

# Gravity

The start of a scifi novel.

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# Preface

# Clapham Common, Britain, 1797

Henry Cavendish dropped exhausted onto the only chair in his laboratory. He had just finished lifting the second 12-inch, 350-pound lead sphere into place using block and tackle, and needed to rest before he could start the final suspension. He was building an apparatus to weigh the earth. He had seen something like it in the lab of a geologist who recently passed away, John Michell, who had never completed his experiment.

It was a large affair; a support frame ten feet high and ten wide, supporting delicately from its center a balanced six-foot horizontal rod, with two 2-inch lead spheres hanging off either end. And just inside the arc described by the two small lead weights when the beam swung were the two large lead spheres hung on their own rotating suspension. He was going to measure just how much gravitational force was felt by the small moving weights as they were close to the large lead spheres. It was very delicate work, but this is where Henry loved to be, alone in his lab.

Henry Cavendish hated crowds, hated interacting with people; but he loved numbers, measurement and experimenting with chemicals and apparatus. His father, the gregarious Lord Charles Cavendish, politician and scientist, brought young Henry along to his assignments in the British Museum and to the Royal Society to hear reports on the treasures unearthed in foreign lands and in small laboratories alike, to hear tales of discovery in the sciences, in physics, in chemistry, in geology and geography, in archaeology, all the wonders that Henry found so absorbing.

And there in the halls of the Royal Society Henry heard of Newton. Isaac Newton, who had lead the Royal Society for a time and had died just five years before Henry was born. The great physicist and alchemist, it was Newton who came up with a scientific law describing the gravitational attraction of one mass for another. It was a straightforward relationship between the two masses of interest multiplied by each other, divided by the distance between them squared, all multiplied again by a constant. And that constant was Henry's goal. Big G, the universal gravitational constant, was unknown.

Big G was small, too small to observe in the presence of the Earth, itself a very, very large mass. The apparatus of Michell was just the thing to measure the force of gravity in a different direction from that of Earth's gravity; it would measure the small force of gravity acting sideways.

It took Henry a week to get the masses positioned and measured as precisely as possible. He had the advantage of access to the best scientific equipment through his father's wealth and his own connections into the great scientific community around London. His measurements were the rate of rotation when the weights felt that very small gravitational force. Henry set up his apparatus well; he could measure distances and could measure deflections of 0.01 inches.

His plan was simple: measure Big G and use that to find the mass of the earth using Newton's Law of Gravitation equation. The Universal Gravitational Constant, responsible for keeping the planets in their orbits, and for holding galaxies together, could be known. Big G was a constant. Henry was about to measure the value.

# Massachusetts Institute of Technology 1999

Timothy Farnsworth walked into an auditorium filled with the buzz of excitement. Everyone in the packed hall was chatting, questioning, and some were attempting to explain the new observations. This hastily-gathered convention of physicists, astronomers and cosmologists was brought together on the news from the latest cosmological survey.

Timothy found a seat on the side, near the wall. Like Cavendish, he was a shy associate professor, holding to himself more than to crowds. And, like Cavendish, more at home with apparatus than with people.

Someone Timothy didn't know was at the podium, trying to get everyone's attention.

"Ladies and Gentlemen, we're here to hear about some of the latest discoveries in cosmology. We know this is an exciting day, but if you in the back can quiet down, we can get started." The crowd in the back of the hall, who seem to have started a debate of some kind, quieted and sat down.

"Our first speaker, Dr. Elise Butler of MIT, will speak briefly on the Galactic Shape Survey. Then we will hear from Dr. Stuart Gains, Cal Tech, on the latest results from the Spacial Flatness Survey, and finally we will hear at length from Dr. William McGinty of Harvard on the measurement of the universal gravitational constant calculated from the galactic cluster survey."

As Timothy listened to each speaker, he did as he almost always did when listening to scientific lectures, translate the scientific vernacular into one his freshmen students could understand. In his mind he was giving his own lecture to his students.

