

480. Holiday Diary (Part 7) BIG ROCKS!

<https://teacherluke.co.uk/2017/09/18/480-holiday-diary-part-7-big-rocks/>

Hello folks!

Welcome to another episode of the podcast. I have got some news here about one of my sponsors and that is Spoken. So as well as they are message based English learning service they are now launching voice calls. So with Spoken calls, you can have twenty-five-minute voice calls with their trained native English speaking instructors through Whatsapp, Line, Wechat and other platforms. Right? So actual conversations with their teachers, not just text-based stuff. In your voice calls you can focus on the most important topics for you, such as meetings, conference calls, interviews or even just general conversation skills in English and for a limited time you can try your first voice call for fifty percent off when you go to getspoken.com/lep. Fifty percent of your first voice call at getspoken.com/lep.

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Hello folks!

How are you doing? Welcome back to the podcast. I hope you are doing alright. I am feeling quite pleased with myself today because I've put some shelves up. I do not know if you often put shelves up. If this is something that you've ever had to do, to put shelves up. So I have been doing DIY. DIY: Do It Yourself. DIY means all the bits of work and stuff you do at home like, for example, painting, redecorating, putting up shelves and things like that. So we are kind of having to rearrange the flat here because, you know, we are going to have a baby, aren't we? So, you know, when you have a baby, you have to do things. You have to make changes, you have got to sort of move things around, make space, for where this other person is going to go, you see, because when you have a baby, it's basically having another person in your life. Suddenly you've got this other person. You got to, first of all, keep them alive and then kind of bring them up and all that stuff. Wow!

And, you know, obviously babies when they start, they are small, aren't they? They are very small. But they grow into people. You know how it works? You should... Anyway. So the point is that we've got to make space where we put the baby's cot –the cot is the thing that the child would sleep in–. It's a bit like a bed crossed with the prison. That is a cot. You know what I mean? You want your child to have somewhere to sleep. But at the same time, you do not want him to escape

in the middle of the night or at least roll over and fall out of the bed. It's for their own protection. But anyway, so you've got to find a place for the cot and for the baby's stuff and things like that.

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So basically we're re-arranging the flat a little bit. And part of that involves moving books around. We've got loads of books, because books are nice, aren't they? They're nice things to have. Obviously to read all the wonderful things you can get from books. But also they look nice on shelves. So we have got loads of books downstairs, so we've had to move books and also I have this.. I've got an electric piano that used to be downstairs but we have to move that out in order to put some other stuff in its place. So the piano had to come up here in the skypod where, I record episodes of the podcast, I call it the skypod or space pod at night. Anyway, so the piano had to come up here which meant that I needed to make space up here, so I used to have this sort of set of really dodgy cheap white shelves, I had to get rid of them, take them apart and get them out. Put the piano in where the shelves used to be and then - because of all those books, you know, what I was going to do with all the books that came from the white shelf? So I had to put up some shelves on the wall above the piano and I've done that and... I mean that's an annoying thing to do. I don't know if you've ever had to put shelves up.. If you're not very practical, if you're not a practical person, if you're not good with your hands, if you're not good at DIY or carpentry and things like that, then it's often a very frustrating experience, isn't it? Putting up shelves because you have to make sure that they're straight, you've got to try and work out exactly where they are going to go, you have to make sure that they're going to be in line with each other and perfectly straight. So that involves using rules and pits in a pencil and a spirit level - do you know what a spirit level is? A spirit level is.. they're usually yellow, I don't know why they're usually yellow but they usually are. Certainly in the UK and in France as well apparently. So a spirit level is kinda like this, is like a ruler usually about a meter long, but inside the ruler there are these little spirit level things like.. How do you describe them? It's like a little tube of liquid and inside the liquid there's a bubble. And you know when the thing is leveled, because the bubble moves into the center of the tube, that's a spirit level. You see them on things like camera tripods as well, it's a way of making sure that something is perfectly horizontal or vertical or something. So you've got to use the spirit level, you've got to use a ruler to make sure that you're putting that shelves in the right place, you mark the little spots where you're going to drill holes.. Then you've got to get you drill out and choose the correct drill bit, which goes in the front of the drill and so you've got to get the right drill bits, it's got to be the right size, it's got to be the right kind of metal, you know, if you're drilling into wood or if you're drilling into the wall, you know, depending on the material.

