

SEARCH

for SOLUTIONS

Episode 1

Understanding Science (Transcript)



Episode 1 – Understanding Science

The following is a transcript of Episode 1 in *Search for Solutions*.

Narrator

How do we know what we know? How do we know that we're made up of billions of DNA codes that give each of us a unique identity? What makes us think that the physics of the subatomic universe are different than our own? How do we know that the clownfish and sea coral exist in an odd mutually dependent relationship? What makes us think that we can look into deep space and discover new planets? The answer to each of these questions is quite simply: Science. Results of scientific thinking can be found everywhere, but science is not the accumulation of that knowledge. It's not what we, as a global community, know. Science is the systematic deliberate process that leads us to knowledge. It's how we go about trying to answer the questions about ourselves and the world around us.

Charles LeGault
Fishery Biologist

What is science? Science is the search for more understanding.

Mark Burrell
Student Scientist

It tries to bring order to certain chaotic, or seemingly chaotic, functions in the universe.

Cheryl Ward

My heart of hearts, and six words: Science is the search for truth.

David Westcott
Rainforest
Biologist

Science is really a very structured and controlled way of asking questions and learning how things in the world operate.

Dee Garrett

Science is understanding at a basic level how something works. Physician/Scientist

John Stern

Science is really a philosophy. It's a way of thinking. It's a way of Biologist looking at the world.

Mitch Sogin
Microbiologist

I think sciences are expressions of curiosity.

Scott Woodward
DNA Genealogist

That drive, that passion to understand things; to know something about something.

Narrator	After centuries of exploration, research and contemplation, how is it possible that we're still yearning for answers, and just how will we discover the answers? That might be the clue to what science is all about. So if science is not knowledge itself, but instead, the process by which we gain knowledge, how does that process work?
Jim White Physicist	Scientists go about their business in a fundamentally different way than most people go about their business. Scientists look at the world, or look at their problem, come up with a hypothesis for how this thing works.
Dee Garrett	You have to think: What do you think the results are going to be? You have to kind of guess as to what you think the results are going to be, and then you have to be very methodical.
Vicki Colvin Chemist	And then you have to start to think about how you might test that than most people go about their business. Scientists look at the world, or look at their problem, come up with a hypothesis for how this thing works.
Jim Tour Chemist	Every time we come up with something – every time we discover something – there are ten new questions that arise; ten new things that we'd like to investigate.
Mark Burrell	Science is not just all about successes, it's a lot about failures and learning from those failures, and trying to apply the principles to better your experimental design.
Dorothy Peteet	When people propose things that can't be tested, that is really not Climatologist science.
Geoff Marcy Astronomer	I think we humans do best when we doubt ourselves, when we doubt our friends, and express that skepticism, share ideas about what might be a better solution; a better answer; another interpretation.
Jim Tour	But, the key is that you always come up with conflict when you try to develop an area that's totally off the beaten path. Even your colleagues will say, "You're crazy; this could never work," or "What on Earth are you doing?"
Jim White	And then they do their best to shoot down the hypothesis. We're in the business of ripping down the best hypothesis, and we do that for a very good reason, and that reason is that it's really scientific truth that matters and not how good you are at presenting your hypothesis.
Cheryl Ward	The best thing you can do to any scientist, I think, is try to prove him wrong, because that suggests that the question they were asking is one that can lead to greater truths.
Jim White	Consider the importance of a lawyer in the courtroom. Whether you committed a crime or not, your odds of getting off are better with a great lawyer than they are with a lousy lawyer. In a scientific courtroom, the lawyer is meaningless. How well you argue your point

	lawyer is meaningless. How well you argue your point is not the issue: It's how good the point is, because everybody's going to be in there shooting at that, and trying to find flaws in it, and no matter how unpopular or how bizarre the theory might be, if it stands up to all that scrutiny, that's the dominating theory of the day.
Narrator	That's the real meaning of research and experimenting: A relentless pursuit for answers that generate questions that lead to more answers.
Valerie Wilson Biologist	Well, I think the purpose of science is to generate new knowledge so that we can then develop applications on that new knowledge that will benefit human beings and the world at large. I tell people that science is, in a sense, not so much a search for the answers, but really a search for and learning how to ask the right questions because the answers are all over; it's just that we don't know how to interpret them.
John Stern	What that means is you've got to figure out how to ask good questions that you can answer in a scientific manner. Everybody talks about the scientific method as a way of doing science, and that's really, really true. There's certain ways to go about understanding the natural world.
Faith Karg Student Scientist	I like that it's nature, and then I get to go outdoors. In order to find these cores, I have to go out to the areas and then when I find important sediments, they get sent off, and they're carbon-dated, and they come back, and I can know the age of what I was looking through, and it can be ten thousand years old.
Mark Burrell	I think experimentation is an integral part of life. It's what we do in life. It's testing certain things to see how they react; seeing how humans react to certain situations; seeing how animals react to certain situations; trying to predict something with a model, and experimentation is the basis of what you and I do every single day when we wake up. We go to work, and we shower, and we try to predict who's going to make a right turn at the stoplight and things like that.
Cheryl Ward	I think science is the ability to ask a question and be able to figure out what kind of data you could go out to collect to apply to answering that question, and you might never answer the question, or you might get a lot of wrong answers to the question, but every wrong answer that you get will take you closer to the truth.
Jerry Yin Bioloist	I like science for the problem-solver aspect, and what I mean by that is: I like it when the puzzle is pretty much empty and there aren't many pieces on the board.
Eric Brennan	But it's a puzzle where nobody tells you where to start or where Horticulturist to end. You've got some help from previous work, because all science is dependent on previously done science.
Peter Dann	It's almost like detective work. You get all these little