"As we examine a galaxy, we find they are spinning. We can measure the rate of spin by looking for galaxies that appear to us slightly on end, and measuring the color of the stars at the sides. Stars with colors shifter to the blue end of the color spectrum are coming toward us, as a siren passing on the street sounds higher in pitch as the ambulance approaches. And similarly, colors that are shifter toward the red end of the spectrum are moving away, as you may also have heard. The speed of the stars moving toward us and away can be calculated from the amount of shift. How do we know how far the spectrum has shifted? Because atoms shine at certain frequencies which have never in our experience changed. Hydrogen has four well-known lines of color. We find those lines in the stars and measure where they appear to us.

"We can then estimate the diameter of the galaxy from the rotational speed. Now here is the neat thing about galaxies: the total mass of the galaxy, the weight of all the stars and all the dust and everything, thins out toward the edges, which are furthest away. The inner parts of the galactic

disk, because most galaxies start as rotating disks of stars and dust, rotate a little faster than the outside, having a shorter distance to go around, and a beautiful spiral pattern emerges over the millions of years or billions of years needed for the dust to assemble into stars because of gravity and to light up. Our own Milky Way galaxy is just such an example of a spiral arm galaxy."

"Hmmm," Timothy thought to himself as he listened to the talk, "here is where it gets interesting."

"In a recent survey of the shapes of galaxies we are observing anomalous behavior. When we simulate the formation of a galaxy, we get a slightly different shape than we are seeing. Not every galaxy is different, just a few. And what explanations do we have for these anomalies? They seem to have more matter at the center than we can see. We call this 'Dark Matter.' Or perhaps the universal gravitational constant is a little higher there than elsewhere, but we know it to be a constant, so let's stick with dark matter. What is dark matter? We don't know. We've never seen it. It's not dust or planets or stars which can't shine, because they would block the light from stars behind them, and that light isn't being blocked. We just don't know what dark matter is."

It was a short talk, and reported information already reported before and discussed.

The next talk was also short and went over material already reported. In Timothy's head he continued his lecture to the freshmen: "Space can have a shape. Now, this is very difficult to picture, so we have found ways of picturing what might happen when space is curved. Imagine a plane, flat, infinite, stretchy as rubber, no bumps anywhere. This represents space. Everywhere there is a planet or star or something very heavy, we imagine what it would do to this imaginary plane. Heavy object would distort the plane, make a sort of hole for themselves. Like steel balls might in a thin, stretchy rubber plane. We might call these local distortions. And every heavy object does this to space itself, creates what we call a local curvature.

"But let's take a longer look at the universe, the entire cosmos. The whole thing might be bent, warped in some way so that the normal laws of the universe might be changed a little. In a flat plane, if we distribute galaxies evenly over the surface, we'll see something remarkable: every time you count the galaxies at a certain distance, when you double the distance you always count exactly four-times the number of galaxies. You can keep doing this doubling thing forever, or until you reach the edge of the universe, and the four-times law holds strictly true.

"But what if the universe were bent into a sphere? How would that counting thing work? Every time you double the distance, when you count the galaxies, you get a number less than four-times, maybe 3.8 times. And it gets smaller every time you double, until you get to the other side of the sphere where there are no more galaxies to count.

"Or what if the universe were saddle-shaped, where two opposite corners are bent up while the two remaining were bent down? Then you'd count more than four-times, maybe 4.2, and counting further out that ratio gets larger.

"In this survey they counted exactly four-times. It was a tricky piece of work, because you need to know how far away each galaxy is. I'm not going into that in this lecture, but it's tricky work. But four-times exactly means the universe as we know it is flat."