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And then you have got to drill in properly. And then, into the hole you've drilled in the wall you need to put a little plastic thing which is actually called a rawl plug. Not a wall plug (not w-a-l-l p-l-u-g),

but a rawlplug (I don't even know how you spell R-A-W-L plug)... Ok... (R-A-W-L P-L-U-G). So it's a rawlplug, not a wall plug. So, you have to get a rawl.. you have to get the right kind of rawl plug and put that into the hole. And then obviously you can attach the shelves to those fittings that you have just created. And, you know, if you.. again... if you're not practically minded then there's this sort of other element, this element of luck or the hand of faith that gets involved, regarding like whether or not it ends up straight. So you have to kind of pray or kind of use the force or whatever it is. And just hope that it's going to end up straight, you keep putting the spirit level on that... Yeah! It's still STRAIGHT! And keep the screw, the shelves in, and check it, is still straight? Yes, that's straight. So, I manage to put up these two shelves, they're straight. And I've got all the books on their and it's very nice. And it's a good feeling when you have done that. You know, when you ... just even something basic like putting up some shelves, gives you a good feeling. I feel like a real man now, I feel like a proper man, I put shelf.. me.. strong man – put shelf up...It's good feeling. So I'm feeling a bit pleased with myself because of that. That all it takes to make me feel pleased with myself “Just put what on wall.”

Anyway, so that is going on here. How about you? How are you doing? Have you put a shelf up, recently? Feels good, doesn't it? We also got rid of loads of stuff. You don't need to know this. You're probably thinking: “All right Luke, enough of the shelf banter. What about The Big Rocks that were promised in the title of this episode.”

Ok, then. So, in this episode I'm going to continue telling you stories of my recent holiday. And there will be descriptions of impressive rocky landscapes. A sort of geology lesson and also a brief history of planet Earth. So, just slightly ambitious in this one. You can expect a plenty of solid descriptive chunks of vocabulary as this holiday diary continues. I expect that there will be probably just one more episode to come in this series. And then it will be back to the usual sorts of episodes that I do, including a few conversations with some friends of mine as guests. But let's **finish off** the Holiday diary series. So, the first part of this trip was urban, right, cities and stuff. Now it's all about earth, wind and fire. Not the band, not the funk band from the seventies, no. But, I'm talking about the elements, You know: earth, wind, fire, rocks, stone, water, ice, wood, time.. stuff like that. Big things. It's going to be quite difficult to get across to you how amazing it was.

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But that's what I want to try to do. But I don't want it to just be a sort of “then we went...”, you know, as I have said before, I don't want it to just to be a sort of boring holiday description. I hopefully won't be that. Hopefully it'll also be a chance for me to talk to you about bigger things, bigger subjects. Like for example geology and a history of Earth. Geology, I hope you think that's an interesting subject. I think it is. I think basically any subject can be interesting if you just approach it in the right way. When you realized that any subject is basically connected to... all subjects are connected to something bigger, aren't they? The bigger thing being something about... this again sounds pretentious but it doesn't matter. All subjects, when you think about it, are all connected to

certain bigger... a bigger theme which is just the experience of being a life, right? And what it means? What it's all about? What is the world that we live in? And how does it all mean anything? And what is our place in the world? And what does it mean to be a person living on Earth? Okay. I'm just trying to explain that kind of thing. So all right then.

So we drove from Las Vegas, right, on a road trip tour – a kind of loop, in the jeep that we rented. We went on a loop over about nine or ten days, stopping at various places to stay in, a night or two, and taking in some of the most impressive spectacles of natural beauty, that I've ever seen. And there were some incredible things. Now I don't know about your country. I'm sure that where you live, you have some seriously big and impressive locations as well. I mean there are some amazing places on Earth, all around the world. Places that are famous and that take your breath away when you see them. Places and things that I would love to see with my own eyes one day. There are so many places around the world I'd like to visit. In the UK, in Britain where I'm from, our countryside is absolutely beautiful. I love the British countryside, but it's generally on a fairly small scale compare to other places, like for example, I don't know if you have ever visited the countryside certainly in England, we have like rolling hills and little stone bridges over rivers. And it all seems quite self-contained or cute or something, a bit like The Shire or Hobbiton in *Lord of the rings* – you know. Not all of it. We do have some impressive spots as well, with big mountains and lakes, like for example in the lake district or parts of Scotland in – obviously the north of Britain – they've got some spectacular landscapes there. But certainly in England it doesn't quite smash your senses, like the things that we saw in Arizona and Utah. And, you know, and in your country there might be similarly impressive natural spectacles on a very large scale.

