

"BEYOND SCIENCE?"

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TEASER

ALAN ALDA I'd like you to meet a new acquaintance of mine. Some people think he, or she, or it, just recently arrived from outer space. Others aren't so sure. On this edition of Scientific American Frontiers, we're going to try to find out what's real in science, and what's not.

ALAN ALDA (Narration) We'll ask if balancing a patient's energy pattern can lead to healing. We'll challenge dowsers to find water, and to try our rigorous test. We'll see if, by putting pen to paper, we give ourselves away. And we'll look for zero point energy -- is it real, or is it a dream?

ALAN ALDA I'm Alan Alda, join me now as we venture into the realm of pseudoscience.

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INTRO

ALAN ALDA (Narration) We've asked

DIANNA PAZ to visit a palm reader. She doesn't know it, but the reader -- who's a University of Oregon psychology professor -- says palm reading is pure fiction. And Dianna doesn't believe in it herself. But something strange is about to happen -- Dianna's going to become a believer.

RAY HYMAN You have a hard time hanging onto money. You have spaces between your fingers and...

ALAN ALDA (Narration) Ray Hyman gently raises common topics, like money or career, on the lookout for give-away responses -- a nod here, or a word there.

RAY HYMAN ... let other people do your income tax.

DIANNA PAZ OK. I do.

RAY HYMAN OK, good. Your fate line comes very late. Very, very late, out of your lifeline, and that suggests your career is very, very late in coming. This is children young. And lots of them are there. About the children... one, two, three, four, five, six.

ALAN ALDA (Narration) After about twenty minutes, Ray is feeding back to Dianna what he's gathered she probably wants to hear.

DIANNA PAZ I'd guess I'd better hurry.

ALAN ALDA How accurate was it?

DIANNA PAZ Pretty accurate.

ALAN ALDA Really?

DIANNA PAZ Yeah. The career -- about four years ago I started selling insurance, and just now decided that it's really not what I want to do. Kids -- of course, I have one child, but my mother has five, my sister has five...

ALAN ALDA (Narration) So now Dianna thinks there might be something to this.

DIANNA PAZ ...my brother has three, and I think I was really meant to have more children, but I never married young. And then when he said accounting and stuff, he's right. I am not a bookkeeper. I don't want to be. I let other people handle my taxes and everything.

RAY HYMAN She and I are working as a team.

ALAN ALDA Yeah.

RAY HYMAN I call it a symbiotic relationship. She wants me to be right, because it could help her, and of course I want to be right because it's an ego trip for me as a reader, and so we're helping each other.

ALAN ALDA So was there a point during this where you said to yourself, oh, this guy has some ability?

DIANNA PAZ Yes.

ALAN ALDA What about now? Now that you know that he doesn't believe in it, that he's just reading what you told him. How do you feel about the future? How do you feel about the things he told you about the future?

DIANNA PAZ Well, pretty much the same, except that I'm going to... it's nice to know that I have a big strong marriage line there...

ALAN ALDA This is really interesting. You're thinking about the things that he told you and you're considering them, and you're reconsidering your life in a way, even though he... it was like a put-up job!

DIANNA PAZ I think that I was taking the stuff that I believe, I want to happen, to be true.

ALAN ALDA (Narration) Most of us look at the world the same way as Dianna. We pick the bits of a horoscope we like -- and read them in the stars. We want to believe we're in touch with the forces of nature -- through extra sensory perception. And we believe that beings from outer space visit the earth -- just to see us humans. It's a thoroughly human way of viewing the world. But for scientists like Steven Weinberg, a Nobel Prize-winning physicist at the University of Texas, this kind of thinking is irrational -- it's not scientific. Weinberg has an explanation for why people think this way.

STEVEN WEINBERG I think there's a deep desire for human beings to be at the center of things; that is, for the laws of nature to give a special role to human beings. So the fact that I am a Taurus, boy, that makes me powerful and that's going to affect my life. I'm not like you ordinary Gemini or Libras, and we're all -- human nature is built into the cosmos, you know-the Star Wars movie -- there was a force, and when people die, it affects the force. Well, you know, that's a very attractive picture of nature, a picture that puts us front center. But I don't think we are. The laws of nature, as we've been discovering them, are pretty impersonal. They have to do with forces, with particles. We're not built into the laws of nature, as far as we know, in any central way. Well, maybe -- anything is possible, you know. I might be a butterfly dreaming that I'm talking to you. Who knows? But in life, you get up and you turn on the coffee with the assumption that it's going to come on, and that you're not going to get champagne, you're going to get coffee. We all live our lives making assumptions that things are going to behave in a fairly rational way.

ALAN ALDA (Narration) There's a rational, scientific view of the world, and an irrational one that's beyond science. It's the clash between those views that we're going to explore in this program.

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WATER, WATER EVERYWHERE...

ALAN ALDA (Narration) Paul Sevigny is dowsing for water in the Vermont mountains. He says his mind can directly sense the water, hundreds of feet below.

PAUL SEVIGNY I'm concentrating on over 25 gallons a minute, good drinking water. I build all this stuff into my little noggin so that I get exactly what I'm looking for. Coming up on something. Here we are.

ALAN ALDA (Narration) He mentally asks the dowsing rod about the water's depth.

PAUL SEVIGNY 342 feet deep.

ALAN ALDA (Narration) Next he finds the flow rate a well could tap into here.

PAUL SEVIGNY It's 26 gallons per minute. We're coming up on something.

ALAN ALDA (Narration) A nearby ski resort has asked Paul where to drill a new well.

