IS GENESIS HISTORY?

The Interviews

Andrew Snelling, PhD – Geology

SP Crater

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On December 8, 2015, Compass Cinema interviewed Dr. Andrew Snelling (PhD in Geology from the University of Sydney) and Dr. Del Tackett at SP Crater, Flagstaff, AZ.

Introduction

DEL: Andrew, where are we?

ANDREW: Well, we're just north of Flagstaff. It's south that way. And down there are the San Francisco Peaks. This is a whole volcanic field, and we can see a number of cinder cone volcanoes.

DEL: I see them all over.

ANDREW: This one here is about 900 feet high. This particular one is larger than some of the others, but it's smaller, comparatively. Humphreys Peak in Flagstaff rises thousands of feet. This one is only small, but we can see here one small lava flow, one particular event that came all the way around here. But that represents one single eruption. You can't see where it flowed. It may have even flowed out of the side there. You can't see where it came over the edge. A lot of that is breccia. It's loose. But it may have come out of the cracks. Sometimes it comes out of the bottom through a crack and then it just oozes out here and flows. We're standing on it here. So it indicates that this section here was much thicker, then it thins over to the side. This must have been the main exit of flow, and then it thinned out on the other side. And you can see when it cooled it started to crack and crumble.

DEL: And that's where we get this really rocky result. It kind of fractures.

ANDREW: That's right. As it cools it fractures. Sometimes you can get a crack that will open, and it will ooze out, and start to form a lobe here, or a lobe there. You see that in modern eruptions in Hawaii. The other thing we can see if you look closely are gas bubbles, because the volcanic gases that are trapped in the lava burst out, and as the rock cools you see the holes, and that's why this is quite porous.

DEL: Is that why it's porous, and why they feel so light?

ANDREW: That's right. And those cracks allow water to get in after it's cooled, and so you start to get weathering along cracks, and they start to break apart. So this is the sort of terrain that you get, and it's a very lunar terrain.

DEL: This is just awesome.

ANDREW: It takes me back to my childhood days. I became interested in geology when I was nine years of age. And this place brings back memories, memories of family vacations back in Australia to remote places like this, when I was just getting started in geology. And when I got married, of course, we'd still plan our family holidays around places where I wanted to go to study the rocks. But I graduated from a small geological hammer, like this, because of my interest in hard rocks like these basalts, to a sledgehammer. To break up rock like this you don't need a small hammer. You need a sledgehammer. So when I used to pack the family in the car, I packed the sledgehammer in the trunk, and the route that we chose to drive, of course, was always passing the outcrops that I was interested in.

DEL: That's convenient.

ANDREW: So we'd pull up and I'd get the sledgehammer out, break off samples, and away we'd go. Those were fun days. But this place brings back memories of that. You can see from these volcanic rocks around here the sort of places that we sometimes visited in Australia.

DEL: Sounds like a great family vacation.

ANDREW: Yeah, and this place brings back memories of that. You see the quietness, the expanse, nothing to disturb you, yet you've got the reminder that it was explosive in the past. There was this volcano back here, this cinder cone volcano, and it belched out this lava flow that spilled out across this countryside, and it was devastating at the time. It would have been quite a spectacular sight.

DEL: Well, how did you get interested in geology?

ANDREW: Well, actually it was a family vacation just before my ninth birthday. We went on a vacation to Tasmania, the island state of Australia, and we went to a mining area, and we got to an area where I could pick up rocks and minerals. And those bright shining stones attracted my interest.

DEL: Andrew, this is your kind of territory, isn't it?

ANDREW: But these rocks are interesting because they're totally different from the sandstones, shales, and limestones that Steve Austin is interested in. And I worked in this sort of country back in Australia. In the early days, after I left university, I had a job with the mining company, and we'd get dropped out in areas just like this. No roads, just drop in by helicopter, and we'd get left to take samples. The helicopter pilot would have to come back and find us—we'd have to use signals because we didn't have walkie-talkies, and that sort of thing, in those days.

DEL: What would you be looking for?

ANDREW: Well, we were looking in stream gravels for ore and diamond deposits. If an ore or diamond deposit eroded, some of the minerals would get washed down into the streams. And so, we would be dropped in by helicopter to get these samples, to test for things like copper and lead, zinc, gold, but also for minerals that are shed by an eroding diamond deposit. And it was a very successful exploration. In fact, one of our discovery teams actually found diamonds in the creek, and followed it up to the source.