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It's quite an amazing experience to witness that sort of thing. It makes you feel as an individual person, It makes you feel very small in comparison to the massive visual things but also the general passage of time that you can be aware of when you witness something like The grand Canyon which contains within it rocks which is something like two billion years old. You know, it just makes you feel sort of small and you realise your place in the epicness of the universe. Just that! So, every day or two, we would be... We'd stopped in a different location and we would be greeted by ever more stunning views as we toured around the border between Utah and Arizona, from Zion National Park and Bryce Canyon NP, two places like lake Powell, where you can see stuff like Horseshoe Bend and Antelope canyon, in the Navajo Nation territories. And finally the Grand Canyon as well before heading back to Los Angeles via Las Vegas again.

You can think what you like about the USA, it's a country of extremes, I mean, for example: There're plenty of things that aren't very appealing like Pop tarts. I mean, pop tarts, what even are they? (<https://pioneerwoman.files.wordpress.com/2017/01/homemade-pop-tarts-17.jpg>) They're sort of disgusting, aren't they? You know what pop tarts are? They're like sort of things that you put in the toaster, it's food, stuff you put in the toaster, and it's like a tart in the shape of toast, and you

put it in and they toast in the toaster, and when they come out they're really hot, and they're full of jam, and... they look like jam on the inside but actually when you read the ingredients there isn't actually any strawberry in there, and they're just like fake kind of... Pop tarts, I mean, they're disgusting, aren't they?

So, it's a country of extremes, The Grand Canyon and.. Like pop tarts is a weird food, Anyway, you can say what you like about the country but you can't deny that it has some truly breathtaking spots of Natural Beauty. And thankfully, most of these places were protected by the National Parks Project which was initially set up at the end of the nineteenth century, and then was fully put into force in the early twentieth century by the President at the time who was Theodore Roosevelt. In a nutshell, the National Park Project was there to protect certain Natural Monuments... How can I explain this? Back in the late 1800s, when America was being populated, greed was rampant like p... There was the gold rush where people were sweeping across the country and digging on the ground in a desperate search for gold and other precious minerals that they could excavate from the ground, oils and things like that.

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And if it wasn't for the protection of The National Parks project, a lots of America's greatest assets would have been kind of cut down or blown up or dug up and sold off for private interest. Places like, you know, some of these spots in these national parks, some of those spaces could have end up being privately owned. And they might have been like seriously damaged and the natural beauty, that has, you know, been developing over millions and millions of years might have been damaged or destroyed or simply unavailable to general members of public, who now - thanks to this project - can go and witness them and learn about them. Thanks to The National Parks project these things are still available for us to see today. So the whole area that we were driving around and visiting basically features canyons and cliffs, that form what is known as The Grand Staircase, ok? Now, imagine a big staircase made out of rock. And I say a big staircase, I mean huge. It's spread out over hundreds of miles. In different locations you can see different layers of rock that are exposed because the rock layers have been uplifted. For example by seismic activity under the ground or they have been tilted exposing the rock. Or that simply erosion has exposed the rock as well. This is a series of colorful cliffs stretching between Bryce Canyon in the north of that general area and then The Grand Canyon which is basically in the south. And then there's other places as well, like for example Zion National Park which is kind of between that two. So from Bryce Canyon up in the north to The Grand Canyon in the south we have this thing called The Grand Staircase. And it's famous and it's unique as well, it's one of the only places in the world where rock is exposed in this way. And this is rock in something like forty of different layers, each layer represents a different sort of age in natural history and the rock at the very bottom of The Grand Staircase is something like two billion years old. And the rock of the top is, you know, fairly young really, it's about sort of thirty to forty million years old. So there's all of this time and history and it's

the Earth's history as well. It's all there, all visible in these layers of rock which have been exposed because of various different sort of natural processes in this area. That's The Grand Staircase. I didn't really know about this when we arrived or when we were planning it. I knew, when we were planning it, that there are amazing things to see, but I hadn't quite sort of worked it out in this story of The Grand Staircase. We learnt about that when we arrived and when we, for example, got information from guidebooks.

