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Stories.

J Series

J11

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Contents

Keepers of the Kalachakra.

1. Part 11: 45 to 50.

2. Poem: The Road Not Taken.

1. Keepers of the Kalachakra

By Ashwin Sanghi

Part 11

45

The team was huddled around monitors at the facility in Livingston. Located in Louisiana, the monitoring station was surrounded by vast and wet loblolly pine forests. The location was distant enough from human habitation to prevent interference in the detectors.

The team's director, a short and podgy Irish-American called Harvey Walsh, wanted to be abundantly sure that they hadn't goofed up. It had been fifteen years since they had first started looking for gravitational waves—ripples in the space-time fabric of the universe. It was a hundred years since Albert Einstein had predicted their existence, but they had been impossible to detect until now.

Harvey's facility was known as the Laser Interferometer Gravitational-Wave Observatory, or LIGO. The Livingston facility consisted of two arms, each four kilometres long, placed at ninety degrees to one another. An identical facility was located around three thousand kilometres away at Hanford, Washington.

Both sites had been chosen very carefully. There were only a few places where vast tracts of land could be provided for a colossal science experiment that needed miles of empty space. Much in the way that astronomical telescopes are built at considerable distance from city lights that pollute the night sky, gravitational wave observatories need to be insulated from the vibrations of usual human activity.

'It's a wrap, guys,' said Harvey. 'I'm taking a break. Just ensure that the data has been fully backed up before we call it a day. Each one of you has been magnificent.' He clapped for them and they returned the favour. Harvey looked through the window at Judith Frost and waved. He exited the door and gave her a hug. 'Let's go get some coffee,' he said to her, his red cheeks puffing up as he smiled.

'Thanks for calling me here,' said Judith. 'Big day.'

‘We would never have reached this day without your help,’ said Harvey. ‘I understand science but not the science of networking.’

Harvey was referring to the fact that LIGO would have died a premature death without Judith’s schmoozing. LIGO had been through a series of rollercoaster twists since inception. A prototype interferometer had been built with military funding in 1967, but the project was cancelled even before it started operating. Similar projects had been tried at Hughes Research Laboratories in addition to MIT and Caltech but with little progress. The US Congress eventually agreed to finance LIGO, and in 2015 it undertook a \$620-million revamp to make its interferometers four times more sensitive than the earlier versions. They struck gold within a year, detecting gravitational waves from two black holes that had merged around 1.3 billion light-years from Earth. LIGO had succeeded in proving Einstein’s theory right.

Judith and Harvey had attended Seymour High School together and had been the best of friends, but their careers had taken them in different directions. They had reconnected many years later by which time both of them were well-established in their respective occupations. Judith had helped Harvey lobby influential people in business and politics to ensure that LIGO’s capital requirements came through. At one time he had been ready to quit, given the vagaries of financing.

Harvey and Judith walked over to the cafeteria and settled down at a table with their coffee cups. Behind them hung a map of the United States with the two LIGO locations, Hanford and Livingston, marked.

‘Why do you need two facilities that are at opposite ends of North America?’ asked Judith. ‘I have always wondered about this but never got down to asking.’

‘LIGO’s detectors are very sensitive,’ said Harvey, vigorously stirring his coffee. ‘They can detect the teeniest vibrations. Unfortunately, road construction, vehicle movement or field ploughing cause disturbances that can be misread as gravitational waves. Two facilities located far apart cannot simultaneously feel local vibrations, but they can experience distant gravitational waves in parallel. Having two locations ensures that what we detect are actually gravitational waves and not local tremors.’

‘Although I’ve been here several times, I still can’t seem to get my head around the idea of gravitational waves,’ said Judith. ‘I feel like I’m back in high school, depending on you to help me with my maths and science homework.’

Harvey laughed. ‘Think of a sheet that is stretched open and held by four people at the corners,’ he said. Judith attempted to visualize it. ‘Now, a fifth person drops a heavy ball into the middle of the sheet. What will happen?’

‘The sheet will sag at the centre?’ asked Judith tentatively.

‘Absolutely right,’ said Harvey, quickly sketching a diagram on the back of a paper napkin.

‘Now, if you start releasing more balls into the sheet, they will all head to the centre because of the curve in the sheet—the way our Earth is attracted to the sun. Ordinary Euclidean geometry cannot be applied in the context of such a curved space-time fabric. After all, can you apply two-dimensional geometry of a plane to the surface of a sphere?’

