

# THE LABORATORY OF DOCTOR LUCAS

## Kinda Different

Ben is right, Professor Lucas is a bit eccentric. His lab looks like Dr. Frankenstein works here. There's all sorts of weird equipment, with lots of dials and switches, and a constant electric hum. This guy is definitely a magnetism freak!

TK loves it. This is his first real exposure to pure physics - and he's eating it up. Nitro is just shaking his head; the place is like a movie set! In fact, in one corner there's a blackboard and desk. It is a "set" where they tape shows with Professor Lucas for educational television. Walter Lucas is dressed in plaid pants, a white shirt, striped tie and a strange green mackinaw coat that has the sleeves cut off with what appears to be a two or three day old banana sticking out of one of its many pockets. "I hope he's color blind," thinks Nitro, "otherwise I better get my eyes checked!"

Soon TK and Walter, (the Professor asks TK to just call him Walter), are talking magnetism. Walter is writing out calculations and drawing diagrams with various colored felt tip markers on an endless supply of two foot square pieces of white paper that seem to be everywhere in the lab. Sometimes he has to look to find one with nothing on it, or even use the back of a used one. But he always comes up with another piece of paper. It looks like he *never* throws one away.

## Electra

In the middle of all this, Professor Lucas's daughter shows up with a large platter of sandwiches for everyone and replaces the banana in his pocket with a fresh one.

Even though Electra Lucas is still in high school, she's helped her father in his lab since she was old enough to walk, and before that she was out here in a crib. It's always been just the two of them.

"Electra?" queries TK.

"It's not as weird as just having two letters for a name!" she snaps back. "Besides, my dad's kind of wrapped up in his work. His other choice for a name for me was 'Magnetta'. I'm lucky it's Electra."

She immediately goes to work, setting up one of the small 'high speed' magnetic field generators that Professor Lucas has developed on a testing bench.

Walter continues, between bites of sandwich, to explain to TK the fundamentals of electromagnetism and some of the amazing things he's discovered while working with it over the years. By now they are surrounded by piles of the square white sheets of paper, each of which is covered with all sorts of formulas and drawings of electrons and protons, et cetera. Both are completely immersed in a discussion about subjects like "power as a function of time," "the kinetic density and energy of protons" and "Faraday's Law."

## Magnehelics

What it all boils down to as far as TK can tell, is that the Professor has come up with a way to speed up the centrifugal force of protons and electrons with a very small ultra high speed generator, a process he calls "Magnehelics." However, as yet he hasn't had a way to spin his generator fast enough to totally prove his theory. At this point, Electra has the test unit all set up and they spin it up

to full speed. Now it's *really* looking like Dr. Frankenstein's lab!

"This is as fast as we can spin a magnetic field generator with the equipment available at the present," says the Professor, having to shout over the noise. "Look at the size of the unit it takes to get enough torque and RPM's to complete the experiments we've done so far."

TK looks at a huge electric motor driving a complex set of gears and flywheels that take up enough space to park a small pickup truck.

"However," the Professor goes on - yelling above the din, "this generator that we've developed," he points at a small cylinder about six inches in diameter and six inches long, "will easily turn twice this fast. There's just nothing available to spin it at the speed we need for maximum performance."

## **Levitation**

The Professor and Electra proceed with a few experiments that just boggle the mind. Even without what Walter calls "maximum performance", the force field is so strong and controllable with this system, that among other things, he can actually suspend an engine block in mid air!

"If we could spin the generator twice as fast, it would multiply the power of the magnetic force by eight," Walter continues as he shuts off the testing apparatus, "We could suspend an entire car in the air!"

"It'd make a great magic act," thinks TK, and then says, "Our small turbine will easily double the torque and RPM's that you have now. In fact, it could probably spin your generator four times faster than you can now."

Walter just shakes his head and says, "That would be amazing! We could elevate the centrifugal force of the protons and electrons to a level that would radically alter the point of angular momentum!" The Professor is so excited his head is still shaking.

Standing by TK, Nitro is a little left behind by the electro-physics and theory, but he understands what this set-up could do on RocketBike, and is already thinking of ways to integrate it with the systems already on the bike.

The rest of the day is spent with TK and Electra running calculations on TK's computers in the Bikester trailer while Professor Lucas supplies them with data and Nitro tries to think of a way to fit the Magnehelic system on to the bike.

They've decided, as Professor Lucas suggested, to use two of the small magnetic field generators, each one powered by a small turbine running on oxygenated hydrogen fuel from the rocket's H<sub>2</sub>O-S separator. It's beginning to look like the whole set up will fit onboard. "This will make RocketBike a formidable piece indeed," thinks Nitro.

The next morning they head west for home, after packing up two of the magnetic field generators and making arrangements to stay in close contact with the Professor as the project progresses. He will fly out when it's ready to test.