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Or when we listen to rangers who are employed by The National Parks describing it all. So it was a learning experience and something I found fascinating, because it told me things about the way in which the Earth has, I don't know what, like developed over the years and how we occupy a tiny tiny little chapter in the grand scheme of history. So The Grand Staircase. Now the bottom layer of rock at Bryce Canyon. So you have got Bryce Canyon at the top in the north. So the bottom layer of rock at Bryce Canyon is the top layer of rock at Zion and the bottom layer of rock at Zion is the top layer of the Grand Canyon. And the bottom layer of the Grand Canyon is like the Colorado river and that's the bottom of The Grand Staircase, ok? So in terms of the Staircase - Bryce is at the top, Zion is in the middle and The Grand Canyon is at the bottom. If you were a massive giant, right, imagine you're a massive giant like Gulliver from Gulliver's travels or even bigger than that. Let's say you're a huge giant, now you could start at the Riverbed at the bottom of the Grand Canyon and go up The Staircase and btw some of the stairs in The Staircase are in fact huge plateaus and kind of moving sideways across them you can visit places like Lake Powell or Monument Valley, where you can see these eroded tables and platforms and columns that stick up all around you. But you're this giant, you start at the Riverbed in the bottom at The Grand Canyon and you go up the Staircase moving north over hundreds of miles, stepping up every now and then you take steps up, you walk up the cliffs, you walk up these stairs, you pass through Zion, you keep going into the gate to Bryce Canyon at the very top. On your walk you'd (20:00)_assent_?_ through about forty identified layers of rock and about two billion years of history. The oldest sedimentary rock at the bottom of the Staircase is two billion years old and the rock at the top is about forty to thirty million years old. So driving around the area we were going up and then sort of going back down this Staircase, because there obviously the roads wound around and, you know, you drive up in altitude and then back down again. So we were driving up and then back down this Staircase travelling through hundreds and hundreds and millions of years worth of time as well as hundreds of miles of distance. This is one of the only places in the world where this much of the Earth's history is exposed to us. And because of that, because so much old rock is exposed, is one of the most studied geological areas in the world. And we have learnt a lot about the Earth's history from this place. These forty layers of rock are full of evidence.

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That show us what happened in this area in the past and that allows us to understand a lot about what happened in the Earth's history. And we're talking about things like prehistoric stuff – way before humans even existed. The story is told in the rock including, for example, fossils of many dinosaurs. Fossils being the remains of living things that got sort of buried in the ground and became stone like petrified. Became fossils. You can find many fossils of things like you know dinosaurs. So, as well as that, as the impressive sort of historical stuff, it's also just incredible to look at. The layers of rock that you see in the different area have different colors. Some of them are rust-colored, some of them are sort of yellower, some a bit pink, some look white, some are gray; some of these are deep blood red. And the different colors is caused by different chemical reactions in the rock; things like for example the presence of iron in a rock which when it meets, I guess, water, it oxidizes and it changes its color a bit like the way an old bicycle will go rusty in the rain. If you leave an old bicycle out in the garden and it gets rained on over the years then eventually the iron in the metal will react with the water and it goes rusty, and it changes its color. Ok.

This is similar kind of a chemical process in this case. That what turns the rocks these interesting colors. So, our entry point into this Grand Staircase was Zion National Park, sort of in the middle. And we spent a day and a half there and did a fair easy hike up the side of the Canyon to a viewpoint. Now, We had to be very careful and cautious this time. Because obviously we didn't want to have another dramatic hiking experience like we did in previous holiday. As If you listened to the episode I did about traveling in Indonesia you will have heard the stories of us climbing up volcano called Mt Rinjani. And That was... That ended up being a bit dramatic and fairly dangerous. And then in the Yosemite National Park on our honeymoon two years ago we did a hike around the park which kind of turn into, a sort of, dramatic beat for survival, sort of. But. Anyway you can listen to I guess episode the fifth part of the California route trip series if you want to know about what happened in Yosemite National Park. But we didn't want more... We didn't want more dramatic hiking experiences and stuff, we have wanted to take it very carefully, obviously, because my wife is pregnant. Now, If you're pregnant you can hike, you can go walking, in the countryside and so on. And you just have to be a bit careful, don't try anything too strenuous, and obviously make sure that you have got plenty of water, and you cover yourself from the sun. So, we carried loads of sunblock. We carried loads of bottles of water that we bought from whole food supermarkets, we brought with us food and supplies, just in case.

