***Antigravity***

**Breaking the Law**

**Breaking the Law of Gravity**

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In 1996, Russian émigré scientist Eugene Podkletnov was about to publish a peer-reviewed article in the respected British Journal of Physics-D - proving, he claimed, that gravity could be negated. Then a London newspaper publicized his conclusions, and the skeptics had a field day. Everyone knew you couldn't mess with the law of gravity - Einstein himself had said so.

Podkletnov withdrew the article. His university evicted him. He retreated from the public eye.

But the controversy hasn't gone away, as his findings began to be investigated in laboratories around the world. Including one owned by NASA.

Now, as Charles Platt discovers, Eugene Podkletnov is back and unrepentant.

Shortly before dawn on a dismal, rain-drenched winter morning I'm heading out of Helsinki along Highway 3, into the heart of Finland. This obscure nation is an underpopulated wilderness sandwiched like a DMZ between Russia and Sweden, extending all the way up into the Arctic Circle. The sun barely sets here in the summer, while in the winter, it barely rises. I can't imagine why anyone would visit Finland in the dark months, unless motivated by some strange need to go skiing in perpetual twilight ... but my grueling pilgrimage has nothing to do with snow. I've come in search of a singular individual, a reclusive, elusive Russian émigré scientist named Eugene Podkletnov, who claims that he can defy the force of gravity.

Five years ago, while testing a superconducting ceramic disc by rotating it above powerful electromagnets, Podkletnov noticed something extremely strange. Small objects above the disc seemed to lose weight, as if they were being shielded from the pull of Planet Earth. The weight reduction was small - around 2 percent - but nothing like this had ever been observed before. If the shielding effect could be refined and intensified, the implications would be immense. In fact, practical, affordable gravity nullification could change our lives more radically than the invention of the internal combustion engine.

Imagine a future in which vehicles can levitate freely.

Highways and railroads become obsolete, airplanes no longer need wings, and oceangoing ships can be broken up for scrap. Industries in which large masses have to be transported or supported - from mining to construction - are revolutionized. Citizens gain unprecedented mobility, transcending all geographical and national barriers.

Meanwhile, space travel is now safe, cheap, and fast. Resources can be mined in the asteroid belt and shipped to factories relocated in orbit around Earth, freeing our planet from pollution and greenhouse-gas emissions. Ultimately the old dream of colonizing other worlds may be realized, not just for a handful of highly trained astronauts but for millions of everyday people.

Far-fetched? Indeed. Most physicists laughed at Podkletnov's report. Riley Newman, a professor of physics at UC Irvine who has been involved in gravity research for 20 years, typified the reaction when he commented, "I think it's safe to say gravity shielding is not conceivable." Like many scientists, he felt that Podkletnov must have made a mistake, measuring magnetic fields or air currents instead of genuine weight reduction.

And yet, few of Podkletnov's critics actually bothered to read his description of his work. Their reaction was so dismissive, it almost sounded like prejudice. From their perspective he was an outsider, a nonmember of the "gravity establishment." They couldn't believe that a major discovery in physics had been made by such a no-status dilettante fooling around at some obscure lab in Finland.

True, Podkletnov wasn't a physicist - but he did have a doctorate (in materials science) and he knew how to do careful lab work. When he wrote up his results, his papers were accepted for publication in some sober physics journals, and at least one theoretical physicist - an Italian named Giovanni Modanese - became intrigued. Modanese didn't dismiss the whole idea of gravity shielding, because on the subatomic level, we simply don't know how gravity functions. "What we are lacking today," according to Modanese, "is a knowledge of the microscopic or 'quantum' aspects of gravity, comparable to the good microscopic knowledge we have of electromagnetic or nuclear forces. In this sense, the microscopic origin of the gravitational force is still unknown." At the Max Planck Institute in Munich, he developed a theory to explain the shielding phenomenon.

In the United States, scientists affiliated with NASA were thinking along similar lines. They obtained funding to replicate Podkletnov's experiment - but still the skeptics remained cynical and unimpressed. The concept of gravity shielding has an aura of science-fictional weirdness; it sounds like something out of The X-Files. Indeed, Podkletnov's experiment was actually mentioned in an episode of The X-Files, virtually guaranteeing that most scientists wouldn't take it seriously.

Podkletnov now claims that his results have been verified by researchers at two universities - but he won't name these people for fear that they'll be ridiculed and ruined by the gravity establishment. The team at NASA make no secret of their work - but they have no definite results, yet. And so, at this time, the only credentialed scientist claiming to have witnessed gravity modification is Podkletnov himself.

For almost a year I've been wrestling with this story, which is a journalistic nightmare, because nothing can be verified. Podkletnov may have made one of the great breakthroughs of the 20th century, or he may be suffering from a severe case of hubris coupled with wishful thinking. In darker moments I wonder if he even exists; the whole gravity story could be a prank by a bunch of hackers using a fake email address and a Finnish phone number that auto forwards calls to a dorm at MIT.

These thoughts run through my mind as I pull off Highway 3 into a rest area, crack a screw-top bottle of Vichy water, and check my map. It's now an hour after dawn, but the light is still so dim, the scenery outside is all in shades of gray - as if I'm trapped inside a monochrome TV with the brightness control stuck near zero. In Finland in the winter, when the sky is totally choked with clouds, the country becomes one big sensory-deprivation tank.