The last lecture, the one everyone had waited for since the first news was published three days ago. Something new in cosmology. Timothy continued lecturing to his students in his head. "Now let's take a look at the expansion of the universe. This was quite a discovery in its time, and is still a source of amazement for me. When looking at all the galaxies, and there are millions of them, they all look too red to us. This is the same red shift we talked about earlier. All galaxies, taken as a whole, are moving away from us. You've heard of the Big Bang? That was a facetious name given to this observation, and it stuck. Somewhere, the theorists propose, something happened to bring the entirety of the universe into existence. All the mass, all the energy we have now appeared in an instant, and began to expand. Eventually atoms formed, then they were attracted to other atoms to form a sort of dust, and the dust gathered into masses, which attracted more dust until the stars lit up! And the stars gathered into galaxies. Or maybe it was the other way, dust gathered into galaxies, and stars formed there. It's hard to say when we live such a short time to observe the process, and the galaxies hang together for billions of years."

Wait, what did he just say? Timothy was surprised by the announcement that the expansion seems to be accelerating! If gravity is operating over the whole of the universe, expansion should always be slowing. No matter what. But accelerating? How could that be?

He listened closely, and no specific proposal was given. Someone mentioned "Dark Energy?" What was that? Energy is such that it is visible. How can it be energy, and dark at the same time? Perhaps antimatter would exhibit antigravity, but that has been examined and proved false. Antimatter would have normal gravity. What sort of energy could push galaxies apart, and accelerate them?

The lecture ended with a battery of unanswerable questions.

Timothy walked slowly back to his office, head bent in concentration, trying to make sense of this bombshell.

As the days and weeks went by, the problem seemed to consume more of Timothy's time. He forgot to teach a class, and as he delved deeper into the problem, this became more common. His colleagues in the department noticed this and tried to find out what was wrong, but he could not shake this problem of acceleration. It was consuming him.

Five months later he resigned his position and dropped out of academic life entirely.

Timothy Farnsworth then disappeared.

# Chapter 1



# ELBERTA, UTAH October 1, 2024

The announcement of antigravity took everyone by surprise, but none more than Sam Davis, who was right on top of it. Literally. Sam was a retired civil engineer from Chicago who came to Utah to not be surrounded by buildings anymore, thank you very much. On a sunny fall afternoon, he was riding his ATV out in the hills to the west of Utah Lake. He liked being out in the low scrub of the desert, the sun shining bright, and the cool wind blowing over his face and arms. Riding the trails kept his mind focused. He came out here almost every day and knew the trails well, almost as well as he knew the underground vaults and pipe-racks back in Chicago. The nearest town was Elberta, not much more than a wide spot on the road and home to a few dozen farming families, and even that was miles away. Sam liked it here, riding alone, riding where he felt like going. Enjoying the freedom of a man on his bike.

At exactly 3:00 in the afternoon he was riding what might be called a “transitional trail,” leading from the dirt patches used for trailer parking near the highway to up into the taller hills to the west. He felt a bump. This bump was not in the trail as he rode over. Puzzled, he stopped and looked back. He saw a six foot hole in the ground immediately behind him, right in the trail, with a stream of black objects flowing straight up out of it.

“Bats,” he thought. It occurred to him that he’d never seen bats in the sunlight.

Around the edge of the hole were metal triangles, splayed out like petals of a flower. It was those petals, swinging outward, that hit his ATV. “Unnatural” was the impression he got. The hole didn’t seem to have sides, and the bats weren’t bats at all. They were spheres. And there were a lot of them. They continued to rise straight into the sky and seemed to form a line above him. As he fumbled with his phone to take a picture one of the spheres one left the stream and floated over to him. The sphere was black and about the size of a softball. It floated easily in the air, and sometimes rotated slightly, as if to see something better through the windows distributed on all sides. Then it spoke.

“It’s not safe to be here. That hole is about to open wider and you need to be at least a mile away. Probably further if you want to see what’s going to happen.”

Sam stammered, “Thanks,” but was too dumbfounded to move. He stared as the sphere retreated, slowed, then returned. A bright green laser shone from the side, illuminating a dot on a rather tall hill about two miles west.

“That should be a good place to watch. Go up there. The big show starts at 6. Go now.” It quickly rejoined the stream of spheres.