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I mean, you know, the one in Zion was like an hour and a half of walking. So not that dangerous. But still, we packed up the rucksack with all the supplies we needed. And I carried it all on my back. It was really heavy but good exercise. Anyway, so we saw some incredible views from this hike in Zion. Zion National Park is basically, well, it's like a huge canyon, again. Imagine just the ground and imagine some like rocks. Imagine standing on the ground in the big field, okay? Huge,

wide open flat field, okay? Now imagine, on either side of you huge rocks that create these massive walls that are really, really high just coming out of the ground on the both sides. And the rocks being... like all the mud getting washed away from the rocks. And then, you know, that's what it was kind of like. So huge rock walls on two sides, very wide. And the rocks are these amazing orange and kind of rust-colored rocks. And then in the middle, you get like all these pine trees growing. And so if you climb up to a vantage point at the top somewhere, you can look along the canyon and you can see these incredible cliffs on either side, either side of the canyon, with this beautifully colored rocks. And then you can see the canyon winding it's way down into the distance. And then like there is a twisting road at the bottom of the canyon, and all these trees. It's just absolutely stunning. And as the sun comes down, you know, the color of the rock changes. It's really incredible. So we spent some time there and then we drove north, in the northerly direction up the Grand Staircase. In the direction of Bryce Canyon which is another National Park. Bryce Canyon is the highest point in the Grand Staircase. So we drove up towards an elevated point on one side of the Canyon. This point is called Rainbow Point and it's at the end of a series of viewpoints. So the usual thing to do there is that you drive to the end of this point, and you're there and you look, and take in the spectacle. And then you drive back along this route, stopping at certain viewpoints on the way to get different views and different, sort of, angles on the canyon. And you can see different, sort of, famous features in Bryce Canyon. So I've described Zion. Let me now try describe the Bryce Canyon. And, sort of, the thing about our trip, I guess we were just fortunate in the way that we'd planned it, because we didn't really know exactly what each thing would look like. But we were quite lucky, because we'd planned it in such a way that each thing we visited was better than the previous one.

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So Zion is beautiful but it's not quite as big or, sort of, in your face as the other things we saw. So each one was like ever more impressive spectacle as we went around this loop. So Bryce Canyon, yeah, the highest point in the staircase. You drive out to this point; it's called rainbow point. So we drove there. Took it like, you know, two and half hours of driving through this interesting landscape and then you get to end of this road where there is like a car park and viewing points. Stopped the car there. And we walked out to the edge where you find barriers and information points and things like that. So the infrastructure is quite good, you know. It's easy to drive to this places. You don't have to go off-road. You don't have to do lots of trekking through the wilderness. And there are facilities and things like that. It's perfect, really. Especially if you're not completely mobile. So image now, I'm going to try to explain what it looks like when you're standing at rainbow point looking out across Bryce Canyon. And by the way, you can see some photos of all this stuff on the page of this episode. It might be worth have a look at those photos while you're listening to this, so you can actually see the things I'm describing. It might help you to just put it all together. So imagine standing on the edge of some cliffs, okay? Imagine you're in sort of elevated position. The

whole area is whole plateau that you're on. It's very elevated and you get to the edge of the plateau and there are some cliffs. And in front of you there is this huge canyon. So the land just drops down in front of you. And to the left and to the right it's really, really wide. The whole land just drops down in front of you. And there are then thousands of bits of rock that stick up in this canyon. These thousands of bits of rock that stick up. Now, technically Bryce Canyon is not really a canyon. A canyon really is formed by river that runs through an area. And over millions of years the river forms this channel, this extremely deep, extremely wide channel.

Bryce isn't really like that. It's just sort of like... how would you describe it; it's really hard to explain but let's say... it's like... instead of it just being one river that's eroded this channel... instead it's just a more complicated process of moisture leaking down into many cracks in rock, which then splits the rock apart when it becomes ice. And then leaking down again as it melts a bit and then splitting the rock again. So this form of erosion which is just generally across the whole area of this moisture leaking down into rock, cracking it and leaking down and cracking it.