- Biologist clues. You often can't see the whole picture.
- Jim White And I think science is the same way. We have lots of facts – they come from all directions; we have to put them all together and come up with one conclusion. *interpreting*
- Vicki Colvin Really, science is really social. You get your ideas from talking to other scientists, from going to meetings. You spend a lot of time talking to people and it's by talking to people and also reading the papers that they've written, that you learn to understand and get ideas.
- Narrator Do scientists see the world differently?
- Jim Tour When I, for example, look at a tree; I don't just see those leaves. I see magnesium sitting within a poriferan site, and knowing that a photon of light comes in and hits that magnesium, and that magnesium will then convert the photon, through a series of cascades, into an electron. It'll run down several proteins and start the photosynthetic process to make that tree grow. That's what I see when I look at a tree, but the rest of the world just sees these leaves. I say there's something much richer here than I see, because I know something about the function of how a tree works.
- John Stern Just looking at patterns and how the environment is laid out – that's like doing science, essentially, and that's what's so cool is you start seeing patterns, and you start saying "Gee, the world is made up in a certain way and it's predictable."
- Robyn Wilson
Rainforest
Biologist You actually get more by just sitting and watching. So, if you sat and watched one bird, or even a cat, and just watch how it's behaving, and I think you get more from that than just trying to race around and gather heaps of information.
- Lisa Barlow
Geologist For instance, in the field of geology it's so important to spend a lot of time looking at rocks, because the rocks are always right. We can make our interpretations and put them on the rocks, but they're always right, and so the more time that you spend actually seeing how the world is, the more that suddenly kind of bubbles up – when you get those inspirations.
- Geoff Marcy When I go to the supermarket, I feel like I'm the premier scientist, and I think everybody is. When you go to the supermarket, you have twenty-five different boxes of cereal that you could buy. Well, what box of cereal are you going to buy? Some cereal is less expensive than other cereal. Some cereal tastes better. Some cereal is more healthy for you. And, you have to take all of that information and come up with an answer: Which box of cereal are you going to buy? That's not obvious. How do you do that?
- Tom Rich
Paleontologist What I like about science, I think, is being on the ragged edge of knowledge. The well-established stuff is things you have to learn to be able to do science, but what I like to do is cope with the unknown and try to

- figure things out, and to have a really unique insight.
- Geoff Marcy To think scientifically is a very simple thing. It's simply to ask yourself, "Am I wrong?" I think that's ultimately what it's about.
- David Westcott Why am I a scientist? Ever since I was a kid, I've always enjoyed being out in the bush. Being a scientist is a way that not only lets me go out and watch animals in the bush, and spend a lot of time in the bush, but it's also a job where I'm actually paid to go and ask questions about it.
- Jim Tour So, what we do is we think of a small idea, and just let our minds run with it. That's the beautiful thing about science. In no other field, do you ever get paid just to sit around and think, and here we are paid to sit around and think, and people don't scold us for just letting our imaginations run.
- Astrid Ogilvie Historian You know, there's science and there's the arts, and they are both ways of amassing knowledge about the world.
- Tom Rich Good scientists are like good artists. Good artists have to be artists, they have no choice. They've just got to do it, and I think good scientists are the same way. You've just got to do it. You become fascinated with something. Something burns in your soul.
- Scott Woodward I actually decided I wanted to be a scientist when I was in high school, and the reason for that is I had a friend, a very good friend, who got sick. He got sick with cancer, and I decided that that's what I wanted to do—that I was going to cure cancer, and I was going to make Mike better, and I didn't know how best to do that, but as I went through school, I knew I wanted to study some biology, I needed to study some chemistry, I needed to do all of these different types of sciences in order to understand what was going on.
- Rob DeSalle Biologist It's almost something new every minute of the day, which is really a lot of fun for me, and it keeps you awake; you don't fall asleep in this job.
- Mark Burrell Exactly, I can go to Wall Street and really make a killing, but do I like that? That's the key question.
- Narrator Think of science as a great adventure into the unknown.
- Nereida Perada Physician/Scientist The joy of science. There's actually many joys of science. It's actually thinking about that question that you want to think about at 4:00 in the morning and put together. Even though at times, it might be a little painful, it's still joyful.
- Rick Smalley Nobel Prize Chemistry What I most like about being a scientist is those moments where you feel that you're learning something that Mother Nature has had there all along and no one else has realized.
- Jenn Fletcher The sense of wonder, that you really get to explore

things. You get to discover a mutant that no one's ever found before, and there's just nothing like that feeling, to say, "Ah, this is something that may really be helpful."

Geoff Marcy

I think the real stuff of science is not the facts, it's not the equations, it's really the dreaming and constructive dreaming. You can't just dream up an idea, you have to actually then work at it for awhile. Both are important, but the dreaming is the most important part.