On the car radio some nameless station plays authentic American bluegrass, except that the lyrics are in Finnish, which is a head-bending experience, the last thing I need right now. Still, having come 5,000 miles I am determined to see this through. In just a few hours I am scheduled to meet Eugene Podkletnov in person, in the town of Tampere, where his gravity-modification experiments took place. I will verify, if nothing else, that he does exist ... assuming of course that I can find Tampere in this drizzle-soaked wilderness of undifferentiated gloom.

Gravity shielding isn't a new idea. H. G. Wells explored its potential for spaceflight almost a century ago in his classic novel The First Men in the Moon, and Wells also foresaw an avalanche of applications on Planet Earth, creating an uneasy conflict between pure science and pure greed. In his novel, a lone mad scientist says he isn't in it for the money; he just wants some recognition, and maybe a prize or two. But then he starts to realize just how much money could be involved. "I suppose," he says thoughtfully, "no one is absolutely averse to enormous wealth."

Eugene Podkletnov must be aware of this - but so far, he has reaped more pain than profit. After publishing a preliminary paper in 1992, he wrote a more thorough paper that was rejected by more than a dozen journals till finally it penetrated the peer-review process at the respected British Journal of Physics-D. This seemed to offer the recognition he was hoping for, yet instead it initiated a career-destroying nightmare.

The trouble started when Robert Matthews, science correspondent to the British Sunday Telegraph, got hold of the story. Matthews, like any journalist, relies on contacts, and he's disarmingly honest about it. "You don't get stories by digging for them," he now says with a laugh. "This isn't like Sherlock Holmes, that's a lot of bollocks. It's like, you hope a little brown envelope turns up in the post, and if it does, you're in luck."

In his case the little brown envelope contained page proofs of Podkletnov's paper, leaked by a man named Ian Sample who worked on the editorial staff of the Journal of Physics-D. Although Podkletnov's paper hadn't been published yet, Sample and Matthews decided to break the story in the Sunday Telegraph, which printed it on September 1, 1996. The first sentence was key: "Scientists in Finland are about to reveal details of the world's first antigravity device."

Antigravity? Podkletnov never used that word; he said he'd found a way to block gravity. Maybe this seemed a trivial distinction, but not to the staid professors at the Institute of Materials Science in the University of Tampere, to whom "antigravity" sounded like something out of a bad Hollywood movie.

The director of the institute promptly denied any involvement and declared that Podkletnov was working entirely on his own initiative. Then the coauthor of Podkletnov's paper claimed that his name had been used without his knowledge - which was highly implausible, but he stuck to his story, presumably because the institute told him to. In the end Podkletnov had to withdraw the paper from publication in the journal, he was abandoned by his friends, and his credibility was impaired.

At this point I obtained Podkletnov's phone number in Tampere and gave him a call. He turned out to speak fluent English but was reluctant to say anything, claiming that irresponsible journalism had ruined his career. I gave him various assurances, faxed samples of my work, made more calls - and finally, on November 10, 1996, he gave me a telephone interview.

He told me how he had made his discovery. "Someone in the laboratory was smoking a pipe," he said, "and the pipe smoke rose in a column above the superconducting disc. So we placed a ball-shaped magnet above the disc, attached to a balance. The balance behaved strangely. We substituted a nonmagnetic material, silicon, and still the balance was very strange. We found that any object above the disc lost some of its weight, and we found that if we rotated the disc, the effect was increased."

I had no way to evaluate the truth of this, so I contacted John Cramer, a physicist who was familiar with the story. "I don't believe he has discovered a shield for gravity," Cramer told me, insisting that huge amounts of energy would be required.

I checked back with Podkletnov. "We do not need a lot of energy," he said, sounding irritable, as if I were wasting his time with dumb, obvious questions. "We don't absorb the energy of the gravitational field. We may be controlling it, as a transistor controls the flow of electricity. No law of physics is broken. I am not one crazy guy in a lab, we had a team of six or seven, all good scientists."

So who should I believe? Maybe if I met Podkletnov in person, I could assess his plausibility - but a few days later, he told me this was impossible. In fact, he said, he had decided that he wanted no further publicity of any kind.

This put me in an impossible position. Podkletnov had talked to me, originally, because I pledged to publish nothing about him without his consent. Now that he had withdrawn his consent, I simply had to honor my pledge. Temporarily at least, I abandoned the story.

Months passed. Once in a while I sent email to the Italian physicist, Giovanni Modanese, who seemed to know where Podkletnov was hiding, but Modanese just confirmed that the reclusive Russian still wouldn't talk. Finally, by chance, I read a Usenet message from a 34-year-old software developer in Oregon named Pete Skeggs, who turned out to be a pivotal figure in a newly emergent Net phenomenon: the gravity-enthusiast underground.

Skeggs had a BS in electrical engineering, a BS in computer science, and he loved to tinker with things. In his own little workshop he had tried to replicate Podkletnov's experiment using some homemade electromagnets and a 1-inch superconductor that he ordered from the Edmund Scientific mail-order catalog for US$24.95. He didn't get any results, but decided to start a gravity-modification Web page. Soon it was a huge repository of abstracts, speculation, and references, along with reports of work by other amateurs, some of whom claimed amazing results. A man named John Schnurer, at Antioch College, Ohio, said that his homemade setup could reduce the force of gravity by 2 percent on a reliable, repeatable basis.

I sent email to Schnurer; he replied enigmatically, refusing to divulge his home or office phone numbers and insisting that I must page him, after which he would call me back. On September 17, 1997, he returned one of my calls.