Sam went. He missed most of what happened next, which he couldn't have seen from below anyway. The spheres, later estimated to be about 250,000 in number, had formed into a long rectangular panel about 2000 feet above the ground. The panel was large, about a mile long and a half mile high. It was one sphere thick. No one from the cities across the lake, where the panel was facing, noticed. The few in the west desert didn't notice either. Sam remained the only witness, and as he rode at a speed higher than he was comfortable riding, he lamented having no photos or video to prove it.

At 3:30 Sam Davis heard a rumble. He was climbing the base of the tallest hill to the West and looked to the east to see dust rising up from all over. As he climbed the trail he saw "petals" opening up, far wider than before. Juniper trees were in his way so he didn't have a good view, but those petals looked huge, maybe 2000 feet long each. Each had a tall wall around its rim to retain the soil and sand that overlay it, and as the petals neared the vertical the dirt was beginning to fall towards the rim. He gunned his engine and raced to the top. When Sam reached the top of the hill the petals were passed vertical and thousands of tons of dirt had fallen beyond the rim and the petals were settling down on it, apparently compressing it, for the petals went nearly flat. The nearest two extended towards Sam far enough to worry him; man-made things aren't supposed to be that big and move that fast, he thought. It took another half hour for the dust to settle to where he could see the hole, but by then other things drew Sam's attention.

# OREM, UT

Professor Timothy “Philo” Farnsworth, known to his neighbors only as Philo, a physicist who retired young and looked no more than 50 years old, stood tall on his front lawn, looking southwest. He was watching for the panel but could not make it out. He knew where it would appear. At 4 pm the panel would light up and his new transmitter on 1400 KHz, the antenna of which popped up on the edge of the big hole, would light up, much to the surprise of the owners of that frequency who shut down 20 years earlier and removed the transmitter and antenna. A smile crept over his face. “This should be fun.”

# UNIVERSITY OF UTAH SEISMOLOGY LAB, SALT LAKE CITY, UT

The second person to know something was happening was Geophysics PhD candidate Terrice Young. She saw it on the seismographs at 3:20 pm. Sharp transients, with no lingering S-wave or P-wave signals. Shallow or on the surface. Located west of Utah Lake. Man-made. Did an airliner just crash? She started checking news apps for anything but found nothing. The signals continued, but of lower intensity. Big peak at 3:32. Something was going on out there, but no one was noticing. She opened a browser tab to a road webcam page run by the Utah Department of Transportation, and found the webcam on State Route 68 was obscured by dust. "What the heck was going on?" she puzzled. Her question would be answered at 4:05 when the story hit the local news stations.

At 4:00 sharp the panel lit up.

# ELBERTA, UTAH

To Sam it seemed as bright as the sun, as if the panel were composed of mirrors. To those across the lake it was bright, eye-catching, and entirely unmissable. Thousands of phone videos of this were captured in the two hours it was lit. The panel read:

ANTIGRAVITY!

6:00 TONIGHT North of ELBERTA

Tune 1400 AM

It shone the same message on the side facing the desert, and the panel began slowly rotating.

# 1400 KHZ AM, UTAH VALLEY, UT

At 4:00 pm sharp the transmitter went on the air, took a moment for the variable LC network to tune the antenna, and began transmitting prerecorded messages for two hours. Tonight would be the transmitter's only time in service. It was a "pirate" broadcast, unlicensed by the FCC and thus illegal, and at 10,000 watts, generating a strong signal, but the Federal Communications Commission, who police the airwaves, ignored it. "It was for public safety," they later claimed.