PAUL SEVIGNY There we are. 44 gallons a minute here. 161 feet. So this is a better yield, and not as deep.

ALAN ALDA (Narration) We'll call that last one Site 1. Then a little further up -- Site 2.

PAUL SEVIGNY OK, got something here.

ALAN ALDA (Narration) Site 2's deep -- nearly 500 feet -- but a good flow rate.

PAUL SEVIGNY 48 gallons a minute.

LIZ WALKER Wow.

ALAN ALDA (Narration) With two promising well sites in hand, next day Ken Bannister -- who works with Paul -- continues the process. Ken uses

conventional instruments. This one measures the earth's magnetic field. Small variations can mean there are fractures in the bedrock -- which is where water might be. Site 1 has just such a magnetic feature, and Ken's not surprised.

KEN BANNISTER For several years I did applied geophysics such as this. A lot of times my clients would say, it's very interesting that you picked this site, my dowser also picked the same site. And that happened way too many times to be considered coincidences as far as I was concerned, so on one of those jobs, I actually asked the dowser if I could try it myself, and when I crossed over the features that I'd already found, the dowsing rod went down. And I became a believer at that point.

ALAN ALDA (Narration) Finally Ken pinpoints the spot at Site 1 where they'll drill, this summer. Only dowsing can be this exact, he says.

KEN BANNISTER This would be the location where we would drill the well, right here.

ALAN ALDA (Narration) We'll check back with Ken's well later, but first meet Jay Todd. He's testing this site in Eugene, Oregon very carefully. Because we're going to put Jay through a test, to see if he can find a metal target hidden under one of 10 containers. Jay, who has been dowsing for water, oil or lost objects for 20 years, is happy to demonstrate his abilities.

ALAN ALDA You picked something up over there, didn't you?

JAY TODD I picked up water over there.

ALAN ALDA Water, huh? So now, that's not going to interfere with what you're doing here?

JAY TODD Well, I don't think so. I wasn't picking it up here, so I doubt it, no.

ALAN ALDA I see.

JAY TODD Gee, whiz...you got any smaller?

ALAN ALDA (Narration) This is Ray Hyman.

JAY TODD I don't need anything that big.

ALAN ALDA (Narration) He's the psychology professor who read Dianna's palm.

ALAN ALDA Is that going to get in the way of your work if it's that size?

JAY TODD I don't know whether it'll get in the way, but it don't have to be that big.

ALAN ALDA (Narration) Jay needs an object like the hidden target to serve as what he calls a receiver. He accepts the large receiver, and starts the first trial. It looks casual, but actually we're using a rigorous test procedure. Here's how it works. Off to the side, a random number is generated electronically. That's the number of the container under which the target is to be hidden. To place the target, Barry Beyerstein, a neuroscientist friend of Ray Hyman's, goes through an elaborate routine of fake placements -- so the dowser can't get any hints from flattened grass or shifted containers. We even filmed this demonstration afterwards, so we couldn't unconsciously give hints during the test. This is a form of double blind testing that's essential if the results are to be trusted.

BARRY BEYERSTEIN He's blind by virtue of the way we've set this up, and all the other people who are around him while he's being tested are blind too.

ALAN ALDA (Narration) Here we are back at the first trial. Jay gets a possible response...

JAY TODD That's number nine.

ALAN ALDA (Narration) Then continues down the line.

JAY TODD Getting absolutely nothing there.

ALAN ALDA (Narration) Then there's another response at number ten.

JAY TODD Well it's just a guess I think, but that's the one I'm picking. It's probably not it. I'm pretty sure it isn't.

RAY HYMAN No.

JAY TODD Try... Which was the other one I was having?

ALAN ALDA Nine, you said.

JAY TODD Nine. Try nine. But I doubt it.

RAY HYMAN No.

JAY TODD How about a different receiver. How about lead.

ALAN ALDA (Narration) So now it's a lead weight that Barry places during his hiding procedure, while the rest of us wait at a distance.

JAY TODD Are you holding it real loose?

ALAN ALDA Yeah.

ALAN ALDA (Narration) Jay takes the opportunity to see if I have the power to dowse.

JAY TODD All right try it in your other hand. Same way, same way, and you're not in the center. All right, now hold it really loose. Hot dog, hot dog, I got him, I got him, you can do it!

ALAN ALDA I can do it?

JAY TODD You can do it.

ALAN ALDA (Narration) And guess what? When I crossed that aquifer that Jay found earlier, I could find that, too.

JAY TODD If they crossed, did they cross?

ALAN ALDA Oh, they crossed and smacked me in the chest. JAY TODD OK, that's where the aquifer's at, right where I went.

ALAN ALDA (Narration) Learning from others like this is how dowsers get started.

ALAN ALDA They're crossing again.

JAY TODD Yeah, that's the aquifer.

ALAN ALDA I think, when I know where it's supposed to happen, my hands let it happen.

JAY TODD Well, to a certain degree, you're correct. You are. Your mind plays a role in it.

RAY HYMAN Now over a male hand that's going to go back and forth, like a... There it is, you see.

ALAN ALDA (Narration) Here's a simple demonstration of the role

RAY HYMAN thinks the mind plays.

ALAN ALDA Yeah, and I'm not trying to do this at all.

RAY HYMAN Now if we can get a female hand under here, it would go in a circle.

ALAN ALDA Let me try this with Sara.

RAY HYMAN There it goes. OK.

ALAN ALDA Lookit. Right into a circle.

RAY HYMAN Exactly.