Aged 45, Schnurer said he had a "strong science background," though he admitted he had no college degree. He claimed to have coauthored "more than 12 peer-reviewed papers" and had spent "more than nine years providing tech support for Armstrong Aerospace Medical Research Labs at Wright-Patterson Air Force Base," where they had been trying to find ways for pilots to control airplanes via brainwave sensors. "We had a flight simulator," Schnurer said. "You could sit in it and make it roll with your brainwaves." However, he'd been laid off in 1995 because of budget cuts, and he was frank about his current problems. "I don't have any money," he said. "Most of my equipment I built myself, or borrowed, or resurrected." Still, he claimed that his redesigned version of Podkletnov's setup was working on a routine basis and could be used onboard Earth satellites to make small orbital corrections.

Was Schnurer for real? He agreed that I could visit him, so I arranged for Wired photographer Norman Mauskopf to meet me in Ohio. A couple of days before my trip I contacted Schnurer just to check that there were no snags, and he assured me his apparatus was still up and running. "I have enough liquid nitrogen for one run, maybe two," he said.

This made me suspicious. Two demos would be just enough to show some results, while preventing a more thorough investigation. I sent email asking Schnurer to obtain more liquid nitrogen. I even told him that if he didn't have enough money, I'd pay for it myself.

Two hours later, he called me. "Can you wire me the cash via Western Union?" he said. "I need $150."

Well, I'd been dumb enough to make the offer, and I was determined to witness a thorough trial; so I sent the money. Two days later I was in a rented car with Norman Mauskopf, driving across the flat farmland of Ohio to Antioch College, just south of Dayton.

We found Schnurer in a fine old red-brick residence with white-painted casement windows and a big front porch. This turned out not to be his home; the place had been divided into offices. Schnurer's workshop was in a long, thin sunroom where a white-painted wooden bench left barely enough space for people to squeeze past each other. The bench was strewn with components, tools, computer circuit boards, books, and loose-leaf binders. At the far end stood the Gravity Modification Machine.

A long wooden rod was pivoted on a nail, supported by a wooden yoke glued to a block of plywood. A piece of string dangled from one end of the rod, tied around a lump of scrap metal. At the other end a tangle of fine wires ran down to some coils underneath a 1-inch black disc - a superconductor that had been donated by a local manufacturer, thus saving Schnurer the $24.95 charged by Edmund Scientific. When I asked why he had to economize so stringently, he muttered something about his family not fully sharing his enthusiasm for gravity research.

The wires from the electromagnets snaked back to a 12-volt power supply, via a "switching system" consisting of bare copper contacts that had to be maneuvered by hand. "You can't photograph that," Schnurer said firmly. "That's an integral part of my patent application."

I stared at his apparatus in dismay. Even straining my creative powers to the limit, clearly there was no way to portray this as cutting-edge science. The components looked as if they'd been salvaged from a dumpster.

Schnurer, however, was eager to begin. He showed me his "target mass" (a bundle of seven glass rods), which he placed ceremoniously on a borrowed digital scale. He noted the readout: 27 grams. Then he picked up a small tank of liquid nitrogen - my liquid nitrogen, I realized, feeling a bit pissed about it - and he poured a portion into a Dewar flask. The liquid hissed like oil in a hot frying pan as it boiled violently at room temperature. We waited a few minutes for the clouds of white vapor to die down.

"Now!" said Schnurer. He lowered the electromagnets, disc, and target mass into the Dewar flask, to cool the disc so that its electrical resistance would diminish to zero. Then he placed the lump of scrap metal on the scale, to read the difference in weight between it and the assembly in the Dewar flask. The numbers flickered wildly, responding to thermal currents in the liquid, air currents in the room, vibration from a truck passing on the road a couple hundred feet away, and a dozen other random factors. Still, a substantial weight reduction would make these small fluctuations irrelevant. "We'll call the weight 20.68," Schnurer said, scribbling the figure.

He went to his copper contacts and started manipulating them to send pulses to the electromagnets. I watched the scale - and suddenly felt as if reality was warping around me, because the numbers began changing. According to the scale, the target mass was getting lighter.

"Write down the peak value!" Schnurer alerted me.

The numbers were still jumping, but I averaged them as well as I could. Schnurer grabbed his scrap of paper, did a subtraction, divided the result by the original weight of the target mass, and got his answer: here in this funky little workshop, the force of gravity had just been reduced by 2 percent.

"Let me try that," I said, pointing to the copper contacts. Schnurer stepped aside, looking somewhat reluctant; but when I did what he had done, the results were the same.

"Maybe you should take a look over here," Norman Mauskopf remarked, nodding toward the superconductor where it dangled in the liquid nitrogen. I realized with chagrin that I had been totally hypnotized by the red LEDs on the scale. When I turned my attention to the flask, I saw what I should have seen before: electricity flowing through the submerged coils was creating heat that made the frigid liquid boil. Just as eggs bounce around when you boil them in a saucepan, the superconductor and its target mass were being lifted by bubbles. We weren't measuring gravity reduction, here, we were conducting an experiment in cryogenic cookery!

I pointed this out to Schnurer. He looked annoyed - then indifferent, and I realized that there was still no doubt in his mind, because he was a True Believer. He knew he was modifying gravity. "So we'll lift it out of the liquid nitrogen," he said. "It'll stay cold enough for the effect to work for 15 or 30 seconds. And you'll see, it will still get lighter."

We tried it, and sure enough the assembly lost weight. But it had dragged some liquid nitrogen with it from the flask, and was steaming madly. This was now the source of weight loss, just as damp clothes become lighter as they dry on a washing line.