## **Home Again**

After an uneventful trip across the country, everyone is ready to get to work on the Magnebrakes. TK is doing the final design of the system in 3-D CAD (multidimensional "Computer-Aided Drafting"), while Nitro, Terry, and Celeste fabricate and fit pieces together. Because of the extremely high RPM's that each turbine and magnetic generator turn, the tolerances and degree of balance of many of the components is highly critical. Celeste spends a lot of time running back and forth to the machine shop to oversee production of the parts they are having built to be sure they are being built to their exacting specifications.

They have to move along and keep this project on schedule because Celeste has booked them

into the Spring Fair in Texas, where they will do a flying show with RocketBike. The spring Fair is a huge event that draws almost two million people during its run of over two weeks. The Bikesters will be the feature show of the fair, and the performance Terry has planned requires taking off from and landing on the trailer.

After many hours of Nitro drawing sketches and then sitting in front of the computer watching while TK works things out precisely, they've come up with a design that will allow them to fit the complete system on RocketBike. They're building a new rear axle, which contains almost all the components of the Magnehelic and Magnebrake systems including the turbines. "And it looks cool, too," says TK. Rather than build a test bench, they have decided to do the testing right on the bike. The Professor will bring the instruments with him to calibrate the system.

### **Guess Who Came Along**

Celeste and TK are on their way to pick up Professor Lucas at the airport, while Nitro and Terry put the finishing touches on RocketBike, which is ready to test with the new system. As Celeste pulls the van up in front of Professor Lucas and a formidable pile of boxes and cases of testing equipment, she's surprised to see Electra has flown out with him. TK lights right up when he sees her and Celeste thinks, "Hmm, TK's never shown much interest in girls before." On the way back to the farm, TK and Electra are talking non-stop, after the Professor tries once or twice to get a word in edgewise, he finally just exclaims, "Teenagers!" with a shrug of his shoulders.

TK takes Electra on a tour of the farm while Professor Lucas and Nitro are already going full tilt, deciding where the various sensors etc. will be placed on RocketBike so the bike can be used as a test bed for the new systems. Nitro has placed a large piece of heavy steel plate on the shop floor and RocketBike will be suspended on a hoist above it. The hoist will have a sensor on it, and that along with other sensors and instruments on various parts of the bike, will allow them to measure and calibrate exactly the magnetic pull of the new system towards the steel plate.

The data they gather from these tests will also allow TK to calculate how much the torque of the high-speed turbines and generators will effect RocketBike's handling and stability.

The shop is already starting to fill up with those big white squares of paper as Professor Lucas disappears into his world of protons, electrons, and calculations.

### **MagneTwins**

"Professor Walter" soon mesmerizes the twins, who have come out to the shop to "help". During his whirlwind of calculation, diagramming with squeaky felt tip markers on his squares of paper and fitting test equipment on RocketBike, he has also decided to teach the girls Beginning Physics, which they are soaking up at an amazing rate. Or as Professor Lucas says, "They're doing better than a lot of my freshmen!"

TK and Electra arrive back from their tour and start setting up the computer system that will record and interpret the information from the monitoring devices during the test.

At first the twins were quite jealous of TK's attentions toward Electra, but when they discover that she can talk physics to them and continue their instant education, they decide she's "O.K."

Soon the girls are drawing on those sheets of paper themselves and diagramming the basics of "Faraday's law" and "magnetic flux."

Terry, helping Nitro fit test equipment on RocketBike looks at what the twins are doing and thinks, "Scary, these are going to look pretty weird next to their drawings of horses and flying motorcycles on the refrigerator door."

## **First Test**

RocketBike is hanging six feet above the steel plate as everyone prepares for the first test. Terry is on the bike in his silver fire suit and helmet. The rocket engine itself won't have to be running but the separator and several other systems besides the Magnebrakes will be operating and it's best that someone be on the bike to watch over them. Also, Terry will operate the magnetic set-up from on the bike to get the "feel" of it.

TK, Celeste, Electra and Nitro are in front of individual computer screens, each monitoring a separate group of sensors and functions during the test while Professor Lucas and his able "assistants," Katie and Jill, oversee the entire operation.

## **Testing, One-Two-Three**

Professor Lucas indicates "everything ready" and Nitro gives Terry the "go" signal. Terry starts turning on systems. First, the Hydrogen-Oxygen Separator starts up with a muted whirring sound; next there is a quiet ticking as the injectors on the turbines are actuated. At the same time, a low whining begins and gets louder and louder as the turbines and generators come up to speed.

On the bike, Terry watches as the kilo-amp meter begins to indicate power being generated. Down below him the monitor screens are becoming a fast moving blur of activity as they begin to register the flow of data from the sensors and systems.

In less than ten seconds the Professor says, "It's producing the necessary amperes. Tell him to begin to actuate the Magnehelic system." Terry pushes one of the buttons on the new console they've installed and watches the needle on the large Magnehelics gauge begin to move.