DEL: I bet that was exciting.

ANDREW: Yeah. It ended up being Australia's largest diamond mine, one of the largest in the world. So that's my background. These sort of rocks, of course, start as hot molten material and then they cool. You can see from the terrain around us that when they cool they break apart.

Catastrophes In The Past

ANDREW: There's something like 1000 of these volcanoes around here, and the little one behind us here, we call that a cinder cone volcano.

DEL: You call that a little one?

ANDREW: Yeah. It actually is a little one when you compare it to the San Francisco Peaks. That one is about 900 feet high. Imagine from the base of where you observe to its top. Mount St. Helens is about 8,000 feet high, and it blew the top off with the 1980 eruption. This thing would have been cinders that bubbled up with molten material and cooled up there in the air, and then dropped down and gradually built that cone shape. But here behind us we can see where it actually spilled out of the cone and ran across the ground. We can see it right into the distance out here.

DEL: Just a huge amount of basalt lava.

ANDREW: Yeah, but it's actually small compared to the lava flows that we see in many places. If we look at a profile, this one might have been about 10-12 feet thick. That's fairly small compared to some of the ones we see in the geologic record. And this is one of the things that we observe: these volcanoes are small. When Mount St. Helens erupted in 1980, it blew the top 2,500 feet of the volcano right off. But that was small compared to historical eruptions. We can go back a little bit further to the Yellowstone eruption, some of that volcanic ash made it all the way to Texas. It blew that far away. So, in fact, as we go back in time, and we find that lava flows and eruptions were much bigger in the past. We go to the geologic record. This is why it's interesting for helping out the soft rock geologists, because we see lava flows in the rock record between the sedimentary layers. Think about it, you get an eruption like that, that's a moment in time. We call that an event. And like a historian wants to know exactly when that eruption occurred, a geologist wants to know how that fits in the overall sequence of the accumulation of the rock layer.

ANDREW: So, this represents an event horizon. And, when we go back in the geologic record, some of these lava flows are humongous by comparison. Some lava flows in India have an accumulation of up to 1,000 feet. These lava flows can be 10'- 20' thick, and they kept on accumulating over an area a third of the size of the subcontinent of India. An example close to home is up in the Pacific Northwest, the Columbia River basalts. People are familiar with those because the Columbia River comes through a deep gorge, and you can see the lava flows there. They were huge by comparison to this, but not as large as those ones over in India. And so, when we look back in the geologic record, even just thinking about volcanoes and these lava flows, what we see in the present is really minuscule by comparison to what we've seen in the past. And that's telling us something about the historic past. It's telling us that it's okay to look at the present to see how volcanoes erupt, and understand the plumbing system that brings the material to the surface, and how it explodes. But we can't use present day rates of these processes to understand how quickly and how majestically, in terms of scale, the geological record accumulated.

Radioisotope Dating

DEL: Well, that is the point that has brought me to you. Steve was pointing me to the great issue that we have, one of the great issues, and that is the age of the rocks and what the conventional paradigm would tell us about how old these rocks are. And my understanding is that we use the present to determine that age. So how do we determine the age of these rocks?

ANDREW: Well, the important first thing to recognize that this lava flow is, in a sense, an instant in time. It's an event. And when it's molten, you've got all the different elements that have come out of the volcano all mixed up. Then, as it starts to cool, the different atoms and the different elements combine to make crystals, and the rock starts to crystallize. Once those atoms are locked in, any of those atoms that are radioactive now start to accumulate the daughter products. The daughter products are the decay products from those decaying parent atoms. And so, this has been used as a clock by geologists to date these lava flows. It's important for someone like Steve Austin, who is interested in how quickly sediment layers form, to determine how long it took between this lava flow here and that lava flow here. Is it millions of years? Let's date this lava flow, let's date this one here. And so these clocks, these radioactive clocks, have been very important. In fact, the age of the earth has been determined, in the conventional wisdom, from these radioisotopes, or radioactive, or radiometric methods. They're all synonyms for the same methodology. In fact, the age of the earth was not determined by analysis of earth rocks. It was actually determined using meteorites, based on the assumption that meteorites represent material from asteroids in the solar system that formed at the same time as the earth out of the sun.