"Hi everyone, I'm Philo Farnsworth, no relation to Philo T. Farnsworth, just a big fan. Tonight at 6 pm we are launching, from a location north of Elberta, many space vehicles. You are all invited to attend, or to find a location as close as you can. Good locations will be along State Route 68 north of Elberta, from the southern slopes of Lake Mountain, and the northwestern slopes of West Mountain. Those with ATV's can find locations all through the hills west of the opening. Feel free to get as close as you like; our launches produce no flames and are completely safe. Follow any orders that the Utah Highway Patrol and Utah County Sherriff's deputies give you. Be patient. Don't park on private land, which means any field you come across. It should be quite a show, visible from just about any place in Utah Valley. You don't even need to get on your rooftop to see it, it's all high up in the air. Stay tuned to this frequency at 6. I'll tell you all about it. Message repeats. Hi everyone, I'm Philo Farnsworth...."

# PROVO AIRPORT, UTAH

Provo Airport was located on the eastern shore of Utah Lake. It had a manned tower, and those manning the tower had the best view of the panel from anywhere in the valley. The controllers tower listened to this transmission and realized that all the inbound and outbound air traffic south of Salt Lake International Airport flew directly over where the panel was located. After a hasty consultation with the controllers at SLC, all aircraft were diverted away from the launch area. As it also turned out, they didn't need to; all launched spacecraft could easily dodge the airplanes without disturbing any flightpath.

After 15 minutes of of Philo Farnsworth's looping announcement, a second message was sent:

"This is Philo Farnsworth again. Starting tomorrow I will hold a press conference at the launch site each day, Monday through Friday. Each press conference begins at 6 pm, and I alone will speak. When I've finished telling you about the topic for the day I'll entertain questions from the press. Monday the topic is my company, Anti-gravity, Inc. Tuesday the topic is energy. Wednesday it's transportation. Thursday, communication. And Friday we'll clean up with some odds and ends." This message was repeated once every 15 minutes.

# THE “BIG HOLE,” ELBERTA, UT

Sam Davis heard none of this. He was still trying to understand the thing he’d just witnessed. About 4:30 he saw the dust of hundreds, no, thousands of cars headed his way, from the north and from the south.

By 5 he was the center of an enormous scrum of ATVs of all shapes and sizes all trying to find the level spot at the top. That spot belonged to Sam alone. He’d never imagined so many people in the desert. The highway by the lake was already an enormous parking lot. From a loud stereo system mounted to someone’s UTV he heard the messages. “Spaceships?” he said quietly. “I want to know about the spheres.” His neighbor to the right, dressed the same as the farmers Sam knew in Illinois, gave Sam a puzzled look.

The “billboard” was still shining brightly above them, but the display had changed:

ANTIGRAVITY!

6:00 TONIGHT Watch from HOME

Tune 1400 AM

“At least whoever’s running this is paying attention to what’s going on,” Sam said out loud.

His neighbor looked at him and asked, “What spheres? He didn’t say anything about spheres.”

Sam wanted to tell him everything he’d seen, but said only, “That sign up there; it’s made of 5-inch balls floating in the air. One spoke to me. Told me to get up here before that hole opened up.”

“No kidding,” said the neighbor. “Floating, like a balloon?”

“No, floating like an antigravity ball.”

“How do you know that?”

Sam told him the story, with everyone around him craning to hear it. Someone yelled to turn down the radio, and Sam told the story again, for the back-row seats. By the next day Sam would be a minor celebrity, overshadowed, of course, by the events he witnessed.

The two food trucks who drove out, thinking this is just the event to get some sales, were sold out before 5:30. The police, deputies, and highway patrolmen were overwhelmed by the crowd, their



vehicles being just as stuck in the crush as everyone else. A few news helicopters had begun orbiting overhead, beaming live news streams to their audience, and, to the delight of the local news producers, to the world. The national news was still organizing to get their reporters to Utah and find out where Elberta was. Salt Lake International and Provo airports were the busiest in the nation for 48 hours.

At 6:00 the sign went dark and the transmitter went silent, transmitting an unmodulated carrier. The big hole remained dark inside. Everyone pushed forward to see. The transmission restarted.

# 6:00 PM

Philo Farnsworth was again on his front lawn. His neighbors and a few others who knew where he lived were gathered on the street. No news vans. Philo didn't mind. They weren't stepping in his flowerbeds.