ALAN ALDA That's amazing. And I'm not doing anything. I'm not trying to make it... I'm trying to hold it still!

RAY HYMAN If I told you the reverse, it would do the reverse, by the way.

ALAN ALDA Tell me the reverse.

RAY HYMAN OK, let's now assume that this is a male hand, even though it's a female hand, it'll go back and forth. Very good.

ALAN ALDA Ha, ha. OK, now, lest anybody think that this is real magic, why is it working?

RAY HYMAN Without realizing it, we are making this move to fit what we expect it to do. And we're not aware of it because we're focusing on this and as a result, we under the right conditions can believe that some outside force is doing this.

ALAN ALDA Right.

ALAN ALDA (Narration) After years studying dowsers,

RAY HYMAN has concluded that the dowsing rod reacts to nothing more than our own unconscious. But dowsers have a response to that.

RAY HYMAN Almost all dowsers agree with my explanation. They agree that the mind is unconsciously doing it, but then they say that the unconscious, though, has some connection to the ethereal world, or whatever.



PAUL SEVIGNY I think it's an ESP experience, and the answer's coming from up here and these are just indicators. Most of the dowsers now believe that it's coming from your mind, through your muscles and causing involuntary action.

ALAN ALDA (Narration) To say dowsing is ESP is truly beyond science -- science has no way to test such a belief directly. But what's not beyond science is what we're doing here -- a controlled test to see if dowsing gets results.

JAY TODD I just don't have a long enough attenuater. But I'm not going to give up trying on it until I find one.

ALAN ALDA (Narration) We're on the second trial, looking for the lead weight.

JAY TODD I have to go with this one.

RAY HYMAN No.

JAY TODD I didn't figure. I got to get longer attenuation somehow.

ALAN ALDA What does that mean?

JAY TODD Got to get a longer antenna. Get the right length. It might even be that it'll take a shorter one. All I know is to just go through it. See if I get any kind of response.

ALAN ALDA (Narration) For Trial 3 Jay changes dowsing rods. But that doesn't help.

JAY TODD I don't get any responses at all.

ALAN ALDA You know, if you get good at this, you could open up a plumbing supply store with just stuff you dig up from the ground.

JAY TODD Well, I can find pipe under the ground.

ALAN ALDA Yeah, you can? If you can find pipe, why can't you find these...

JAY TODD Because I'm following it.

ALAN ALDA Oh, well, yeah, so what? What do you mean?

JAY TODD I'm following the motion, basically.

ALAN ALDA Of what's going through the pipe?

JAY TODD Basically, yeah.

ALAN ALDA Oh, I see.

JAY TODD And this thing ain't moving.

ALAN ALDA Yeah. Yeah.

ALAN ALDA (Narration) Trial 4 is to be the last. For Jay, he couldn't come up with the rod with the correct response.

JAY TODD I'm not getting any response at all. I'm really not. I'm sorry, Ray.

ALAN ALDA (Narration) We're back in Vermont, and there's been a hitch. The preferred drill site, which was supported by magnetic measurements and dowsing, has been ruled out because it's close to conservation land. So we're at Site 2. Because there are nearby power lines, which disrupt magnetic measurements, only dowsing has identified this site. Nevertheless, Ken is confident they have a good site to drill, accurately located with dowsing.

KEN BANNISTER The best spot is right here. There's no question, there's a dowsing reaction at this location. The fellow that works for Sugarbush, who's also a part-time dowser, came up and he picked the same site as well, so you've got three dowsers all picking the same spot.

ALAN ALDA (Narration) Drilling starts first thing next morning. Grinding through Vermont granite is a tedious process -- watched nervously by Liz Walker from the ski area, which is paying the bill. But in these mountains they're sure to hit water somewhere, says Dave Parker, the driller.

DAVE PARKER Probably 99% of the time you're going to hit water no matter where you drill. It's just a question of how deep you got to go to get it.

ALAN ALDA (Narration) Sure enough, at 370 feet there's a trickle -- about a gallon a minute. The dowsers have promised 48 gallons a minute at 465 feet. But by 500 it's still only a trickle. Liz calls up Ken.

LIZ WALKER If you say it's worthwhile going any deeper, we'll go out and we'll get some more sticks and go deeper.

ALAN ALDA (Narration) They keep drilling, and Ken joins Liz at the site.

KEN BANNISTER Kind of disappointing

LIZ WALKER Yeah, I know. I was disappointed over 100, 200 feet ago.

ALAN ALDA (Narration) At 600 feet they call it off, confirming what Dave thinks of dowsing.

DAVE PARKER Personally myself, I don't have much belief in it. I've proved them wrong too many times.

KEN BANNISTER I've always learned that whenever there's a failure, it's not that the dowsing didn't work, it's that you didn't do a good job at it, or sometimes, the actual hole will miss slightly, and you don't just hit the fracture.

ALAN ALDA (Narration) While our two examples don't disprove all of dowsing, literally hundreds of scientifically controlled studies have shown that dowsing can't find things

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## ALIENS HAVE LANDED

ALAN ALDA (Narration) At a secret military installation somewhere in America, two air force pathologists examine the body of an alien being. A few weeks earlier the alien's space craft has crash landed in the New Mexico desert, where it is discovered by a local rancher. All wreckage and alien remains are quickly impounded. All details are now classified top secret. An air force cameraman has been called in to document the autopsy of one of the aliens. It's an event of the utmost importance -- the first evidence of a visit to Earth of beings from another world. The alien is clearly advanced -- it no longer needs large teeth to eat. The size of the skull indicates a highly developed brain. And the eyes appear to be protected from space rays by special contact lenses. It is 1947, to avoid public panic, the government suppressed all word of this historic event -- but Scientific American Frontiers managed to acquire a copy of the film. Well, all right -- disregard everything I just said. Actually we faked the whole thing in a Hollywood special effects house, run by

STEVE JOHNSON, who played the other pathologist in the autopsy.