Almost immediately he feels the bike begin to pull downward. Nitro, on the radio, tells him, "Give it a little more." He pushes down the Magnehelics button again and this time holds it down for a second. There's a very noticeable increase in the downward pull, "This is cool," thinks Terry. For the next several minutes, they experiment with different levels of magnetic force and find that it's quite controllable. In fact, Terry can increase and decrease the amount of pull to a very precise degree.

Immediately after the test TK, Electra and Professor Lucas begin analyzing the data. The first question they answer is how much steel they will have to put on the floor of the elevator for the Magnebrakes to pull toward, as the elevator will now become the "launch platform" when it's all the way up to the roof. They quickly calculate that a relatively thin sheet will work fine. That's good, the less weight they have to put up there the better! As soon as they have the exact figures, Nitro leaves to pick up the steel.

## **Ready**

The data analysis is complete, and after a couple of days and several more tests in the shop, they have made the necessary changes and adjustments to the system. Nitro is just finishing up painting the sheet of steel he has added to the elevator platform with special non-slip epoxy paint. He's also added extra lights around the top of the trailer for night landings. Tomorrow morning they will be able to do a complete test of the Magnebrakes with a take off and landing!

## **Set**

It's a cloudy but dry morning as they get everything set up. Professor Lucas is running around doing last minute checks of everything. This is the highlight of his career. At last, an actual field test

of his Magnehelics system. He's never been able to test it anywhere but doing experiments in the lab. Plus, they've never been able to spin the magnetic generators at even remotely as many RPM's as they can with this turbine system

### **Blast Off!**

TK and Electra are in front of monitors as Terry gets ready to launch. Celeste is off to the side with a video camera recording everything.

Nitro comes down off the top of the trailer after checking things one last time and his customary preflight handshake with Terry, as he walks over to the computer console and puts on his headset TK tells him everything is "Go". He relays the message to Terry who begins the process of starting up the H<sup>2</sup>O-S separator and injectors, then the turbines and generators, and, when everything is spun up, he pushes the Magnehelics button, holding it down for several seconds. He feels RocketBike pull down hard to the top of the trailer. Then he fires up the rocket, he brings it up to full thrust, feeling it pull against the Magnebrakes which are holding, locking tight to the platform.

"I hope I got that steel bolted down and braced as well as I think I did or he could pull the whole thing apart!" thinks Nitro. However, his worries are unfounded, as it holds quite nicely. Terry hits the rocket burst button, releasing the Magnebrakes at the same instant, and is suddenly airborne with a roar!

By the time everyone recovers from the launch, he's already out over the water leaving a steamy vapor trail behind him. Even Professor Lucas lets his analytical mind rest for a moment; he has never seen anything even remotely that spectacular! Then he gets it back together and squints over Electra and TK's shoulders at the monitors to check the incoming data.

### **UFO**

Terry has never felt acceleration like that, by the time he gets his act back together he's already looking down at the water: "Unreal!" After making a wide turn around the closest island, he waves at some rather startled folks in a sailboat and heads back towards the farm. "I probably just became a UFO sighting," thinks Terry. "I wonder if they had enough time to take one of those blurry UFO pictures of me!"

### **Slow Landing**

He makes a circle around the farm and then sets up to make a slow test pass. As he floats in low at stall speed over the edge of the trailer, he experiments with the Magnebrake button, pressing it a little bit at a time to see what he's got.

It's amazing: he feels the magnetic force immediately. This system is incredible! It's even more powerful than they thought. Everything is working just right and Terry decides to go ahead and do a landing instead of waiting until the next time around as was planned.

Using the magnetic force which is pulling RocketBike more and more down towards the trailer, and the power and aerodynamics of the bike which are trying to hold it up, he is almost hovering while he slowly sets it down. As RocketBike settles on the flight deck, much like a Harrier Jet landing, Terry thinks he sees, out of the corner of his eye, a large eagle hovering a few yards off to his left side. But when he turns his head to look there's nothing there. "The ultra acceleration of the take off must have shook up my vision a little," he says to himself, and then forgets about it. On the ground, Nerissa and the twins saw it too, but don't say anything--even to each other.

The rest of the day is spent doing several more complete takeoffs and landings and a series of

touch-and-goes, until they have it down pat. Or as Terry says, “I could take off and land up there in my sleep.” Plus, they’ve amassed tons of data, which makes both TK and Professor Lucas quite happy.

### **Doctor Lucas’ Departure**

Professor Lucas has just about finished getting all his equipment packed up, and then Nitro will run him down to the airport to catch his plane. Electra is going to stay and ride down to Texas with them, spend some time at the fair, and then fly home from there. After sharing her room with Electra for the last week, Celeste has decided she’s “alright”. Kind of a science club/computer nerd type, like TK, but definitely okay. They’ve become good buddies.

**Chapter 17**

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