ANDREW: And so, this whole question of age dominates the thinking today. When you're talking about the history of the earth, the history of man, putting man in his time setting— we want to understand our roots, our origins. The time question is the thing that's so unfathomable for people. We can experience a volcanic eruption today, and within ten years many people have forgotten it. So, when we're going back further in the past, we've got to have ways of exploring. And we weren't there. We weren't there as eye witnesses, so the scientist is like the forensic scientist who is trying to piece together the puzzle for the judge and jury. Now, of course, the irony is: the judge and jury prefer to have the eye witnesses that were present. But we weren't there to see it, so the scientists are stuck with what we see in the present, and then try and make assumptions to understand what happened in the past.

DEL: Well, let's look at this a little more deeply because the issue of age for most people is a question to be able to look at something. I can look at the difference between a young boy and an old man, and I can tell that there's age there. I can look at a little sapling tree or a big tree, and I can tell there's a difference in age. But now, you're talking about something we can't see with the human eye.

ANDREW: It's more difficult with a rock. We can look at these lava flows because they're so recent, they're on the current land surface. We can go deep into the Grand Canyon, not far from here, down deep, and the basalt looks exactly the same. So, you just can't see from the appearance of the rock. You have to have some other measure. This is where the idea came to use radioactive decay to measure the passage of time. If we can measure the rate of decay in the present, and we can measure how much of the parent and daughter atoms we've got left in the rock, we can use that as an age calculation. Let's try and get down to the nitty gritty with this, and understand it a bit more.

ANDREW: I like to use the analogy of an hourglass. It's a common one, and it fits with the conventional thinking. You've got the two glass bowls, and there's a narrow neck between the two glass bowls, and you've got sand grains in the top that fall to the bottom. It was an old way of measuring time. You could start by tipping the hourglass so all the sand grains were at the top, and within an hour, all the sand grains would fall to the bottom. It's an objective form of measurement. So, you knew that if you started with all the sand grains up in the top, and you left it sitting on your bench top, and you went and did something else, when you came back you would know how much time had passed. So, you make observations. You make measurements. You see that half the sand is still at the top, half the sand has fallen to the bottom. You know it takes an hour for it all to fall, so half of that means you've been out for 30 minutes. And so, that's why the geologists are saying, "If we know the rate of decay, if we know you only had parent to begin with, if we measure the daughter now, and assume that all that daughter came from parent, it's like that hourglass clock." We should be able to figure out how long ago all the atoms were originally just parents in the rock, and that would go back to the time when the rock formed. When this basalt cooled it locked in all those parent atoms, and then it was like having all the sand grains at the top. Now, we come back years later, and we measure how many of the daughter atoms are down at the bottom in this basalt, and then we can calculate the rate at which they fall.

DEL: So the sand in the top represents that material that is radioactive, and if it is converting into a daughter element, that's the sand in the bottom.

ANDREW: Here are two radioactive elements that people are familiar with: uranium decays to lead, and potassium decays to argon. Now, the point is this rate of decay is so slow where we measure it in the present, that it takes millions of years for parent atoms to decay to daughter atoms. And so that's ultimately where the millions of years come from, the fact that the decay rates in the present are slow.

DEL: But this seems like an open and shut case then.

ANDREW: Well, it isn't quite like that at all. And we can start with this lava flow here. We know that this was fairly recent. We know that from looking at how much it's weathered, and how it fits into the terrain. And yet, if we take samples of this, and we use potassium-argon dating — that's the parent potassium decaying to argon — we actually get ages that are way too old. We know that. In fact, there's been a number of studies done, where we've taken historically-observed lava flows, say, in Hawaii. We've done it in Mount St. Helens. I've done it in New Zealand. There's plenty of examples in the conventional literature, in the textbooks even, of recent lava flows that have been dated using the potassium-argon method, and they give ages thousands, and even millions of years old. And that's because, if you look closely at this rock, there's lots of little gas bubble holes. And so, the volcano also spews out gases, and amongst those gases is argon. So, we actually can demonstrate that extra argon. It wasn't just potassium atoms that were trapped in the basalt. There was also argon trapped in the basalt. So if we assume that all the argon came from potassium we're calculating double.