ALAN ALDA Good to get out of that.

STEVE JOHNSON You're telling me. Got a few new wrinkles on our faces.

ALAN ALDA (Narration) This is the alien autopsy film that we were mimicking. First shown on TV in the early 90s, it was accompanied by the same kind of

claims we just made for our alien. To special effects people like Steve it's an obvious hoax, and not a very good one. It looks more like a tailor's dummy, with no apparent structure like a skeleton to hold it up. Somehow the cameraman never manages to get the close-ups in focus. And whenever there's any interesting action -- like opening the skull -- a convenient shoulder obscures the view.

STEVE JOHNSON The biggest thing that made the other one false is that there is absolutely no sense of weight to it. If you remember, they're kind of pretending to look in the mouth. They just do this kind of thing. They kind of pretend to examine the head, as opposed to doing what we've done here, really being able to see weight and mass. Now, that's one thing that really makes this much more believable, because you can pick it up. You can really see how a body would react.

ALAN ALDA (Narration) The alien autopsy film fanned the flames of alien fever that millions of American have caught.. Roswell, New Mexico is the focus. In 1947 a rancher near here found what was said to be flying saucer wreckage. 50 years later, Roswell tourists are still thinking about it.

MAN Something happened, we don't know exactly what it is.

WOMAN The object was unidentified, and so it has to be something.

BOY If nothing happened, then they probably wouldn't have all this stuff.

ALAN ALDA (Narration) Aliens are good business for a small town, but they're taken seriously.

TOUR GUIDE When it cracked open, it was still pretty much basically intact, but it kind of split open at a seam and kind of had an opening to it, like this, so you could peer inside. There were three bodies still inside the craft, there was a fourth one kind of hanging half in and half out of the opening in the craft, and then the fifth body had either been thrown out or had crawled out, and was sitting up high...

ALAN ALDA (Narration) We think we have a better account of what happened in Roswell in 1947. Let us explain.

NEWSREEL ANNOUNCER The sky is the stage, the actors flying saucers. And they're back on the scene with some new twists.

ALAN ALDA (Narration) In the forties and fifties, saucer scares were all the rage. A pilot on the West Coast seems to have started it all, when he saw some

strange lights. It was June, 1947. At that time, a team from New York University was at work in Alamogordo, New Mexico. They were developing ways to lift microphones up into the stratosphere, hoping to pick up the first Soviet A-bomb tests. Standard weather balloons were used to fly the microphones, along with radio transmitters, battery packs, and things looking like foil-covered kites to act as reflectors for tracking-radar. The first balloon flight of 1947 was launched from Alamogordo on June 4. It drifted northeast, tracked by ground radar and by a B-17 to monitor radio signals. About 70 miles downwind -- just 15 miles from the Foster ranch, and beyond radar range -- the batteries failed prematurely. With no signals to monitor, the B-17 turned back. It was the only balloon the project lost, before or since. 10 days later, a rancher on the Foster ranch found some mysterious wreckage and pushed it under a bush. Then came the West Coast flying saucer scare. The rancher wondered if he'd found a crashed saucer, so he told the sheriff, who called the local air base -- Roswell Army Air Field. The intelligence officer, convinced they had a saucer, gave the local press this dramatic story. The wreckage was flown to 8th Army Air Force headquarters at Fort Worth, where these pictures were taken. This is the Roswell intelligence officer. At Fort Worth, General Ramey brought in his meteorologist, who immediately recognized the materials as parts of a weather balloon and a radar reflector. He'd used both in World War Two. So the general issued another press release saying there was no saucer, and that was that. At least it was until the 1970s, when a series of popular books reopened the whole Roswell affair -- this time alleging an elaborate government cover-up of the truth. So we tracked down one of the scientists from the original balloon project, Charlie Moore. Here he is working at Alamogordo in 1947, when he was a graduate

STUDENT. Charlie, now a retired meteorology professor, has pictures showing the balloons and radar reflectors they were using that year. They were still using similar equipment in 1953, which is when this reflector dates from. It pretty well matches what the rancher said he found. The local paper reported the rancher as saying:

RANCHER VOICE "...the tinfoil, paper, tape and sticks made a bundle about three feet long..." "...there were some eyelets in the paper..."

CHARLIE MOORE The rancher who picked up the debris noted that it contained brass eyelets at the corners of these radar targets. They were also on the targets we flew.

RANCHER VOICE "...considerable scotch tape and some tape with flowers printed upon it had been used in the construction."

CHARLIE MOORE The tape had some flowerlike designs, they looked like little poppies and little rose petals imprinted on the back. The tape was along these

balsa wood sticks to reinforce the attachment of the panels to the balsa wood. That turned out to be an emergency fix that the prototype targets we had, had to have, and the manufacturer happened to have some tape on hand and put these reinforcements on it.

ALAN ALDA (Narration) The tape designs are now interpreted as alien hieroglyphics -- you can even buy this "authentic replica" in Roswell. The rancher said he had not found a weather balloon, only rubber that was

RANCHER VOICE "...smoky gray in color."