"John, you're not measuring gravity fluctuations," I told him. "You're measuring the effects of boiling and evaporation."

Schnurer was now visibly agitated. He wanted to run the experiment again. And again. He varied the target mass, scribbled more numbers on odd scraps of paper - after a while there were so many scraps, he lost track of which was which. For several hours he tried every conceivable configuration.

While waiting patiently to see how long it might take him to admit defeat, I noticed a page from Business Week lying on his workbench. It was an article about gravity modification, mentioning Schnurer's work, illustrated with a photograph taken right here in this cramped little hobby-den - although false color and a wide-angle lens made the place look like a futuristic laboratory. Then I scanned the text and realized that this writer possessed the creative powers that I so sadly lacked. He seemed cautious and objective yet made Schnurer sound like a fully qualified scientist, even identifying him as "director of physics engineering at Antioch College."

I queried Schnurer about this. Gruffly he told me that he has never been employed by Antioch University; his workshop just happens to be near Antioch. With several partners, he runs a very small company named Physics Engineering, of which he's a director. Only in this sense can he be termed a director of Physics Engineering.

Around 9 p.m., we called it quits. I didn't enjoy being a heartless skeptic, questioning John Schnurer's credentials and debunking his dreams of refuting Einstein. I just wanted to go home.

Back in New York, three pieces of email from John Schnurer were already waiting for me. With urgent sincerity he claimed there had been a series of unfortunate errors. The superconductor had become degraded! The results I'd witnessed were invalid! He begged me to return to Ohio right away, to witness a whole new series of experiments with a brand-new disc.

Well - thanks, but no thanks. I didn't relish another session of Skeptic versus True Believer. I felt sure that it wouldn't work out any better the second time around, and it wouldn't make either of us very happy. Instead, I followed up another reference from the indefatigable Pete Skeggs, and learned the strange history of NASA's involvement in gravity-shielding research.

In 1990 a senior scientist at the University of Alabama named Douglas Torr started writing papers with a Chinese woman physicist named Ning Li, predicting that superconductors could affect the force of gravity. This was before Eugene Podkletnov made his observations in Tampere, so naturally Li and Torr were delighted when they heard that Podkletnov had accidentally validated their predictions. Their university enjoyed a good working relationship with the Marshall Spaceflight Center in Huntsville, where they eventually persuaded NASA to start a serious long-term investigation. Ning Li remained involved, while Douglas Torr relocated to South Carolina.

Skeggs now forwarded to me an amazing document suggesting that Torr had ventured into even stranger territory. The document was Antigravity News and Space Drive Technology, an amateur zine that looked like a 1970s counterculture manifesto, generated on an old daisywheel printer, pasted into pages, photocopied, and stapled down the left edge. This science-oriented samizdat was a hopeless muddle of wacky ideas and grandiose claims, but on its back cover it reproduced an announcement from the Office of Technology Transfer at the University of South Carolina.

Incredibly, this text described a "gravity generator" that would create a force beam in any desired direction. The announcement concluded: "University seeks licensee and/or joint development. USC ID number: 96140." At the bottom of the page was a phone number for William F. Littlejohn at the Office of Technology Transfer, so I called it, and reached an assistant named Frances Jones. Sounding not very happy, she confirmed that the announcement was genuine. "But Mr. Littlejohn says it was presented prematurely, it got wider distribution than we intended, and we're - still working on the technology, and would prefer not to receive any publicity."

She refused to say if Douglas Torr was involved, but on the university's Web site I found an Annual Report to the Faculty Senate which listed his name on a patent application for the gravity generator. This was totally bizarre; a respected university supposedly looking for commercial partners to develop a gadget straight out of a 1950s science-fiction novel. Surely, nothing could be weirder than this - but no, there was more in store. Through my physicist friend John Cramer I learned of a scientist named James Woodward who claimed to have found a way to reduce the mass of objects.

"Mass" doesn't mean the same thing as "weight." You'd weigh less on the moon than on the Earth, because weight depends on the force of gravity. Mass, on the other hand, is an innate property of matter; it exists even when an object is in free fall. Nevertheless, Woodward had written a paper claiming that he could adjust the mass of an object (Foundations of Physics Letters, vol. 3, no. 5, 1990), and he even managed to get a US patent for his device (number 5,280,864, issued January 25, 1994).

I called him at his office at Cal State Fullerton, where he's been affiliated for 25 years and is currently an adjunct professor of physics. He turned out to be a jovial, amiable man who was more than willing to talk on the record, probably because his work has remained so obscure, no one has had a chance to ridicule it yet.

The equipment he uses is relatively simple, which is just as well, since he's had to pay for a lot of it himself. If you want to reduce the mass of an object in the privacy of your own basement workshop, here's how it's done: Obtain a high tech ceramic capacitor (a standard electronic item) and attach it to the speaker terminals on a stereo amplifier. Feed in a steady tone (perhaps from one of those stereo-test CDs) while using some kind of electromechanical apparatus (maybe the guts from an old loudspeaker) to vibrate the capacitor up and down. According to Woodward, the capacitor's mass will vary at twice the frequency of the signal, so you will need a circuit called a frequency doubler to drive your vibrator at the correct rate. If the vibrator lifts the capacitor while it's momentarily lighter and drops it while it's heavier, you achieve an average mass reduction - which sounds as if you're getting something for nothing, except that Woodward believes that in some mysterious fashion you are actually stealing the energy from the rest of the universe.