‘That’s gravity,’ said Judith. ‘But gravitational waves? What are those?’ She winced as she burnt her tongue with the scalding-hot coffee.

‘When a ship moves through water, the water has to get out of the way to make space for the ship, right?’ answered Harvey patiently. ‘The water curves

around the ship, and when it moves out of the way it also makes ripples on the surface. Now, just like the example I gave you, colossal objects—black holes for instance—move through space and make ripples in space-time. These are called gravitational waves.'

'And how does LIGO detect them?' asked Judith.

'Can you see the photograph on that far wall?' asked Harvey pointing towards it. 'It shows the layout of our facility here at Livingston.'

Judith looked at the extra-large backlit image covering one wall of the cafeteria. It showed an aerial view of the LIGO facility.

'The ripples caused by gravitational waves are negligible by the time they reach the earth. Some compress space-time by as little as one ten-thousandth the width of a proton,' explained Harvey. 'So how do we detect them?'

'Exactly, how?' asked Judith.

'We have these two long arms running out several miles at ninety degrees to one another,' replied Harvey. 'We send laser beams down from each of these arms so that the beams cancel each other out perfectly when they arrive here. But what does a gravitational wave do? It stretches one tube while squeezing the other. This alters the distance that the two laser beams travel. As a result the beams no longer cancel out perfectly. The resulting residual light is what alerts us to a gravitational wave.'

Judith shook her head in awe. It was incredible stuff.

'Do you know what is even more interesting?' asked Harvey. 'We can convert gravitational waves into sound! We can actually hear gravitational waves. The sounds of the universe!'

'And what do they sound like?' asked Judith.

'Almost like a drop of water in a bucket, but we still have to collect more data. Indian sages used to meditate on a sound, Om, that they claimed was the primordial sound that accompanied the creation of the universe. Who knows? We may just find it.'

'I hope you do,' said Judith. She stirred her coffee absentmindedly for a few seconds and then spoke to Harvey in a hushed voice.

‘Now that LIGO is well-established,’ she said, ‘would you be interested in considering a competing job offer? Something even more challenging? One of my friends mentioned your name the other day.’

47

In a darkened room located at Milesian Labs sat a former operative of the National Security Agency. He was known to most people only by his nickname—Cracker. He was a bulldog of a man, stocky, muscular, round-faced and red. Having been part of the NSA, an organization that intercepted telephone and internet communications of over a billion people worldwide, the job at Milesian was child’s play. He reported only to Schmidt.

Across the table now sat the German, perfectly turned out, unlike Cracker. He was looking at a set of photographs that had been taken of Vijay. ‘His face was beaten up pretty bad,’ said Cracker. ‘He never filed a police complaint though. I checked with our police liaison in New Delhi.’

‘How long was he missing?’ asked Schmidt.

‘A few hours,’ said Cracker. ‘Claimed to his girlfriend that his valuables were stolen and that he was assaulted and left in an abandoned warehouse.’

‘Does his story check out?’ asked Schmidt.

‘We interviewed the cabbie that dropped him to his girlfriend’s place,’ replied Cracker. ‘The girl had to pay because his wallet was gone. Also, there are three warehouses on the road where he was supposedly assaulted. Any of them could have been the place he was dumped. His bruises are genuine. There is no evidence that indicates anything to the contrary.’

‘I’m not fully convinced,’ said Schmidt. ‘Let’s step up our surveillance until he gets here.’

The Indian state of Uttarakhand lay nestled at the foothills of the Himalayas, sharing its northern border with China and Nepal. For locals it wasn't Uttarakhand but Devbhumi, the land of the Gods, and the gateway to the Himalayas. And so it was. Numerous ancient pilgrimage spots dotted the snow-covered mountains, the terrain's natural beauty only adding to the intrinsic spirituality of the area.

The flight from Delhi to Jolly Grant Airport near Dehradun took exactly an hour. Arriving there, Vijay quickly pulled his suitcase from the baggage claim and exited the airport. A chauffeured SUV awaited him. It would be a seven-hour drive towards Kalimath, uncomfortably close to the Indo-China border. The research facility of Milesian Labs was located near Kalimath.