ALAN ALDA (Narration) Here's the material photographed at Fort Worth. But Charlie Moore has a simple explanation.

CHARLIE MOORE This is a neoprene balloon similar to the ones we used in 1947, and they're quite sensitive to light. If the material is sitting on the ground, the fragments can turn quite black. Here is some neoprene balloon material that I've exposed to the sunlight for 2 or 3 weeks.

ALAN ALDA (Narration) In fact the balloon project explanation makes sense now, as it did in 1947. But many people just won't buy it.

WOMAN All we need is for the government to do is release the documents, and we'll find out yes or no real quick.

ALAN ALDA (Narration) It's said that the flying saucer wreckage and the aliens were quickly concealed in this hangar at Roswell Army Air Field, then flown out to Wright-Patterson air base in Ohio. A massive cover-up was put in place, with Charlie Moore and his balloons as the official story. Philip Klass is an engineer and aerospace journalist who has worked to debunk UFO reports for thirty years. He's found that in secret intelligence papers from the time -- now declassified -- nobody had ever heard of flying saucer wreckage. For example, here's a report from 1948 -- the year after Roswell -- by the head of intelligence at Wright-Patterson.

PHILIP KLASS He says we've analyzed 180 UFO sighting reports or incidents. And he says, some of them are weather balloons, some turn out to be bright planets or stars, but there's still others that we are unable to identify. Now he says, "although it is obvious that some types of flying objects have been sighted, the exact nature of those objects cannot be established until physical evidence, such as that which would result from a crash has been obtained." This document I have personally offered to a number of TV show producers, it has been available to the authors of Roswell books, never used, never mentioned, never

cited. This one document alone, if it were not for all the others, would prove that there was no crash saucer at Roswell.

STEVE JOHNSON This is just as hard to do as it could be in reality.

ALAN ALDA (Narration) In science there's a useful doctrine. It states that the simplest explanation is probably the right one. That means the only aliens around come from Hollywood.

ALAN ALDA Now the bone doesn't seem to have any marrow in it, but that would only be...

STEVE JOHNSON Getting picky, are you?

ALAN ALDA Yeah, well, I'm beginning to believe that this is not a real alien. What made you make the teeth like this?

STEVE JOHNSON Well, we wanted to have some degree of interest inside the mouth, so we made teeth that were vestigial.

ALAN ALDA So these people have apparently evolved to the point where they drink their meals out of a can.

STEVE JOHNSON That's right.

ALAN ALDA Or they take a pill once a month. This is a boring life. No wonder they're out exploring other planets. They have nothing to live for in their own planet.

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## NEW ENERGY AGE

ALAN ALDA (Narration) We're on West Braker Lane, outside Austin, Texas. It's Austin's hi-tech highway, lined with a lot of small outfits with big ideas. And this place may have the biggest idea of all -- free, unlimited energy for all the world. Out back is one of the first machines they've been testing.

ALAN ALDA What is this thing?

SCOTT LITTLE This is a supposed free energy device that was developed in Moldavia.

ALAN ALDA Yeah?

SCOTT LITTLE Yeah -- one of the former Soviet states. It was widely rumored around the world that this thing produced about 3 times more heat energy than the mechanical energy required to pump the water through it.

ALAN ALDA Yeah, well, that sounds like the kind of thing you can't get a patent for.

SCOTT LITTLE Exactly.

ALAN ALDA It's not going to blow up, is it?

SCOTT LITTLE We only hope.

ALAN ALDA You wish it would

SCOTT LITTLE Yeah, I really do.

HAL PUTHOFF We would welcome that.

ALAN ALDA (Narration) Water is pumped into a circular swirl chamber, which forms thousands of tiny bubbles. As the bubbles collapse on the way out, they're supposed to tap into what's called zero point energy. Zero point energy is said to be all around us. Any small enclosed space -- like a bubble -- is supposed to create an imbalance in this energy sea, with more energy outside the bubble than inside. When the bubble collapses, the energy is released. You have to be a physicist to get why all this could be true, but right now there are maybe forty groups around the world exploring the idea. In Austin they tested the Moldavian device thoroughly. And, yes -- it did heat up the water, but no more than you'd expect from the energy it took to run the pump. And that energy came from the local electric company. But maybe they had simply failed to recreate the original conditions of the discovery.

ALAN ALDA How do you know that you're exactly reproducing those conditions?

SCOTT LITTLE It's impossible to know. This is something that is such a common problem, that I've even coined a term for it: the experimenter's lament.

ALAN ALDA (Narration) They tried every combination of conditions they could think of, to no avail. Reluctantly they concluded the Moldavian device is a dud. But they haven't given up on bubbles.

ALAN ALDA Actually there are little bubbles in my ears now.



SCOTT LITTLE If you put your finger under the...

ALAN ALDA Oh, no. You put your finger under it.

SCOTT LITTLE It doesn't hurt but it makes your finger warm, because it's...

ALAN ALDA Yes it does. Really warm.

SCOTT LITTLE Now watch what it does to the water.

ALAN ALDA (Narration) The ultrasound generator creates a huge number of bubbles. The heat given off will be accurately measured, to see if there's any extra from zero point energy. Hal Puthoff's absolutely certain the energy's out there.

HAL PUTHOFF Even in far out empty space, there's enough energy in the volume of a coffee cup to, for example, evaporate all the world's oceans. This energy is already there.

ALAN ALDA This is the part I don't understand. You're talking about something existing in a vacuum. You're talking about out in space, where there are no particles. That means it's a vacuum, right?