At 6:00 p.m. a sphere floated to a position three feet in front of him, to the side so it didn't cast a shadow, and Philo began speaking, heard by most of the planet, or most of the part that was awake:

"Ladies and Gentlemen, it's my pleasure to describe for you what you are going to see tonight. I have invented antigravity, and can control it. This started about thirty years ago, and has reached its fruition tonight. I am very happy to announce the availability of antigravity technology to the world." His neighbors on the street stood in a sort of stunned silence, now making out what this meant. At the launch site the mood was similar, but witnessing the "fruition" of the big hole, they were far more more exuberant.

"The first thing we are going to launch are the ground-to-orbit rocket ships. These are 120 feet tall and will carry 100 passengers to orbit from the ground anywhere on the globe." One rocket lifted from the big hole and hung in the air, three rockets firing a blueish mist from the back. It was silver and sleek, pointed at both ends, bulged gracefully at the center, and at the bottom end, had three hollow bulging tubes. The rockets looked as if they came directly from the 1950's pulp sci-fi magazine covers. "I built these rockets to look good. They will provide easy transportation of passengers and cargo to earth orbit. These are not intended for planetary exploration." The rocket increased thrust, lengthening the plasma cone under each engine and sped vertically out of sight.

"The bluish flames you see projected from the back of each nacelle is water vapor accelerated under about 100 thousand gravities to provide thrust. So though they operate by the force of antigravity, they are in fact classic rockets." Two more appeared from the big hole, and these did not pause. Then six more, then a dozen, then a steady stream of rockets ascended, hundreds the crowd thought. It was 125. It took four minutes.

"Next we will see the launch of the transporters." Small rectangular, glass-walled booths began to ascend slowly. They sped up, out of the way of the fleet of booths that followed. These the crowd estimated at hundreds of thousands. Over the course of five minutes they ascended a hundred at a time and dispersed every direction. "Transporters are intended for terrestrial movement of people and cargo. The small booths you see now are for up to eight people at a time, all going from one location to a single other location, a direct flight, at the reasonable cost of ten cents a mile."

There was a slight hush in the murmur of the crowd, the oohs and ahhs, as everyone did the math in their heads, then a growing applause when they came up with the results. Except for transoceanic flights, this was very cheap. How do we use this?

There was a pause in the narration by Dr. Farnsworth. Something was happening in the hole, judging by the light coming out, but it was below the surface. Over the next minute, everyone waited. The news helicopters saw it first: it was a wheel, over half a mile wide, four large spokes connecting the thick rim to the great hub at the center. It ascended flat, so that the crowd at the launch site saw only a long, curving white wall, growing taller as it rose. It grew to a height of 100 yards then the bottom became visible. As it rose above them, it began to swing to the vertical, and the nature of the wheel was visible to the crowd. A hush fell over them, seeing the enormity of the thing hanging there in the air. The wheel was 1000 meters in diameter, had multiple, Sam guessed ten, decks circling inside the rim, and the hub was open at the ends to create a gaping space where, presumably, the rockets could easily land. The sight was, everyone felt, simply stupendous.

“This is the space wheel Aldebaran,” he said, as the word “ALDEBARAN” appeared on the side of the rim. “It is a place where your children will learn to live in space. No adults will be allowed on the Aldebaran. It will have a six-hour orbit. Schools worldwide can schedule an orbit for classes or even entire grades. Rockets will come to the school to provide transportation to and from the station. We’ll take care of everything. We do not charge for this service. It will be available tomorrow, beginning at 1400 GMT. School principles only can schedule at [antigrav.org](http://antigrav.org). We would like all schoolchildren to have two trips to Aldebaran each year.”

There was a thrill and a certain dread with that announcement. Going into space for free seemed like a dream, but kids going with no parents or teachers? Who’s minding them? How will that work? And why no parents?

As those at the launch site craned their necks higher as the great wheel ascended, some noticed a second huge curved wall of another space wheel moving out of the hole. When it was clear of the hole, it, too, rotated into the vertical.