Vijay ignored the beautiful sights around him. His mind was entirely on Sujatha. Earlier that morning, he had bid her farewell, knowing that he would be cut off from her for the next three months. She had hugged him tightly, feeling guilty about having encouraged him to take the assignment. 'Ironically, I shall be in your neighbourhood soon,' she had finally said as she pulled away. 'I have received security clearance to collect plant samples from a few of the forest areas in Uttarakhand. I'm going to miss you even more, knowing that you are so close and yet so far.'

At that moment, Vijay knew that he was in love with her. He recalled reading somewhere that love was not about finding someone you could live with. Rather, it was about finding someone you couldn't live without. It was the prospect of living without Sujatha that made Vijay realize that he needed her. But something prevented him from telling her that he loved her. Or that he now wanted nothing more than to spend the rest of his life married to her.

It was six in the evening when Vijay's SUV drew up outside the gates of Milesian Labs. His face was hit by a blast of cold air as the chauffeur opened the door for him. Winter temperatures dropped to minus seven degrees here, but, mercifully, the lows had yet to arrive. Some consolation.

Nestled in the Garhwal Himalayas, Kalimath stood at an altitude of over six thousand feet above sea level and was endowed with immense natural beauty, surrounded by the mountains of Kedarnath, one of the holiest sites of Hinduism. The area around it was famous for its glaciers, walking trails, deep forests, snow-clad summits, thermal springs, meadows, waterfalls and streams.

Vehicles were not allowed inside the Milesian campus, which was located east of Kalimath. One of the security officers of the company was waiting outside to receive him at the car park. On his lapel was the Milesian logo, a circle within a triangle containing the letter 'M'.

The security officer led him through a winding pathway that cut through forestland to reach the massive Milesian gate manned by guards and Rottweilers. Just outside the gate was a colossal sculpture of a dancing Nataraja encased inside a pinecone-shaped structure.

It was a stunning piece of art and Vijay stared at it for a while before moving on. The security officer efficiently helped Vijay with his luggage and directed him through several checkpoints that led into the facility. He was assigned a safe deposit box in which he could leave his personal electronic items. He would be able to access them on his way out three months later. Both his luggage and his person were scanned as he passed through. Vijay held his breath, wondering whether the microchip embedded in his arm would set off any alarm bells, but he sailed through.

From here, Vijay was escorted to a cable car station that provided an aerial link to the facility that was located at a substantial elevation. The total distance was around two kilometres, with a journey time from the base to the top of seven minutes. Unlike most cable cars that offered substantial views through plate glass windows, this one was entirely enclosed, offering no views of the landscape.

Strange, thought Vijay to himself. What are they hiding?

50

As soon as they reached the facility, Vijay was led to a studio apartment furnished in contemporary chic, blending stone, steel, wood and glass into highly desirable accommodation that looked as if it belonged in the pages of Architectural Digest. It was perfectly suited for him, with a small living room cum en suite bedroom with an open-plan kitchen. The plate glass windows of the living area looked out into the forested hills. On a desk by the fireplace were a brand new notebook computer, a mobile phone and tablet, all duly charged and ready for use.

There was a soft knock on the open door. At the entrance was Dr Klaus Schmidt. 'I am delighted to see you, Mr Sundaram,' he said with all the excitement of a paperweight. 'I shall be happy to show you around our beautiful campus. Put on your jacket and I will wait for you outside.'

Vijay gratefully accepted the offer. But first, he quickly made a call from his new phone to Sujatha to say he had arrived. 'I'm missing you,' said Sujatha. Vijay wanted to tell her that he had been a fool not to propose marriage and that he loved her and missed her, but there wasn't any time. Schmidt was waiting outside. He quickly left his apartment after putting on a heavier jacket.

There wasn't any need to lock the door behind him because there was no keyhole, only a fingerprint sensor that had been programmed for Vijay. All doors in the Milesian facility only had biometric locks.

2. The Road Not Taken

By Robert Frost

Two roads diverged in a yellow wood,
And sorry I could not travel both
And be one traveller, long I stood
And looked down one as far as I could
To where it bent in the undergrowth;

Then took the other, as just as fair,
And having perhaps the better claim,
Because it was grassy and wanted wear;
Though as for that the passing there
Had worn them really about the same,

And both that morning equally lay
In leaves no step had trodden black.
Oh, I kept the first for another day!
Yet knowing how way leads on to way,
I doubted if I should ever come back.

I shall be telling this with a sigh
Somewhere ages and ages hence:
Two roads diverged in a wood, and I—
I took the one less travelled by,
And that has made all the difference.