I asked him why no one had ever noticed that the weight of capacitors varies in rhythm with their energy level. "Well," he said, "people don't normally go around weighing capacitors."

He claimed that so far he's measured a reduction of up to 150 milligrams; just a fraction of an ounce. Still, practical applications could be developed. "If someone decided to put substantial amounts of money into this, you could have something within three to five years. For spacecraft, all you'd need would be big solar arrays instead of rocket fuel."

I asked him if there was any chance that his discovery might turn out to be bogus, like cold fusion. "Of course!" he said, laughing cheerfully. "I have biweekly paranoia attacks, and then I try something else to see if I can make this effect go away. But, it won't go away."

I asked his opinion of the team at NASA. "Serious and competent, sensible folks," he said - though he seemed to find gravity shielding a bit implausible, even compared with mass reduction.

Clearly, it was time to call NASA. I contacted David Noever, a theoretical physicist and former Rhodes scholar who started working with NASA in 1987 after getting a PhD at Oxford University, England. He seemed to be the key figure trying to replicate Podkletnov's work, and he invited me to see for myself.

The Marshall Spaceflight Center is a box-shaped 10-story office building with a 1960s pedigree. The closer I came, the shabbier it looked; when I walked up the front steps, I noticed cracks between the faded gray panels of its façade. Alas, poor NASA! Formerly the favorite child of federal legislators, now nickel-and-dimed half to death. Upstairs I found utilitarian government-style offices with cheesy rubberized floor tiles, ancient gray steel desks, and file cabinets that seemed to have been repainted by hand. The place was almost Soviet in its austerity.

I entered the office of Whitt Brantley, chief of the Advanced Concepts Office, and found five people waiting around a wood-grain Formica conference table. David Noever was one of them: a tall, brooding figure with intense eyes and dark brown hair in need of a trim. Behind a desk at the far end sat Brantley, a genial Santa Claus who joined NASA back in 1963, when he worked on von Braun's wildly ambitious scheme to put men on Mars, before the Apollo program had even test-launched its first capsule. Even this seemed relatively normal, though, compared with gravity shielding. I asked him how he had raised the money for such a wacky idea.

"The first research proposal I wrote didn't have the word 'gravity' in it anywhere," he said with a grin. "Then the Sunday Telegraph article came out, and our administrator, Goldin, was going to a Star Trek convention where the Trekkies might ask him about gravity modification, so we decided to tell him what was going on. He backed up a step or two, then said he thought NASA should spend a little money on work like this. So, we wiped the sweat off our brows and continued."

Tony Robertson, another member of the team, leaned forward, a lot younger and more earnest that Brantley. "The way I see it," he said, "NASA has a responsibility to overcome gravity."

"Right," said Brantley. "We've been building antigravity machines since day one - it's just that they're not as efficient as we'd like them to be."

Everyone chuckled at that.

"It's true we're pushing the edge," Brantley went on. "But the only way to guarantee you don't win the lottery is, don't buy a ticket."

I turned to David Noever, who looked tense and restless, as if he'd rather be in his laboratory. I asked how he felt about amateur gravity enthusiasts. "Well, we went to visit John Schnurer," he said. "But he wouldn't let us in. We had to meet him outside on a park bench. We also invited Podkletnov to come to Huntsville, back in January 1997. We said we'd pay his way, but he said he didn't see any value in it."

"It's not uncommon for people to distrust NASA," said Brantley, "because we're part of the government. They think even if we did discover something, we'd cover it up. You know, Roswell and all that -"

By this time, Noever was definitely ready to go. "Let's show you the lab," he said.

He led the way outside to an enclave of austere, ugly concrete buildings that looked as if they might have been left over from World War II. Inside, past massive machinery for pressing ceramic discs, I entered a lab about 20 feet square, with one wall of windows, fluorescent ceiling panels, big white cylinders of liquid helium and liquid nitrogen, and heavy-duty rack-mounted power supplies in rectangular metal cabinets.

Noever explained that the team is trying several different approaches. He showed an assortment of 1-inch superconducting discs, made from every conceivable mix of ingredients. He demonstrated a gravimeter: a beige-painted metal unit the size of a car battery. Across the room was a tall insulated tank about a foot in diameter, with a huge coil wrapped around the base capable of taking 800 amps, though Noever said that the current would create enough heat to melt the floor. The tank had been designed to contain a 6-inch disc rotating in liquid helium, with the gravimeter suspended above.

Meanwhile, the team was still struggling to fabricate 12-inch discs, which tend to fracture into pieces during pressing and a subsequent baking process. "This is what Podkletnov says is the heart of the matter," said Noever, "learning to make the discs. He said it could take us one or two years. He did reveal the composition -"

But not the step-by-step method for production?

Noever laughed sourly. "Of course not. At least, he hasn't told us. He's very adamant about not talking to people about some aspects of this work."

Already, though, Noever said he had achieved some possible results with smaller discs. He showed one graph that suggested significant changes in gravitational force. "We only saw this a couple of times. We have to see it 100 times before we'll allow ourselves to reach any conclusions. And then we'll get the Bureau of Standards in here to check it out, and then, maybe, we'll publish a paper."

Noever suggested that gravity may have a natural frequency, far higher than X rays or microwaves, which would explain why it penetrates all known materials. A superconducting disc could resonate and downshift the frequency to a lower level where it could be blocked by normal matter. "But this is all very speculative," he cautioned, adding that it's just one of three theories that could explain gravity shielding.