ANDREW: So, in other words, instead of having a lid on the hourglass there's actually no lid at the top, or at the bottom out here in the real world. How do we know? We weren't here to test these rocks for the time that they've been out here. What about the rainfall that comes here? You break open these rocks, and you see fractures, and you see leaching, and leaching is going to move these atoms around. So it's not like having a closed system where you've got a lid on it. You can be adding more parent in, or you could be taking more daughter out, or you could be adding more daughter in. And so, if you're assuming that it's been closed—assuming that you only had sand grains at the top to begin with when your rock formed, and now the ones you measure down the bottom have come from radioactive decay since the rock formed—you've gone wrong with your ages.

DEL: So it would be like walking back into the room with the hourglass that really is open on the top, and is spilling into an open bin on the bottom, and have little kids running around with shovels and sand. You can't really tell how long it's been—

ANDREW: It's even worse than that, because it's almost like you've got a stop cork on it that can actually change the rate. We've assumed that these processes are constant, but we know other geological processes haven't been constant with time. You want to probably talk to Steve Austin about this. He'll talk about rock layers being formed by debris flows. And so that's not the norm. That's where you get an enormous acceleration of geologic processes. And what we would imagine, under normal circumstances, takes tens, hundreds, thousands of years to accumulate into a bed of sand, actually happens within minutes, you get this debris flow. These lava flows are small compared with what we've got in the geologic record. So we've got lots of hints that geological processes haven't been at constant rates through time, and we have other hints that the decay rates may not have been constant.

Comparing Decay Rates

ANDREW: We've gone to lava flows, and we've taken rock samples from a number of places. For example, we've taken samples from four rock units in the Grand Canyon. We collected lots of samples in the Grand Canyon, and in each of these rock layers. We've done it in other parts of the world. Done it in New Zealand. And then we've submitted the same samples to more than one of these dating methods. Because the theory says that if the clocks ticked at the rate that we measure them today, and it's been a closed system, then it wouldn't matter if you used potassium-argon or uranium-lead. They should all give you the same result. It's like having a series of hourglass clocks lined up on a bench.

DEL: With just different kinds of sand.

ANDREW: Exactly. And so we wanted to test that. And when we tested the same samples with more than one method, we were getting ages that were different by hundreds of millions of years, or even a billion years, in some instances. For example, one of the lava flows in the Grand Canyon, the potassium-argon, gave an age of 516 million years, rubidium-strontium was double that, 1111 million years. And one of the other methods, samarium-neodymium gave an age of 1588 million years, three times more than the potassium-argon test. So we're not talking about small disparities between the ages. We're seeing huge differences by using different methods.

DEL: Well, if there is that kind of a difference between all of these dating methods, then that would seem to confirm the fact that we have an open system here, not a closed one.

ANDREW: Correct. And if we have an open system, that means we can't trust it to give us dependable dates for these rocks. And that changes the whole thinking about the history of the earth, because suddenly now, these radioactive clocks are not reliable. We've got evidence that rates were faster in the past. Suddenly, we may not be thinking in terms of millions of years. We may be thinking in terms of a history that's much shorter.

DEL: But you were saying that this kind of evidence is in the open literature now. Why is it not making an impact?

ANDREW: Well, I've been asked that when I've spoken in university geology departments. I'll get asked a question, "Well, if this is in the textbooks why aren't we taught it?" And the answer is: it's because there is a commitment to the "millions of years". Once people get locked into that focus, anything outside their filter view that conflicts with that focus is marginalized. And these millions of years are important, because, if we go back in the history of scientific thought, Charles Lyell in England proposed — and others too, but he was a champion of it millions of years and they multiplied the ages for the rocks. And that was the foundation on which Charles Darwin built. In fact, Darwin read Charles Lyell's book, and was convinced by it of the millions of years of geologic evolution. Darwin concluded, given enough time — although we don't see it happening in the present, or we might only see as small changes in the present — given millions of years these small changes can add up to big changes.

ANDREW: And so, if you want to have a worldview, or a way of looking at history, that says we got here by chance, random processes over millions of years, then you've got to have rocks that are millions of years old. Otherwise you undermine the whole foundation of that view of earth history.

DEL: So time becomes the critical element for the conventional paradigm, and that time has to be deep time.

