Blind as a bat?

(Total word count: 1700)

Tessa took a long, slow gulp of water, savouring each drop as it trickled gradually down the back of her throat. Shaking the metal canteen to check its contents, she reassured herself there was enough remaining to make it the rest of the way to the village.

They had been travelling for almost ten days now, and despite her excitement, Tessa felt a weariness worming its way throughout her body. Each morning they rose early at daylight, dragging themselves reluctantly from the warm comfort of their small tents and out into the morning frost. Even knowing the temperature was sure to rise rapidly over the next few hours wasn't enough to mentally prepare them for that initial icy bite. By the time noon struck, temperatures swerved to a sweltering thirty degrees Celsius, causing the whole crew to break out into lunchtime sweats, such as the ones Tessa was suffering from now.

It was a significant contrast to Tessa's normal workday environment, safe within the confines of her office at the university hospital back home. Usually, she would be tucked up at her desk right now, sipping from a large, round mug of steaming hot coffee; books, papers, and a mess of scrawled notes scattered everywhere. As a medical physicist, it was Tessa's job to ensure that the hospital technology worked correctly. Each day she worked closely with medical imaging equipment - x-ray, computed tomography (CT), magnetic resonance imaging (MRI), and ultrasound scanners. Big, complicated machines which helped the doctors to take photographs of a patient's insides, diagnosing a range of sicknesses - from small fractures and broken bones, to even more serious diseases.

They seemed almost magical, except Tessa knew that logical, scientific explanations existed for each machine, unveiling their magical powers.

Another part of her job - the part which Tessa enjoyed more - was being a researcher. Working alongside other scientists, constantly brainstorming ways to improve healthcare. Just like the way mobile phones, computers, and play-stations got faster and better each year, Tessa and her team worked together to upgrade the hospital equipment, regularly improving the technology.

Tessa wiped sweat from her forehead with the back of one hand, returning the water canteen to her pack with the other. She saw craggy terrain stretching out to either side, the path before her disappearing steeply up into the looming mountainside. Here, higher up in the hills of the Himalayas, there wasn't a hospital in sight. A trek organised once a year by the Himalayan Health Exchange provided basic dental and medical care to the surrounding rural communities. The treks were difficult, however and hampered by the fact that there was no access to electricity.

A few months earlier, Tessa and her colleagues had decided to dedicate time to searching for solutions to improve the medical care within these remote villages. That's what being a scientist was all about after all, noticing problems and then coming up with creative solutions to fix those problems.

"So how does this ultrasound scanner work then?" a voice interrupted her from her thoughts.

Spinning to face the speaker, she recognised one of the crew members, Jaheed, carefully studying the bags that held their equipment. Unlike Tessa, Jaheed was not a scientist. He was a member of the Himalayan Health Exchange, accompanying them on this journey to share his trekking expertise, making sure the crew did not get lost or injured.

"Ah," Tessa replied. *The ultrasound scanner*. One of the very solutions her team had finally come up with. The reason they were all here. "Do you understand how typical ultrasound devices work, Jaheed?"

"Um, kinda, not really… it's the same way a bat sees, right?" Jaheed answered, unsure of himself.

"Yes, pretty much exactly that. It's also the same way whales see things better underwater. You know how sometimes, if you're standing in a cave and shout something, the word bounces back at you from the walls? As an echo? So, you hear your own voice coming back at you from all around?"

"Yes?" Jaheed responded.

"Well bats and whales are much more in tune with this echoing than we are. They're able to pinpoint exactly how far away these walls are which the echoes bounce back

from. From this, they get a picture in their head of their surroundings. It's called *'echolocation'*.

"Ultrasound works on the same principle. We place a probe against the part of a person's body that we're interested in seeing inside. That probe then sends out sound, or *'sonar'* waves, which echo back from anything inside, for example bones or organs. These echoes are picked up by the computer which converts them into an image – just like how bats and whales do! It's like a reflection, but instead of with light it's with sound. Does that make sense?"