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And the bits of the cracked rocks fall down and fall away, and then, you know, maybe some rainfall washes it down and you end up with some... like A lot of rocks that's been sort of chiselled the way, and fall on a way, and you end with this remaining... many, many remaining, bits of rock that stick up in the Canyon, okay. And this huge blocks of rock of different colors, and they look a bit like huge statues, and there're some small river beds in there at the bottom, and trees growing up from the bottom, and then, like big bits of rock that stretched out from the plateau into the Canyon, and those bits of rock have been eroded. So, you get this like weird towers sticking out, sticking up. Hard to explain it. It's really extraordinary and it looks like some sort of alien land. So, imagine this, so the land drops away, these big sticky bits of rock sticking up. And then, way, way, way over on the other side –almost on the Horizon– is the other side of this canyon. So you're standing on the edge of a plateau, it all goes down, and down, and down, and then, way over in the distance the plateau continues again on the other side. So there are other cliffs, and then the plateau continues. You can see all the layers of rock in these cliffs, all are of different colors.

Now, all of this is caused by erosion and the rocks that stick up in the canyon are all these very strange shapes, it's very stunning and weird, like I said it's like an alien landscape. I'll give you some more details of it in a moment. So, at rainbow point we saw a guide, a ranger, explaining all of it and how it fits into the grand staircase, and he was doing a really good job of telling the massive story of the place, and enthusiastically putting himself into it. And it was very interesting, and it helps us to understand a lot of the geology of the whole area.

Now, I've already told you some stuff about the grand staircase and it's pretty difficult to explain. It might be difficult for you to picture it, too, but I'd like to try to give you some more details of how... of the story of how all of this happened.

Now, this is what I understood from the ranger: And this guy, the ranger, a guy employed by the Park wearing a green outfit and a wide brimmed hat.

So, the story of the grand staircase: This is ancient history and geology. By geology, I mean, the study of the Earth's structure, its surface and its origins. So we've had space in previous episodes, we have had like beliefs system, scientology, and a bit of Pop culture. And now, the history of the Earth itself. Yeah, I told you I had a lot of stuff to get off my chest in this series of the podcast. So, now I'm going to try and talk about the history of the earth. I'm going to try to start right at the beginning, the Big bang theory. Not the Tv show, but the account of how the Universe began, which is based on a lot of study, and a lot of analysis of evidence and understandings of the way that the universe works.

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The collaborative work of many people over many years, people analysing evidence, creating hypotheses, testing them, coming out with theories that get adapted and improved, and disproved and for the change and the end result is that we get a pretty solid idea of what must've happened. And the Big Bang Theory is the best that we have at this moment. Is the best theory we have to describe how all of this even began.

So, I'm going to trying go through it now, I hope I don't lose you, I hope I don't lose myself either because it's a bit complicated. Anyway, so, one point, right? The Universe, everything that exists in the universe, all of the matter like literally all of the building blocks, all of the elements, all of the atoms and particles, everything that makes up, everything around us, including for example: you, me, your mobile phone, your computer, the trousers that you're wearing or the skirt you're wearing or whatever, your shoes, the air you're breathing, all of it, all of this stuff was compressed into a space about the size of a pinhead. Everything, all the matter in the Universe, all squeezed into the space of about the size of a pinhead, all of it in this little spot, a singularity, an extremely high density and high temperature singularity. Because you know that when you apply lots of pressure to something, like for example, if you're trying and squeeze something into an extremely small space, what happens? What happens when you put really high... when you put something under a lot of pressure? Obviously it squashes, it squeezes, it got smaller, but then eventually will get hot, it will get unstable like the way in which petrol reacts in an engine, in a car. So, the way that the car gets... the car drives the wheels, all that power comes from putting petrol under loads of pressure in the engine. The petrol is put under loads of pressure so if you put that petrol under pressure it just needs the spark of electricity or something and... it will ignite.

So, when you put something under loads of pressure it will get hot and it explodes essentially, and that's what happened when this singularity because of the laws of physics it was under such high pressure and there was so much density in there that it exploded: "BANG!" and suddenly everything expanded out from this singular point.