ANDREW: And this was actually in a Scientific American article about the origin of life. A professor of biology at Harvard University in the mid '50s went so far as to say, "Time is the hero of the plot. Given enough time, the impossible becomes possible, and the possible becomes probable." And here we are. And so that's the nature of what we're talking about.

DEL: So deep time almost becomes a magic wand here. Without that, there is the stark reality that we're dealing with.

ANDREW: You wave it over the rocks. You wave it over the fossils. And you start to imagine that what couldn't happen in the present, could happen over millions of years.

DEL: Well, in light of all of that, what does an individual who holds to the Genesis paradigm see when we look at these decay rates, and all of that scientific evidence? How is it possible for these dates to look so old?

ANDREW: Well, it's because we're thinking the decay rates were speeded up in the past. Remember the four rock units we studied in the Grand Canyon? I was involved there doing research with a group of scientists, physicists, and geologists. And as we sampled from these four units in the Grand Canyon, we noticed there was a systematic pattern in the ages of the different parent radioactive atoms. That told us that something systematic was going on. Because everyone agrees that the layers of rock at the bottom are going to be older than the layers at the top. Everything is going to be laid down in sequence, like a stack of cards lying one or top of the other, or pancakes off the griddle. You keep stacking. The ones down at the bottom are the oldest, and they will give you the oldest radioisotopes or radioactive ages. The ones at the top, like these lava flows here that are on the earth's surface, they'll give younger ages.

ANDREW: So, there is something systematically happening, and we believe that the decay rate was going much faster in the past—it was accelerated. So that, for example, a lava flow down at the bottom that was deposited in the first month of the Flood year, if we're looking at the Flood paradigm, it would go through 11 months of radioactive decay at accelerated rates, whereas the lava flow that was formed at the end of the Flood year, would only go through a few weeks of accelerated decay. So it would give you a younger age compared to the one down at the bottom.

DEL: That would be like having a bunch of hourglasses started an hour apart—they would all show different times.

ANDREW: Exactly. And that's what you get. Those that were formed first would have more sand grains fall to the bottom. Those that were formed later would have fewer sand grains, and therefore you get different ages. So, you would still get a relative sense of age which you do get visually anyhow. The layers at the bottom are relatively older than the ones at the top. The layers at the bottom are relatively older than the ones at the top, but how old the differences, or how long, we can't automatically assume that we can determine by the radioactive ages. We can get a relative sense, but not an absolute sense.

Radiohalos

DEL: Well, I know you spent a lot of years studying this. Is there evidence of that accelerated decay rate?

ANDREW: Yes. There's a number of other lines of evidence that we discovered. For example, I was looking inside some crystals in granites, and in a granite you get crystals that contain a little higher level of, say, uranium, and when that uranium decays, it's like sending out little bullets from a gun. If a gun fires at drywall, it will leave a hole. It will damage it. And so, that's what happens inside the crystal. The uranium atom spits out the decay particle like little bullets, and it damages the crystal. But it can only go so far before it loses its energy. And so, you have this damage around the center area where the uranium was. We call it a "radioactive halo." It's where the crystal was damaged. And I was studying hundreds of samples from granites all around the world. I was even looking at other types of rocks to see if we could trace this elsewhere.

ANDREW: The interesting thing is, that it was like the difference between a handgun and a rifle. Different atoms will shoot bullets different distances, and they'll shoot them faster or slower. And there is an element called polonium within the decay scheme of uranium that has a very short existence. Polonium has to separate from uranium to produce a polonium radiohalo. And this element was a clue, because for us to find these polonium-only halos, the uranium had to decay quickly enough for polonium to have a chance to produce it's own halo. This had to mean that the uranium decay was speeded up. Because if it wasn't speeded up, the polonium would be lost before it could have the chance to form its own halo. And so, I found that in granites all around the world, in hundreds of samples. That was another line of evidence, because that's physical evidence that radioactive decay has occurred. Some would argue that just because you measure the chemistry of a rock, and you've got uranium and lead in the rock, you can assume that all the lead has come from radioactive decay. But could it be due to the chemistry of the rock? And, it might be, but here, in this instance, we had physical evidence that uranium had decayed, and that the radiation had damaged the crystal around.

DEL: Because of that halo.