Ron Koczor, project manager of the team, had been sitting over at one side of the lab looking amiable but diffident. Koczor's background is in infrared and visible optics; his last project was a space shuttle experiment to measure winds in Earth's atmosphere using specially designed lasers. By comparison, gravity shielding research is a labyrinth of uncertainties.

"In this kind of research you go from depression to elation, sometimes just from hour to hour," said Koczor. "But if this is real, it's going to change civilization. The payoff boggles the mind. Theories about gravitational force today are probably comparable to knowledge of electromagnetism a century ago. If you think what electricity has done for us since then, you see what controlling gravity might do for us in the future."

Before going to Huntsville I had sent yet another message to Giovanni Modanese, asking again if Eugene Podkletnov was willing to talk to me. Naturally I didn't expect a positive reply - but to my amazement Modanese wrote back saying that Podkletnov had returned to Finland and was now ready to cooperate.

I called Podkletnov right away. Yes, he said, it was true; he would talk. I could meet him in person.

Four days later I was boarding a Finnair MD-11. Nine hours after that I found myself in Helsinki Airport, waiting for my baggage to come off a carousel. About 200 Finns were waiting with me, looking stoic and withdrawn, like guests at a funeral. The only sound was the clanking of the conveyor belt, and I remembered a phrase from the Lonely Planet travel guide that I'd read on the plane: "A happy, talkative Finn does not inspire admiration among fellow Finns, but rather animosity, jealousy, or hostility. Being silent is the way to go."

Outside, it was almost noon but looked like dusk. "Winter is the most hopeless time, when many people are depressed," my guidebook warned me. In fact, back in the early 1970s a Finnish scientist named Erkki Vaisanen discovered SAD - seasonal affective disorder, the type of depression caused by lack of sunlight. He was tipped off by the rash of suicides that sweeps through Finland every September. I began to wonder why Podkletnov had chosen to relocate here.

I drove to a grim little industrial park (where all the buildings were painted gray, as if to emulate the weather) and checked in at a Holiday Inn that looked like a small electronics factory. After exiting an elevator paneled in stainless steel, I struggled to open a massive metal fire door, walked past a sauna, and unlocked my tiny Euro-style room. Shortly before sunset, around 4:30 in the afternoon, I did some serious channel surfing in a dutiful attempt to locate and comprehend the core, the quintessence of Finland.

The first thing I found was an ancient episode of hey-hey-we're-the-Monkees resuscitated from some godforsaken video archive and dubbed in French, "parce que nous monkee around." Then there was a 1990 Hong Kong action movie, dubbed in German, subtitled in Finnish - maybe Swedish, it was hard to tell.

Finland's identity was proving elusive, and I could think of at least one reason why. A key factor could be the 1,300-kilometer frontier that the country shares with Russia. How did the Finns cope with the ominous presence of that notoriously expansionist superpower during the fearful decades of the Cold War? They suppressed their separate national identity. They made their political system close enough to communism to placate the Politburo, and they traded actively, selling the Russians cheap wood products and electronic devices such as telephones. Thus, they made themselves far too useful to be worth invading.

Interestingly, the policy of appeasement paid dividends. Finland enjoys steady growth, with inflation down near 1 percent. It exports telecommunications products to the rest of Europe and steals shipbuilding contracts from the Japanese. Its infrastructure looks well maintained. Its people seem healthy. Thus, Eugene Podkletnov's presence here is not such a mystery after all. Compared with Russia, Finland is a land of opportunity.

And so, finally: Tampere.

As I drive in on Highway 3, the first thing I see is a huge smokestack and a rail yard with mercury-vapor lights on steel towers. Another smokestack stands in the distance, trailing a white plume. Although the population is under 200,000, this is still the second-largest city in Finland, and a haven for industry.

Opposite the railroad I find the Hotel Arctia, where Podkletnov has agreed to meet, since he feels that his "modest apartment building" is not suitable.

In a slightly rundown lobby paneled in varnished plywood, I sit on a couch upholstered in drab gray wrinkled fabric and wait as patiently as I can, very conscious that I have come 5,000 miles on this far-fetched, far-flung pilgrimage - at which point a man in a navy blue pinstriped business suit walks into the lobby.

This is Eugene Podkletnov.

He looks strangely similar to NASA scientist David Noever, with sharp features and a restless intensity. Close up, though, his face shows a poignant mix of emotions. His mouth twists quixotically at the corners, as if, at any moment, he may display some unexpected response - pathos, laughter, or resignation.

He sits beside me on the rumpled gray couch, and I ask why he decided to talk to me after almost a year of evasion. "You seem sincere," he says, choosing his words cautiously, "and you are polite, and -" He smiles faintly. "You are very persistent."

But he's not interested in small talk. He pulls out a wad of papers and starts a long monolog.

First, he tells me, his work has been replicated by students in Sheffield, England, and scientists in Toronto, Canada. No, he won't give me their names. He consulted by phone with the Sheffield students, and he went in person to Canada, where he stayed for several weeks. "If people follow my experiments exactly," he says, "they succeed. But if they want to follow their own way -" He shrugs. "I try to cheer them up, let them do it, they may find things that I missed." He sounds skeptical - sarcastic, even - and I think he's referring to the NASA team. I wonder if there's a trace of Russian jealousy, here; a suspicion that well-funded Americans will stamp "NASA" on the side of the first fully functional grave-modifying flying machine, at which point everyone will forget about Eugene Podkletnov.