“This is the space wheel Bellerophon.” Again, ‘BELLEROPHON’ appeared on the side of the rim. “This wheel is mine. You’ll notice the hub is larger, the landing bay is taller, and there aren’t as many floors in the rim. Construction of deep space vehicles is the primary mission of Bellerophon. This wheel is invitation only. Bellerophon will orbit quite high, with a 96-hour period.” As Bellerophon ascended, quicker this time, both space wheels began to rotate. By the time they were in orbit they rotated twice a minute, inducing an apparent gravity close to that of earth, depending which floor of the rim you were on.

A third wheel became visible. “This is the commercial space wheel. As yet it has no name. Space will be rented to hotels and restaurants for space tourism. You will pay for the round-trip rocket flight and whatever the hotels charge you. As I said, it’s commercial. Use it as you wish. This wheel has a 4-hour orbit.”

The third wheel ascend to about 3000 feet off the ground, remaining flat to the ground. It would not rise to orbit for a few months, the time needed to build and outfit all ten levels of the initial leases, which turned out to be far more space than most people imagined. Consequent construction took place in orbit.

There were still “oh’s” and “ah’s” from the crowd, but contemplation of hugeness seemed to be settling in. After the booths, the rockets, and the space wheels, they were getting emotionally tired. Those at home were missing out on the scale of the event, and commentators were running out of superlatives to describe what they saw. No one was switching channels.

Those at the launch site said the next event they could hear, but no consensus formed as to what exactly they heard. The spheres were dropping down, and as they “fell” began to light up. The skin seemed to turn from black to silver, and sparkling lights came from the many windows in the surface. From the helicopters warily orbiting it looked like fireworks spread over the crowd.

“At last, ladies and gentlemen, we will introduce to you the robots. These are small spheres which float using antigravity, have a very sophisticated computer controlling them, and are able to do work using a sort of antigravity manipulation beam. These are made to serve mankind, but as you will see, they are not employable as workers, servants or as slaves. But just this once, feel free to ask them to do something for you. I call them Angels, but that’s not really what they are. Calling them Robots is more accurate.”

What the robots were doing was saying “Hello” to everyone there. And not just those gathered at the launch site. Some of the spheres were showing up all over the globe, saying hello in all the local languages and dialects of anyone they could find outside. If you spoke to them, they answered back. Many spent quite some time convincing people who were not watching the events in Utah that they were not ghosts, UFOs, dreams or spirits. They were asked to pick up heavy objects, to move things, to fly patterns, to recite poetry. Many carried on lengthy conversations. One that happened into the Artificial Intelligence lab at the University of Kyoto was put through an advanced version of the Turing test and passed with flying colors, at the top of the “human” category. The researchers in the lab asked for the code driving the AI. They didn't get it.

In just an hour, it was over. “That’s the show, everyone. This is a new era in humankind, and I know you have many, many questions. I’ll try to answer most of them in the press conferences this week. Check the website, [antigrav.com](http://antigrav.com), for more information. This is Philo Farnsworth wishing you all a very good day, and a very good future!”

With that, the transmitter went off the air. It was 7:00 p.m..

Things at the launch site didn’t exactly end, however. The robots illuminated the ground as the sun went down, helped people find their cars, were still answering what questions they could, and a few were inventing games with some kids. At about 8 O’clock the petals of the giant hole vibrated, began to move, swung back toward the center and slowly sealed themselves. Robots then rushed in, and “picked up” large piles of dirt and put them back over the petals now covering the hole. A robot would hover over a pile, then rise up with maybe two tons of soil and sand suspended below it, as if attracted to a magnet suspended below the robot. From a distance it appeared as if the soil of its own accord decided to move bit by bit into the center of the ring left by the opening petals. That sight alone kept many there at the big hole for the rest of the night, hoping to see more miraculous.