HAL PUTHOFF OK, what there are are photons. You know, if you're out in a space ship and you are in vacuum, you can still look and see the sun. So what you're seeing is the light propagating from the sun to you in the form of photons. Well, the zero point energy is a just a photon sea. It's sort of like a noise background.

ALAN ALDA (Narration) It sounds kind of fantastic -- but Scott and Hal seem like careful scientists, not crackpots. I asked one of our top physicists,

STEVEN WEINBERG, what he thought.

ALAN ALDA What about zero point energy? Does it exist? Is it worth spending our time trying to exploit zero point energy if it does exist?

STEVEN WEINBERG I think the answers to those questions are yes and no. No doubt there is such a thing as zero point energy and it turns out to be incredibly small. We measure it because energy produces gravity -- that's what general relativity teaches us, that all energy can serve as a source of gravitation and if there was a lot of energy in empty space, there's a lot of empty space in the universe, and it would create very strong gravitational fields which would completely change the way the universe is evolved. And we would know that.

And based on that sort of argument, you could say that in a volume of space the size of the earth, the amount of energy is less than maybe a gallon of gasoline

ALAN ALDA Did you give your mother this clock?

ALAN ALDA (Narration) Other physicists don't agree with Weinberg's estimate for zero point energy. But in their search for it, Scott and Hal don't intend to fool themselves. To show how tricky that is, Scott took me to see his mother's clock.

SCOTT LITTLE Mom, it's your boy. I brought a visitor. Betty Lou, meet Alan Alda.

ALAN ALDA Betty Lou, nice to meet you.

BETTY LOU Nice to meet you.

ALAN ALDA Nice of you to have us in. Thank you.

BETTY LOU Come in. Got your crew with you?

ALAN ALDA We brought America with us, actually, if that's OK.

ALAN ALDA (Narration) Betty Lou's clock illustrates perfectly how tough it can be to get at the truth. The clock, mysteriously, runs for ever. In fact the big dome shape inside slowly expands and contracts with the weather like a barometer, winding the spring. If you didn't know that, you could be in trouble.

SCOTT LITTLE I could tell you that there was zero point energy transducer in this housing back here, and you might be tempted to believe me.

ALAN ALDA People can fool one another fraudulently like this, and I guess they can fool themselves too, if they don't really know how it's working.

SCOTT LITTLE You can either just simply make a mistake and think it's real or you can subconsciously delude yourself. And particularly if you want terribly bad for it to be real, then the delusion is much easier then.

ALAN ALDA (Narration) Scott and Hal may not be beyond science -- although they are on the fringes. And they're determined to avoid mistakes or delusions. Take a look at this rig they're building. It's designed to make very accurate measurements of heat in a test cell inside. Temperatures are measured using two independent methods, but a couple of days before we arrived, the two measurements started to diverge -- with only a dummy test cell in place. The red line should be down by the blue one, but instead it's indicating an increased temperature.

ALAN ALDA If this were true, what would that mean?

SCOTT LITTLE Well, that would mean that the device in there was making energy out of some unknown source.

ALAN ALDA So that would be time to call for a party.

SCOTT LITTLE Yes.

ALAN ALDA Before you call the caterer, what do you do?

SCOTT LITTLE Assume it's an error. Attack with everything you've got and try to tear it down. If it resists and stays, then you can begin to become excited and maybe you've discovered something new.

ALAN ALDA (Narration) Will Scott and Hal discover something new? According to Hal, we won't have long to wait before we find out.

ALAN ALDA You must have thought about how much it would change the life of everybody on the planet.

HAL PUTHOFF We probably will call the 20th century the nuclear age in terms of new energy developments, and for the chauvinists in the field like ourselves, we think the 21st century could be the zero point energy age.

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## PAPER PERSONALITY

ALAN ALDA (Narration) Barry Beyerstein, the neuroscientist who helped run our dowsing test, is an expert on graphology -- handwriting analysis.

ALAN ALDA When graphologists look at my handwriting, what are they looking for?

BARRY BEYERSTEIN They believe that your personality is encoded in things like slant, for instance. So here we have an example of handwriting that slants predominantly to the left. Here we have writing that slants predominantly rightward.

ALAN ALDA OK, if it's slanting to the left, what is that supposed to tell us?

BARRY BEYERSTEIN OK, they use metaphors. So they say, what does this remind me of? Well, a slant to the left is a standoffish person. This is somebody who slants away from people and notice, here's a handwriting analyst's description -- "people whose writing slopes to the left may be unwilling to go out and fight the world, they're holding back."

ALAN ALDA Holding back.

ALAN ALDA (Narration) This is one of the larger graphology companies, called Datagraph. There are tens of thousands of graphologists across the country. Without knowing it, you may have had your writing analyzed when you applied for a job or a loan. Jack Donovan, Datagraph's president, is proud of their methods which involve careful measurement of hundreds of features -- like size, roundness, word spacing, letter spacing, straightness of lines, and so on. He says their results are far superior to those of other graphologists.

JACK DONOVAN They only normally use 150 to 200 handwriting features, where we use 420 plus. So just mathematically, we'd have a better chance of being more accurate. We say that we're accurate to 90%.

ALAN ALDA (Narration) Datagraph does measure accurately, but the measurements are still interpreted in the traditional way -- like begets like. Take height of letters, for example.

VOICE Large: "...needs attention and admiration ...bold, boastful, lacks discipline..." Normal height: "...stable, practical, realistic..." Small: "...introspective, modest ...may feel inferior ...can mean antisocial behavior..."