He claims, though, he's happy to share the glory. "What we should do is combine our efforts and organize the Institute for Gravity Research. My aim in life is not to get money, not to become famous. I have 30 publications in materials science, and 10 patents, but -" His mouth twists with bittersweet humor. "Russian people are never rich unless they are criminals. I don't dream about big money. I just want a normal existence, working for the Institute for Gravity Research. That is my dream."

He speaks rapidly and shows no hesitation, not the slightest sign of doubt. I get him to stop and back up a little, to tell me about his history.

He says that his father was a materials scientist, while his mother had a PhD in medicine - just as he, now, is a materials scientist with a wife who is studying medicine. "My father was born in 1896, he spoke six languages freely, he became a professor at Saint Petersburg, we had the atmosphere of scientific research at home all the time. I was brought up surrounded by adults, spent very little time playing with friends in school, and even now I feel different from colleagues my own age. My father had several inventions in his life, but at that time the Russians asked him like this: 'Does this method exist in the United States?' My father answered no, so they said, 'Then this must be entire nonsense.'" Again Podkletnov gives me an ambiguous smile, tainted with bitterness. "Finally when he got a patent in the United States and Japan, then they gave him a patent in Russia."

Eugene graduated with a master's degree from the University of Chemical Technology, Mendeleyev Institute, in Moscow; then spent 15 years at the Institute for High Temperatures in the Russian Academy of Sciences. In 1988 Tampere University's Institute of Technology invited him to pursue a PhD in the manufacture of superconductors, and after he obtained his doctorate, he continued working there - until the Sunday Telegraph news item appeared in 1996. Suddenly he was abandoned by his friends, unemployed, and fighting the scientific establishment much as his father had fought with the Russian government, except that in his case the stakes were higher, because he believed he had made one of the major discoveries of the 20th century.

Feeling beaten down and alienated, Podkletnov says he gave up in 1997 and drove the 1,400 kilometers back to Moscow, leaving his family in Tampere. But Moscow was not a good place for a scientist to be. In the 1980s he had been able to borrow equipment freely from other scientists; in 1997, when he asked for something they would say, "How much can you pay me?"

"Russians claim they are happy now because they have freedom," Podkletnov tells me, "but they are not happy, and they are not free. If you criticize the government, you may still go to jail. If you call an ambulance, it does not come. If you call the police, they do not come. Even criminals complain that they were better off under communism. College professors are trying to live on $200 a month in a city where prices are almost as high as in New York, and salary payments are delayed by six months. So - I returned here. I have a job, now, in a local company, as a materials scientist. It only uses perhaps 5 percent of my abilities, but -" He shrugs.

He insists that he isn't embittered. "It is good for a person to be unsatisfied in some way," he says. "You should be happy in family life but not satisfied in your surroundings. This is a source of progress. We have a proverb in Russia: The harder they beat us, the stronger we become." He gives me his twisted smile. "The only problem is, maybe they beat me so much, I never have a chance to use the strength."

I ask how people at his laboratory would characterize him.

"They say always that I am too serious. You understand, here today, I am trying to speak with humor to make your job easier. But in general I am a very determined person, very precise in everything. I don't smile when I am working. When I work, I work."

I ask him what happened to his equipment at Tampere University.

"Part of it is still there, but they don't work with superconductors any longer, and I am not allowed to come to the institute. But still, I can show you the outside of the building."

We walk out into the dark gray afternoon. "Now you are going to be a very brave person," says Podkletnov, "to ride in a Russian car." He unlocks a maroon Lada, which looks like a cheap version of an old Volvo. With another key he removes a metal clamp linking the clutch and brake pedals - a low tech security device.

But I've been told that Finland has a low crime rate. "Yes," Podkletnov agrees, "this is true. Still, there may be Russian immigrants around."

I can't tell if he's serious or joking.

The car's seat backs are almost vertical, enforcing a rigid military posture. We drive out to the university campus, which is uncompromisingly modern - and of course, the buildings are all in shades of gray.

Back in the hotel lobby Podkletnov shows me detailed diagrams of the experimental equipment that he used. "We measured the weight in every way," he says, adamantly denying that air currents or magnetism could have caused spurious readings. "We used metal shielding, we used nonmagnetic targets, we enclosed the target in a vacuum - we were very thorough."

He claims that he placed a mercury manometer (similar to a barometer) over the superconducting disc and recorded a 4-mm reduction in air pressure, because the air itself had been reduced in weight. Then he took the manometer upstairs to the lab above his and found exactly the same result - as if his equipment were generating an invisible column of low gravity extending upward indefinitely into space, exactly as H. G. Wells described it almost a century ago.

At NASA, David Noever feels that gravity reduction should diminish with distance. Podkletnov, though, has proved to his own satisfaction that the effect has no limit; and if he's right, a 2 percent weight reduction in all the air above a vehicle equipped with gravity shielding could enable it to levitate, buoyed up by the heavier air below. "I'm practically sure," Podkletnov says, "that within 10 years, this will be done." He gives me a meaningful look. "If not by NASA, then by Russia."

But wait; there's more. He has news that hasn't been reported elsewhere. Despite the hardships in Moscow, during the past year he says he conducted research at an unnamed "chemical scientific research center" where he built a device that reflects gravity. Supposedly it's based around a Van de Graaff generator - a high-voltage machine dating back to the earliest days of electrical research. "Normally there are two spheres," he explains, "and a spark jumps between them. Now imagine the spheres are flat surfaces, superconductors, one of them a coil or O-ring. Under specific conditions, applying resonating fields and composite superconducting coatings, we can organize the energy discharge in such a way that it goes through the center of the electrode, accompanied by gravitation phenomena - reflecting gravitational waves that spread through the walls and hit objects on the floors below, knocking them over."