Helium

ANDREW: Correct. Now, talking about uranium, another line we looked at is, not only do you see uranium decay to produce lead, but for every uranium atom that decays, it produces one lead atom, and it also produces eight helium atoms. Helium is the second lightest gas. Hydrogen is the next one that's lighter than helium. And so it gets trapped in the crystal, but because it's chemically inert, it doesn't connect with any other atoms. These little tiny helium atoms will actually leak out of the crystals. And we were examining a rock granite from over in New Mexico where they had taken samples down a drill hole, and we got samples of the crystals that contained uranium, that also contained helium. And the conventional uranium-lead age, the conventional radioactive age or radioisotope age, was 1.5 billion years. But we're also looking at what happened to the helium. If there was that much decay of uranium to produce that much lead, there should be eight times as much helium. How much of that is still left in the crystal? How much has it leaked out?

ANDREW: And when we did that as measurements, and we found out how quickly the helium leaks out, we can actually have an independent way of dating those crystals by the rate of the helium leakage. And the helium leakage age for those crystals was only about 6,000 years. And so leakage is a physical process that we can study in laboratories. So, we've got mathematical equations to describe it. It's very well understood. And so, that means that in 6,000 years of real time leakage, we had 1.5 billion years of radioactive decay. And so that tells you that the decay rate had been speeded up. That was another line of evidence. So, we've got these hints. We're still trying to figure out why it would happen. Some have suggested it's to do with changes in the binding forces in the atoms. If you change the binding force slightly, or some other external factor causes changes to the binding of the atom, (because a lot of this is happening in the center of an atom, in the nucleus) then you're going to change the decay rates by orders of magnitude.

ANDREW: And we've got hints of it too. You may be aware, Del, that there's been some papers every now and again. Not everyone is locked into thinking the same, and they still report unusual things that they observe in the hope that might shed some light, or challenge the boundaries of scientific thinking. And there have been papers recently where they have measured the decay rates of atoms. They can actually measure the rate of radioactive decay in the laboratory and they've done it at different times of the day, different times of the year, and in different parts of the world. And they've noticed slight differences related to the solar cycle, and to the sunspot cycle. And that may well have been affected by neutrinos coming from the sun. And so, these are hints that there may be processes that we aren't aware of, that could change these decay rates.

DEL: So back to our hourglass. We have an hourglass that is really strange. It has an open top and sand can come in or go out. It has an open bottom that people can pull sand out or put sand in. It has a variable neck through which the sand can flow faster. It just goes back to what you were saying earlier. How can we then depend so much upon the radiometric dating?

Eyewitness Testimony

ANDREW: Well, if we're in a court of law, the judge would throw out the evidence because they couldn't really depend on these methods giving you reliable, accurate results.

DEL: But we would say that we do have an eyewitness that has given us testimony as to what really happened in that time.

ANDREW: Yes, God has given us an eyewitness testimony in the book of Genesis, and he's laid out the history of the earth—starting with a supernatural creation, where trees were already bearing fruit. If we were going back, and looking at those trees, from our everyday experience we would expect those trees have been around for a while—to have grown and produced fruit. And we see rocks, that by our normal observation today, we would think would have taken a long time to form. But no, God was there, and he supernaturally, instantly created. And that's what he says in his record, in the eyewitness record in the book of Genesis. And then he goes on to say there was a time when he judged the earth because of human wickedness at the time of the Flood, and at that time he caused catastrophic things to happen. Water came out from inside the earth, hot molten material that also came from inside the earth, and the earth's surface was totally reshaped. All the high hills and the mountains were covered in water. And Noah came out to a totally different world than the one that he had experienced before the Flood.

ANDREW: And so geological processes would speed up to such magnitudes and rates that we can't even imagine today. We can only get hints at it by stepping back and looking at the geological record, and looking at the big picture of the geologic record. I think that's very important. Just like we stepped back before. Yes, we can see this volcano, this cinder cone volcano behind us looks quite large, but it's small by comparison to what we see, even in human history, with Mount St. Helens. But these lava flows are small by comparison to what we see in the geologic record. And so, we see evidence that we need to open our eyes to a bigger picture, on a bigger scale, and start to think in terms of what was going on around the world at that time.

DEL: And then the conventional paradigm seems to cut itself off from the picture that the present is not really the key to the past, because obviously the past holds some massive, massive catastrophic events that are not going on today.