ALAN ALDA (Narration) The 420 measurements are combined into a personality profile, giving the subject's scores on 14 characteristics, from self-esteem to sales potential.

JACK DONOVAN Handwriting analysis using our measurement system, we call that a mind print. You're it, and the odds-on chances of somebody else being like you is 1 in 6 trillion.

ALAN ALDA (Narration) I had my mindprint done. The company asks you to write about three specific topics -- hobbies, greatest success, and greatest challenge. "...I met the challenge through team work with other escapees and by calling on powers I didn't know I possessed..." "...I frequently see myself in my mind's eye hitting a long high one over the fence." We sent in samples from eight people, all anonymous. This one's mine. I'm having my slant measured right now.

ANALYST The further right that it goes, the more impulsive, and this person is impulsive, very impulsive.

ALAN ALDA (Narration) I guess my lines aren't too straight, either.

ANALYST There is some confusion in this person's life. A lack of organization.

ALAN ALDA (Narration) Here are the eight finished analyses. Now

BARRY BEYERSTEIN and I are going to see if we can recognize ourselves.

ALAN ALDA All right, this is not me. Independent, self-reliant, has good judgment...

BARRY BEYERSTEIN Oh, that was mine. Give me that.

ALAN ALDA OK, but I don't think that's me. I have to say, nothing here leaps off the page as being me. I don't find myself saying wow, they really got me.

BARRY BEYERSTEIN ... nailed me, yeah.

ALAN ALDA (Narration) In fact we couldn't pick out our own profiles, so after being told which one was mine, I counted up how often it was right.

ALAN ALDA Strong likes and dislikes, that's right. Impulsive, easily offended, hates bitterly. Emotional brush fire. Oh, sure, why not -- let's say I'm impulsive. Self esteem is high -- absolutely, they got that right. Verbal discretion is high, the ability to keep confidences. I won't tell you whether that's true or not. Vitality is average. No, I have a lot of vitality, so that's wrong.

ALAN ALDA (Narration) Altogether I thought 4 were right and 8 wrong, with 2 maybes. I was trying to be scientific about my assessment, although that was hard.

ALAN ALDA You can be influenced by wanting this to be true. If you want it to be true, you'll say, yeah, there are those times when I am standoffish, those dominate. But you have to count up the times you're standoffish and not standoffish to really know.

BARRY BEYERSTEIN This is why we evolved the scientific method, to keep track of all the instances so you have the complete set of data to look at and to do what you just did, tally it up and count at the end and don't rely on faulty inferences, on extrapolations, on faulty memory, to tell you what you think is in there.

ALAN ALDA (Narration) Testing graphology scientifically is the aim of

JOHN NEZLEK, a psychologist at William and Mary College. The idea is to compare graphology with a standard psychological test.

JOHN NEZLEK There are 187 questions, there are three choices for each question. What you need to do...

ALAN ALDA (Narration) 40 students are taking part in the study. This test rates subjects on a series of scales -- from humble to assertive, for example, or trusting to suspicious.

STUDENT I can find enough energy to face my difficulties. "A" -- always. I feel a bit nervous of wild animals, even when they are in strong cages. "C" -- no, false.

STUDENT I have been let down by my friends - "B", occasionally. I have some characteristics in which I feel definitely superior to most people. "A" -- yes.

ALAN ALDA (Narration) Personality is a slippery thing, and psychologists regard these tests as only moderately reliable -- unlike the claims made by Datagraph.

STUDENT In my spare time I like to play music.

ALAN ALDA (Narration) All the subjects submitted writing samples as well.

STUDENT ... but when I do, I find it relaxing.

STUDENT ...a balance that allows me to explore my academic interests and ambitions, but that also allows me freedom to play.

ALAN ALDA (Narration) The study showed some intriguing matches between graphology and the standard test, but the number of subjects was so small this could have been coincidence. It's to avoid this problem that standard tests are developed with thousands of people.

JOHN NEZLEK To validate Datagraph's claims will take a series of studies, not just one such as this. So, at this time, it's not appropriate to say whether it confirms or disconfirms Datagraph's claims, so much as it doesn't have enough information to do either.

ALAN ALDA (Narration) There is, however, a basic flaw in the procedure you see here. Graphologists claim the content of the writing sample is irrelevant. But it's impossible to rule out all influence on the

ANALYST -- conscious or unconscious.

BARRY BEYERSTEIN I laid a few little traps for them in the way I answered. So I answered literally true, but I used words that have conventional expectations and connotations attached to them that, if they were looking at the content, would lead them to conclusions that are totally wrong for me.

ALAN ALDA (Narration) Barry wrote: Beyerstein voice "Greatest challenge: Getting over a serious medical condition. My abiding faith carried me through a very tough time with this illness."

ALAN ALDA (Narration) In fact it was a close relative who was sick, but getting over it was a challenge for the whole family. Nevertheless the analysis came back:

ANALYST VOICE "Shows evidence of medical problems or heavy medication."

ALAN ALDA (Narration) It was one more indication of the problems with graphology.

BARRY BEYERSTEIN There have been well over 200 studies now done by experts in the field of personality psychology and psychological measurement, personnel work and so on, where graphologists have participated knowingly, willingly, claiming that they were sure they could deliver the goods, and they've fallen flat on their faces. I mean, the bottom line, when you look at the whole gamut of research, is that this is like tea leaf reading, this is like palm reading, this is like astrology. It's a pseudoscience, it has no scientific credibility.