And that was the birth of the Universe. That's the Big Bang. Everything, all the... all the matter in the Universe, all the stuff just... It very quickly expanded out from this tiny little point. All this matter... coming right out of this little point and expanding out, okay?

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Now, this is from Wikipedia about the Big Bang theory. It says: Physicists are undecided whether this means that the Universe began from singularity or that current knowledge is just insufficient to describe the Universe at that time. But detail measurements of the expansion rate of the Universe, that the speed of which the Universes is basically moving or expanding away from the certain point. Detail measurements of this expansion rate place the Big Bang at around 13.5 billion years ago which is thus considered the age of the Universe.

So, the whole thing is about just under 14 billion years old. That's old. That's really old! Ok.... You know, You might feel old like for example I'm 40 this year. Like, Oh! God, I'm 40.. Well, compare to the Universe I'm really, really young. So, That's nice, isn't it? Nice to remember, If you ever feel old just remember that in comparison to the Universe... Your... you have hardly even been born. So, anyway after the initial expansion the Universe cooled down sufficiently to allow the formation of subatomic particles and later simple atoms, so this like the basic building blocks of everything. And giant clouds of these primordial elements later coalesced through gravity, meaning they sort of came together in haloes of dark matter eventually forming the stars and galaxies visible today.

All right. So... Everything flew out from this singularity... out into ... into the Universe, cool down and then, because of gravity, things starting moving together in, as it said, haloes of dark matter, and eventually this things formed stars and galaxies. Ok?

Now, this is just we know today. There's obviously still a lot we don't know like, for example, what dark matter is? But that's the whole point of science. We don't have to be able to explain it all at once. We are just working it out bit by bit.

So, anyway, after all that matter came together through gravity in the stars we created... over incredibly long period of time, by the way. And it's still going on now. Earth was also formed... And it... Earth was formed from matter, from stuff that was basically left over from when the sun was created. So, obviously the sun is a star, just one of the many stars that was created in the...n sort of formed in the Universe. And the Earth is made up of stuff that was left over from... from when the sun formed.

We are talking about clouds and dust particles contain the all elements that make up the building blocks of everything on Earth. So, all this stuff coalesced into, in the case of the Earth.. This stuff coalesced into this ball due to the force of gravity.

39:00

Now we know that when, you know, something has a, like, objects are attracted to other objects that have a greater mass than them, that I think is the law of gravity, something like that, basically,

and in space, you know, it's a vacuum so over millions of years these objects would move towards each other and then, in the end, they end up sort of turning into like a sort of a ball. Yeah, I'm just an english teacher, ok? don't judge me on, this is, I'm trying to give you the layman's account of the history of earth. So, all this stuff coalesced into this ball due to the force of gravity and in the early days the earth was very hot and it was basically molten lava, ok? just molten lava, like, liquid rock, and it was hit by lots of other lumps of rock that were still flying around the galaxy. So it's very sort of unstable, in the early days. A lot of this rock, leftover from sun's creation, still exist in space, not all of it formed the planets, some of it's still just out there and flying around in space and is orbiting our sun as well. Most of this stuff is actually is in the asteroid belt, so it's just rocks and lumps of matter in the asteroid belt, which is located between the orbits of Mars and Jupiter. If you took a spaceship and flew from Mars to Jupiter, you would need to fly through the asteroid belt, and if you've seen Star Wars' episode 2 or indeed Star Wars' episode 5, you'll know it's not that easy to fly through an asteroid belt, because this is a huge lumps of, well, it could be anything, lumps of rock, lumps of metal in some cases, so, there are lots of asteroids which are not in this belt as well, and they're just flying around our solar system on different orbits around the sun. So the galaxy is not just populated by the sun and then the planets, there's also loads of other debris and matter, that we call asteroids, flying around. We're pretty sure that one or two of these asteroids hit the earth at some point in the past and probably wiped out the dinosaurs, because if a huge asteroid or two huge asteroids hit the earth, that tends to create a massive explosion, which is a bit like loads of nuclear bombs all going off at the same time, and that tends to make life on earth a little bit tricky, like for example, when the sun gets blocked out by dust, or when the atmosphere is filled with poisonous gas from the explosions of asteroids. Anyway, one of those might actually hit us one day too, when I say us I mean earth now with us living on it, which would be pretty bad news, as I'm sure you can imagine, but, if we're clever we will be able to prevent an asteroid colliding with us by probably sending Bruce Willis up there to just blow it up before it hits us. So, after the earth cooled down the molten rock on the surface cooled down to become the earth's crust.