ANDREW: In fact, the Bible would say that the past is the key to the present. If you want to understand why the way the world is today, you've got to understand what happened in the past. And yet the conventional wisdom is that we should look only at the present, and extrapolate that back into the past. And Charles Lyell went so far as to say only present day rates can be used to interpret the past. But fortunately conventional geologists are now realizing that that doesn't work.

DEL: Well Andrew when we talk about that accelerated decay—my dad worked in nuclear physics for a long time—that generates heat. Does that raise an issue?

ANDREW: It does raise an issue, but we can answer the question from almost the negative. If there was a lot of heat, you would melt rocks. So you would expect evidence of melting the rocks, and we don't see that. The fact that we've got the rocks still in a form that we'd expect them, without that excessive heat, indicates it may not have been excessive heat produced by that accelerated decay. Another indicator we talked about is radiohalos. One of the places where radiohalos were found was in that drill hole in New Mexico, where they took samples of different depths, and measured the temperature. You could actually measure the temperature inside the drill hole, and you can look at the radiohalos. Because once you get to a certain temperature the damage in the crystals gets healed. The atoms vibrate and they snap back into the original positions, and so the halos disappear. So the very fact that we can see radiohalos in rocks that were formed in the past indicates that there hasn't been excessive amount of heat. The fact that the polonium radiohalos require accelerated decay, yet we can still see the end product of the polonium radiohalo, indicates that during that accelerated decay there had not been a lot of heat produced.

ANDREW: Another indication is even with the helium. We talked about the helium leaking out of those crystals. We know that if you heat the crystal up, then you're potentially going to leak that helium out more rapidly. Another way of thinking about leakages that everyone is familiar with is the helium balloon. At first, they float at the top of your living room, but eventually that helium leaks out, and they'll start to fall to the ground. And so, we can actually observe the end result of the helium leakage, and it's fairly rapid. Now, if you start to warm that, it's going to expand, and it's going to force its way out of the membrane that's holding in it much faster. So, there's a number of indicators that give us a clue that the heat may not have been the problem that some people have suggested. We're still exploring these issues, and that's what I enjoy about science. If we had all the answers, there would be no hard work to do.

ANDREW: And it's like the detective that's trying to solve a crime, the geologist is out there looking at the rocks, gathering the evidence, and trying to piece it together. Yes we've got to make assumptions, just like the CSI people do in their criminal investigation. They're trying to figure out who the murderer was. Well, we're trying to figure out what happened in the past, and that's what makes it exciting. And you can live with the tension of not knowing all the answers. You can look at the probabilities that the conclusion you've reached has a high rate of probability, and go from there. So, the fact that I can give you several lines of evidence that indicate that heat might not have been a problem, leads me not to be concerned about that being a problem. On the other hand, I've got strong evidence that the decay rates being much faster in the past. As we've said before, if we can't trust those decay rates it doesn't mean that we can't use the dating of rocks in a relative sense. We can see a rock that's older will have had experienced more accelerated decay. So, it's not as if it isn't a tool that we can use, but we have to adjust our thinking about how we use that tool. It cannot give us reliable absolute ages.

DEL: So, we're still left with some mysteries associated with this whole radiometric dating issue. But it seems what you're saying is that the evidence better matches the Genesis paradigm than the conventional paradigm.

ANDREW: Yes, it does. The Genesis paradigm, of course, is a much younger earth, only thousands of years, not millions and billions of years old. And many of the geological processes were compressed into the year of the Flood. And we can talk more about that. When we talk about these lava flows, we talk about it for the scale of what was in the geologic record. Compared with what we're seeing here, it indicates that if big things happened at a quicker rate, then you can produce the whole geologic record in a much shorter period of time, and that fits the Biblical Flood paradigm in Genesis.

DEL: Andrew, what other kind of evidence do you see mounting up here?

ANDREW: Well, we can look beyond radioisotope dating. This is where my friend, Steve Austin, comes into play, with looking at the geologic record, but we can do that too. This is not the best place because we can't see the layers exposed, but we can go south of here to Sedona where we can see cliffs of the layers, and there's features in those layers that I want to show you that indicate the time periods, just like with the radioisotopes. We can telescope the time periods that the rock layers formed rapidly, just like the radioisotopes decayed rapidly.