murmur in the audience. She glances up to see heads tilting and arms crossing, her statement has had the expected impact. She has taken the audience out of their comfort zone. Déjà Vu is not physics and many in the audience are wondering why they are wasting their time listening to this drivel. She glances at her mentor, Sir Richard Dunlop, a well-respected physicist who has her back. He gives her an encouraging smile and nod of the head. This gives her courage to continue on. She raises her voice, “Déjà Vu, the feeling that you are experiencing the event for a second time and yet you cannot think, in reflection, of any time that you were in this exact same situation. So, what is this; a trick of the mind; a glitch in our memory recall? I think, not a glitch in our memory for when we search for the origin of the event in question, we come up empty – our memory does not know this event from any previous time. So where does that certainty of prior experience come from?”

She presses the ‘next slide’ button on the remote and the screen is filled with complex equations. Many in the audience recognize these as the Lorentz matrices from General Relativity. “Those of us involved in gravity wave detection will recognize these equations. From them, we can derive the variation in our spatial dimension due to the passage of gravity waves. But space-time includes the dimension of time. This dimension is also affected by the passage of gravity waves.” She uses a laser pointer to run quickly through the equations, showing how she has extracted from them a term for the oscillation of time due to the passage of gravity waves.

Several slides later, she has lost most of this audience of experts with her mathematical manipulations. She then gets to the result. Delta Time, the time wobble that results from a passing gravity wave, is laid out in a simple matrix equation. She pauses for effect. The audience has a mixed reaction, many are quiet, having lost the train of the mathematical manipulations, others who managed to follow the manipulations are examining the equation, trying to interpret its meaning. A very few who followed along perfectly are stunned. The concept that gravity waves are putting a measurable time variation into our lives is a revelation to them, so caught up in the precision of measuring the spatial clues to gravity waves, the temporal effects have been overlooked.

She continues, “In this next slide, I have put numbers into the equation. A gravity wave event of considerable size can vary our time, push us forward and backward in time by several microseconds. I contend that this is enough of a nudge for us to experience an event twice, in real time and then in the wobble of a passing gravity wave. This is quite possibly the explanation for Déjà Vu, we do actually experience events twice because of passing gravity waves.”

There is another murmur running through the audience. She looks up to see many attentive faces, a number of hands raised to ask questions. Just to drive the knife in a little farther, she adds as a closing line, “We may all be gravity wave detectors.”

The moderator of the session steps up onto the podium and thanks her for the presentation. “I see that we have a number of questions from the audience.” Monika who is now feeling relaxed and triumphant having completed the presentation is confident that she can handle any questions directed to her. Sure, there will be some arrogant dweeb who picks on some obscure point in her presentation and attempts to hit her with a ‘gotcha’ question but she knows her work inside and out. She is confident that she can answer any technical questions. The

moderator points to a man in the front row, a well-known Nobel Laureate. “Yes Chung-Yao, you have a question.”

The man stands and directs his question to Monika. “Miss Tsu, this is a very interesting piece of work but have you correlated the experience of Déjà Vu with the arrival of gravity waves?”

She knew this would be one of the first questions to be asked. Everyone wants proof. “No, I haven’t. If this theory is correct, it is only part of the story because we all don’t experience Déjà Vu at the same time even though we would all be subjected to the same gravity wave fluctuation in time. There is more at work, perhaps the state of mind of each individual at the moment, perhaps the particular activity they are involved in, perhaps they do experience Déjà Vu but miss it. I think it would require a very large and carefully designed study involving thousands if not millions of people.” Satisfied with her answer, Chung-Yao returns to his seat.

There are many more questions, some about her mathematical manipulation of the equations of General Relativity, many more about the missing evidence that a microsecond wobble in time would actually result in someone experiencing Déjà Vu. The session becomes quite lively with various audience members exchanging their views on the matter, excluding Monika completely. After some twenty minutes, the moderator has to cut off the question period. “We will take one more question. “Yes Chung-Yao, you have a follow up question.”

The man who asked the first question stands and asks, “Miss Tsu, this is a very interesting piece of work but have you correlated the experience of Déjà Vu with the arrival of gravity waves?” Monika is taken aback. Didn’t he ask this very question some twenty minutes ago? Perhaps this venerable professor is suffering from Alzheimer’s or some other neuro-degenerative

disease. There is a murmur in the audience. Someone calls out, a touch of sympathy in his voice, “You already asked that question.”

Chung-Yao turns to the audience, a smile on his face, “Are you certain? Perhaps you are experiencing the effects of a passing gravity wave.”