And this, too, can have practical applications?

"The second generation of flying machines will reflect gravity waves and will be small, light, and fast, like UFOs. I have achieved impulse reflection; now the task is to make it work continuously."

He sounds completely sober, serious, matter-of-fact.

If he really wants knowledge to be freely shared, why hasn't he written more about this? And why hasn't he been more open with the people at NASA?

"I'm a serious person. If someone wants serious work, I can provide this. If I was to relocate in the United States, I would need five or six people and two years in a university or well-equipped technical laboratory. I guarantee, if I am invited, I can reproduce everything. But I am not selling my experiment piece by piece. If your readers are serious, they will be able to find me."

So here's a unique opportunity for the venture capitalists out there. Track down the elusive Eugene Podkletnov, make him an offer he can't refuse, and help to free humanity from its pedestrian existence at the bottom of a gravity well.

Does Podkletnov really believe that this will come to pass? He seems to. Does he see himself playing a central role? "I am not a very religious person," he tells me. "But I do believe in God, and of course there is a soul, you can feel it." He pauses, trying to convey his convictions. "Most of all," he says, "like all Russians, I have a sense of destiny. This is a secret of the Russian soul that can't be explained to foreigners. Even Russian people can't understand it. But - we feel it."

At the end of our meeting he strides out of the hotel lobby, as brisk and purposeful as an ambitious businessman, looking younger than his 43 years. I'm impressed by his intense focus, his strict attention to facts and details, and his sincerity. I wonder, though, if a vague sense of destiny is really enough to get him where he wants to go. The history of science is littered with casualties who ventured too far from the mainstream, or seemed a bit - wacky, for their time. Nikola Tesla is a classic example. Even Robert Goddard, the legendary rocketry pioneer, was scorned and forced to work in isolation and poverty for most of his life.

As one physicist told me, "New ideas are always criticized - not because an idea lacks merit, but because it might turn out to be workable, which would threaten the reputations of many people whose opinions conflict with it. Some people may even lose their jobs."

The man who said this is an eminent physicist who started devising equipment to detect gravity waves 30 years ago. Despite his secure tenure and respected status, he still wouldn't let me quote him by name, because he suffered in the past when he promoted radical concepts of his own.

Bob Park is a physics professor at the University of Maryland. When he's pressed to say something about Podkletnov's work, he comments: "Well, we know that we can create shields for other fields, such as electromagnetic fields; so in that sense I suppose that a gravity shield does not violate any physical laws. Still, most scientists would be reluctant to conclude anything publicly from this." Ironically, Park has made a name for himself by debunking "fringe" science in a weekly column for the American Physical Society's Web page. If scientists are reluctant to "conclude anything publicly," it's partly because they know they may be stigmatized by critics such as Park.

Of course, reflexive conservatism isn't the whole story. Many physicists are skeptical about gravity shielding because they believe that it conflicts with Einstein's general theory of relativity. According to George Smoot, a renowned professor of physics at UC Berkeley who collaborated on an essay that won a Gravity Research Foundation award, "If gravity shielding is going to be consistent with Einstein's general theory, you would need tremendous amounts of mass and energy. It's far beyond the technology we have today."

On the other hand, theories developed by Giovanni Modanese, Ning Li, and Douglas Torr portray a superconductor as a giant "quantum object" which might be exempt from Smoot's criticism, since Einstein's general theory has nothing to say about quantum effects. As Smoot himself admits, "The general theory is widely revered because Einstein wrote it, and it happens to be very beautiful. But the general theory is not entirely compatible with quantum mechanics, and sooner or later it will have to be modified."

He also says that the nonlinear spin of gravity particles - "gravitons" - makes calculations extremely difficult. "When you add a spinning disc," he says, "the equations become impossible to solve."

This means that gravity shielding cannot be disproved mathematically. Even Bob Park, the resident skeptic, shies away from describing it as "impossible," because "there have been things that we thought were impossible, which actually came to pass." Gregory Benford, a professor of physics at UC Irvine who also writes science fiction, echoes this and takes it a step further. "There's nothing impossible about gravity shielding," he says. "It just requires a field theory that we don't have yet. Anyone who says it's inconceivable is suffering from a lack of imagination."

When I first started reading about gravity modification, I was skeptical. Most likely, I thought, Podkletnov's experimental procedures were flawed.

A year later, I'm not so sure. Having questioned him in detail for several hours, I believe that he did his work in a careful, responsible fashion. I'm no longer willing to write him off as an eccentric suffering from wishful thinking. I believe he observed something - although the exact nature of it remains unclear.

And so, frustratingly, there's no conclusive ending to this long, strange story - at least until someone provides independent verification. In the meantime, there's only one thing we can do:

Wait.

Thanks to John Cramer for factual orientation and Robert Becker for theoretical background. Pete Skeggs participated in my visit to NASA and offered extremely generous help.

For additional information:

Pete Skeggs's gravity information page:
www.inetarena.com/~noetic/pls/gravity.html

James Woodward's mass-reduction theory:
www.npl.washington.edu/AV/altvw83.html

Antigravity mailing list: www.in-search-of.com/

John Schnurer's Gravity Society: www.gravity.org/

NASA's breakthrough propulsion physics program:
www.lerc.nasa.gov/WWW/bpp/

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