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## HEALING TOUCH

ALAN ALDA (Narration) This is Columbia-Presbyterian Hospital in New York City. It's one of the country's leading medical institutions. Here patients with serious heart problems are receiving some surprising treatment. It's called therapeutic touch, although there's no actual touching involved. Ellen McMahon, a nurse, is following procedures based on traditional Chinese medicine.

ELLEN McMAHON It's our belief that your body goes beyond your skin.

ALAN ALDA (Narration) Ellen is sensing, and then manipulating, energy patterns.

ELLEN McMAHON Using your hands, you might want to call them kind of like geiger counters, you just keep going over it, working with the areas where you feel need, and then smoothing it. It's our belief that underneath, if we can make you balanced, that it can help the whole of your body. And if you're in a state of restfulness, healing will proceed.

ALAN ALDA (Narration) They're trying to study whether therapeutic touch can help heart bypass patients. But they've run into the well-known placebo effect, whereby about a third of patients respond favorably to anything that appears to be a treatment. So for comparison, some patients must receive sham treatment. Lorissa Klaus is running the study.

LORISSA KLAUSS The sham therapeutic touch practitioners don't have the training for one, in therapeutic touch, and they also don't have, hopefully, the knowledge of what therapeutic touch is.

ALAN ALDA (Narration) Some patients get trained practitioners, some get the sham version, some get nothing. How the three groups do after surgery will be compared. All three groups get the same surgical treatment. While the operating room staff goes about their normal duties, they're regularly joined by a new team member at the head of the table, working on the patient's energy balance. That's how the study was supposed to work. But they've run into problems.

LORISSA KLAUSS The sham practitioners have come and done their treatment and then they come back and report to me and they say, well, I think I felt something. How do you account for that?

ALAN ALDA (Narration) A key component of therapeutic touch is a conscious intention to heal. If the sham practitioners are feeling something, maybe they're healing, too. You'll never know if the trained practitioners are doing any better, or if it's all just placebo effect. So now they're trying another approach. This is a lab culture of live cancer cells. Eric Liu is preparing them for treatment. Frank Huo is an expert in Yuan Chi, one of the Chinese energy therapies that therapeutic touch is based on. In his own practice, Frank treats cancer patients. By having him fight cancer cells, they can directly measure any effect he has. It's the hospital's attempt to bring a rigorous approach to a subject that most scientists would regard as beyond science.

ERIC LIU Left hand up on the belly button, right hand over the plate. Next one is two hands.

ALAN ALDA (Narration) The cell study still requires sham practitioners for comparison. Here Eric is instructing a medical student.



ERIC LIU While you're holding the poses, I want you to count back in your mind from 100, down to zero by sevens, and the reason I'm doing that is because I want to eliminate any intention. Because with your mind occupied, doing subtraction, you won't be thinking about the cells, you'll just be thinking about the math.

ALAN ALDA (Narration) Assuming the sham practitioners don't spontaneously acquire any healing intentions with cells, as they did with heart patients, then this study stands a better chance of being accepted as scientifically valid. The first results show no effect by shams or therapeutic touch practitioners. But Frank Huo, the Yuan Chi expert, showed a peculiar double effect -- some cells grew less vigorously, while some grew more. This could be nothing -- a mistake or a coincidence -- or it could mean something. It needs more study. The foundation of therapeutic touch is the practitioner's ability to sense a patient's supposed energy. This is how practitioners describe the experience.

PRACTITIONER There's like a pulsing, or sometimes there's a temperature change, or sometimes it literally feels like energy, like if you've ever kind of zapped your hand when you've turned on a light or something.

PRACTITIONER There's just a thickness as I move past an area...

PRACTITIONER A warmth emanating from the person's body in that particular area, an area of imbalance in the total body.

ALAN ALDA (Narration) In Poudre Valley, near Denver, Linda Rosa, a nurse, and her husband Larry suggested a terrific science project for their daughter Emily -- to see if therapeutic touch practitioners could detect her energy field.

EMILY ROSA The only way that I could really find out if they really could feel my energy field is if they couldn't see.

ALAN ALDA (Narration) The hands belong to a trained therapeutic touch practitioner. A coin toss determines where Emily will position her hand. Then the practitioners have to say where the hand is.

EMILY ROSA OK.

PRACTITIONER Left.

PRACTITIONER Right.

ALAN ALDA (Narration) To generate reliable statistics, 14 Os each get 10 trials.

EMILY ROSA OK.

PRACTITIONER Left.

EMILY ROSA I got 4.1 for an average of correct guesses. Five is chance and they got below chance.

ALAN ALDA (Narration) The practitioners failed to detect Emily's supposed energy, so it's hard to see how therapeutic touch can work. Emily's results may be published in a scientific journal, but only after the work has been independently reviewed. Peer review is one way science protects itself from faulty conclusions. But perhaps science's most important safeguard is an understanding of human nature itself. It was Ray Hyman, the Oregon psychology professor, who brought this home to me.

ALAN ALDA The interesting thing that I'm picking up from you, and I'm just getting this, I don't know how I'm getting it, is that...

RAY HYMAN Through telepathy.

ALAN ALDA I'm sure. Is that if we're not really careful, we fool ourselves by wanting something to be true.

RAY HYMAN Definitely so.

ALAN ALDA And the most careful people can fool themselves.

RAY HYMAN And as we know, the scientific method was basically set up to protect people from fooling themselves in special areas. They learn by experience that you have to set up certain safeguards within certain areas. That's why different disciplines have different techniques for doing it. But most of these techniques were devised to protect us from ourselves.

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