"I think so, mostly. I've seen pictures of the ones used in hospitals before though and they're pretty big, right? How will they be powered?"

Jaheed was right. The heavy ultrasound machines used in hospitals were awkward to carry, impossible for bringing across the Himalayas on foot. And even if they had figured out a way to carry them, the lack of electricity in the mountains meant they wouldn't work. They had needed another solution.

Tessa and her team had first broken the problem down into simple chunks. What smaller questions must be answered in order to find an overall solution?

Next, they split into teams for some detective work, researching answers to each question. What did they know already? Tessa went over everything she knew about ultrasound scanners used in hospitals, transcribing it all down into neat, concise notes as she went. Others researched the geography of the Himalayas and the villages there: what kind of power sources were used, if any? What was the environment like? What could be carried through that environment and how? They took their information from multiple sources - friends or colleagues, searches on the internet or in books; or in Tessa's case even from going to look at the ultrasound scanners in person. With all the clues laid out before them, it became more likely they would be able to decode an answer to the puzzle.

And eventually, they had.

"Actually, we were inspired by the solar power sources used here by the locals."

Solar power. Clean, simple energy direct from the sun. The sun was a big huge, burning ball of energy, trillions of miles away, yet so hot it's heat could be felt from Earth. That kind of heat took a lot of energy to generate.

"We asked ourselves whether ultrasound scanners could be powered by solar energy from the sun, and whether they could also be made portable for carrying on these treks? Lo and behold, we figured out a way to build smaller ultrasound devices, attaching them to some portable solar panels. From there it became a simple job of remotely setting up the device to feed the images onto our iPads, instead of computers. We ran a few tests back at the hospital. Everything appears to be in working order. Now we need to make sure it works here, too."

Theoretically, there was no reason the device wouldn't work. Before they could draw any firm conclusions though, they needed to be sure. Hence why they were now making this trip. There was no point in making heaps more of the devices if they weren't going to function properly.

"Come on, let's go find out, shall we?" Tessa smiled at Jaheed.

Shouldering her pack, Tessa ensured the straps were secured tightly before turning to her crew to see if they were ready to continue their journey. If they travelled quickly from here, they should reach the village before night hit. Then she would find out for sure whether the device really worked. Whether all those long days of careful calculations, scientific measurements, and research could be put into good use.

They set off into the slopes, arriving safely to the village by nightfall. A local woman ran up to meet them as they approached, panting as she crested the hill where they stood.

"Quick, my husband, he's fallen! He tripped on some rocks whilst hiking and damaged his ankle. We carried him to the house, but he's in a lot of pain. Can you come and help him? Please?"

Hurriedly, they followed the woman back to her house. Upon arrival, the lead doctor from Tessa's team retrieved the ultrasound device from their packs, selecting a few other pieces of equipment along with it. He took it over to the woman's husband who sat perched uncomfortably atop a small, wooden bed, face scrunched tight in pain.

The solar panels on the ultrasound scanner lit up, indicating they were ready for use. Fortunately, the team had left them in direct sunlight each day, allowing them time to fully charge.

The doctor ran the ultrasound probe gently over the man's injured ankle, setting it down once the scan completed. Tessa held her breath, nervously awaiting the results. Moments later, a ping alerted her to the image arriving on the doctor's iPad.

"Looks like your ankle is broken, sir. Don't worry, though, now we know what's wrong we can get you fixed up in a cast right away. It'll take some time to heal and you'll have to rest in the meantime, but you'll be okay." The doctor smiled down at him, then turned to Tessa. "Good work, Tessa. Seems the device is a success!"

Tessa beamed, relief flooding through her. What a wonderful moment. They would still have to test the device with more patients of course - just to be certain it worked - but the results left Tessa hopeful. She was delighted they had already been able to help someone within the first five minutes of arriving at the village.

This was what she loved most about being a scientist. It was gratifying to see her work make a real impact in the world, reminding her just how much she loved her job. Tessa knew she would always be a scientist. No matter how small, her curiosity would always be eager to solve problems, especially when they helped people, like this.