Sam Davis hadn't moved. He was dumbfounded by the entire experience. An engineer by training and profession, his mind whirled at the implications of what he'd seen, particularly moving the dirt. One of his ATV-neighbors hadn't left either. "What just happened here? Do you know?" he asked.

"This guy Farnsworth can control gravity, and he has robots that can control it too."

"What's that mean? How does he do it?"

"I can guess what it means, but I have no idea how it's done. I hope he'll tell us this week. What it means is that a lot of things are going to be easy that used to be hard. Take those transportation booths. They can fly anywhere you want and take you anywhere you want to go. He said the cost, ten-cents-a-mile. That's cheap travel. I mean, it's cheaper than anything but free. He didn't say how long it might take, though. Maybe it's too slow to be of much value, so the price is low. But it's the convenience that you factor in. That's work a lot."

"Convenience?" the neighbor asked.

"Think about traveling by car. You need to stay on the roads."

"Not out here we don't!" his neighbor laughed.

"Cars do. Staying on the road means you get to your destination by following them, turning to new roads, taking a longer path than you need. Booths don't need roads. They can fly up and above the city, taking a direct path. That's a lot less travel time. You'd be amazed how much travel by car is spent driving the wrong way, waiting for lights, stuck in traffic. About 60% of travel time, in Chicago, is spent doing something other than getting closer to your destination. If you can save that time, it's valuable. Much more valuable than ten cents a mile. In Chicago, or any big city. Less in rural areas, I imagine, but still valuable.

"One thing, though," Sam continued, "the booths can't hit each other. That's a real danger, in the large cities. So many people moving, either you need to consolidate passengers and booths into larger groups, or you need some real organization up in the air to prevent collisions. Just look at the situation with aircraft. Aircraft are so numerous in the air that radar has lost its value in keeping aircraft separate. What they do now is to have every aircraft broadcast its location, direction of flight, altitude, identity, all kinds of information, and they listen to all that data from other aircraft at the same time. Computers on board sort it out and create a map. Generate warnings when there is danger of collision. The air controllers on the ground use the same broadcasts to make a map so they can depict the airspace accurately, and they can issue commands to keep aircraft flying safely. Something like that could work, but the airspace over a city would be very congested. Difficult even for an automated system to keep everyone safe." His audience was getting fidgety. Sam switched topics to something he thought might resonate better with his neighbor.

"Take farming. This could change farming in a big way. Where do farmers take their harvest?"

"Take most of it to the co-op. Some we save for seed."

"How many tons?"

“Well, let’s see, 45 bushel an acre in a good year, say a feller has a thousand acres, 60 pound a bushel...ah, that’s...uh...”

“Something short of three million pounds. About fifteen-hundred tons! That can be shipped over the roads, one trailer-full at a time. But what if they could build transporters for grains? You could get the harvest to the co-op in one big load! No more worry about trailer weight and road limits! You load it up and the thing floats over and dumps it in the silos. Or you could sell directly to the buyers of your harvest, cut out the middle man, increase your profit.

“And what about tractors? Maybe they can build them without wheels. No more getting stuck in the mud in a wet year, needing other tractors to stop what they were doing to pull you out. If they can pull the loads. That I don’t know. Maybe. Maybe someone will ask at a press conference. So many questions! My head’s buzzing with them.”

The farmer nodded. “Dang,” he said after a pause. “Well, good luck with that head of yours,” his neighbor said, as he started his ATV. “I’m getting home. So long!”

Sam sat on his ATV for a while more, thinking. “Everything’s different now. I hope Farnsworth knows what he’s doing. Lord I hope he knows. Exciting times. And so many questions! Maybe I’ll go to some of these press conferences, see if I can get in.” Sam started his ATV, and began the long series of trails back to his car and trailer. He drove under the third space wheel, still hanging in the air, occasionally stopping for a spectator standing in the trail, staring straight up. It felt eerie being under such a huge thing. Sam didn’t sleep easily that night. He gave up about 2 am, got up, and began writing out his questions. He could nap tomorrow.