42:00

Which is a bit like... imagine if you leave out some soup in a bowl. Let's say, you make some nice, thick vegetable soup, yum, yum yum, but you don't finish it and you leave it in a bowl in the kitchen. And then you go travelling on holiday for three months. And because you're a very sloppy person, you didn't clean up a kitchen before you left, right? Because you're just that kind of person. So you left this bowl of soup on the side in the kitchen for three months. Now, what would've happened to that soup? I imagine at the beginning, there would be a layer, that would dry out to be on the top [42:35], wouldn't it? You get that sort of layer, that kind of film that would happen on the top of the soup. And then eventually the soup would, sort of, dry up, wouldn't it? And you'd be left with a dry caked layer of dry soup **on the top**. And then maybe some softer soup underneath. Basically that's what happened on Earth, sort of. That the Earth's crust dried out and became this kind of layer on

the top of the earth. So the surface of the Earth was this crust made up of a number of different plates. Because it's not all one single crust; you know if you go deeper and deeper underground, eventually it gets really hot and it's just magma... magma that's a good word. So you know, the core of the Earth is basically just really seriously hot magma. So lava is the stuff that spuse out of the top of volcanos. That is amazing, not very friendly, but it's amazing. That's lava that comes out of volcanos. Under the ground it's magma. So the Earth's crust is made up of number of plates that sit on top of this magma. An on top of these plates you've got all the other stuff. You've got the land with different features, covered in oceans a lot of it. Some of it is covered in grass, some of it is covered in water like the oceans or lakes. Some of it is just rock and so on. Also there are different types of rock. Yes I'm going to teach you different types of rock now. Three different types of rock: igneous rock, metamorphic rock and sedimentary rock.

Igneous rock: this is the stuff that's formed when magma cools down, basically, okay? So sometimes it cools down when it's in the ground. And sometimes it cools down on the surface after being spewed out of volcanoes as lava. So lava or magma that cools down, probably becomes igneous rock. Spud out

Metamorphic rock: this is the stuff that's formed when magma cools under the ground but in certain conditions. Like for example, when there's a massive amounts of pressure or heat, and the rock gets compressed under serious heat and pressure, and it changes quite drastically. That's why it's called metamorphic rock, because it's changed due to high pressure and high temperature conditions. Metamorphosis means a change, doesn't it? So, metamorphic rock - rock that's been changed by really high pressure and temperature.

45:05

For example it becomes crystal, or the rock has got layers of crystal in it. And it's often extremely hard rock and it can be shiny, or maybe stripped with layers of crystal. For example diamond is a form of metamorphic rock, because it's changed from pure carbon or coal - that black rock that we use to burn, you know, we burn it to fuel our power stations and stuff. So diamond is metamorphic rock that's changed from pure carbon into diamond. Carbon is a sedimentary rock and when it's... when so much heat and pressure is applied to it, in the right conditions it can form into crystals like diamond, for example.

Sedimentary rock, then. This is the stuff that usually forms on or near the surface. It's made of particles of sand or shells or pebbles like little stones and other fragments of material, okay? And it's formed through like deposits, sediments being deposited over many, many years and then sort of pressure forcing them together into rock. Imagine, right? You have a fishbowl with some fish in it and you go away travelling for a three months. So not only did you leave your soup on the side in the kitchen, you also forget about your fishbowl as well. You just leave... I don't know, you're very irresponsible. Maybe your friend just said: "let's go travelling, just drop everything and let's go travelling for three months."

And you literally just leave without asking someone to look after your fish. Without even doing the washing up, you just leave. So the things that happened to these things in your flat, similar to the things that happened to the Earth over millions of years. Just the slightly shorter time frame. So imagine you've got a fishbowl and you leave it for three months. Now eventually the water in that fishbowl will get dirty, won't it? If you've ever had a fishbowl, you'll know. For example, if you... it's always a nice idea to get a fishbowl: *let's get some fish, yeah, a little fishbowl*. And then you realize that you have to clean the bowl because the water gets dirty.

So water in a fishbowl gets dirty. First of all, there are the little stones at the bottom. So that's the first layer of sedimentary rock. There are obviously the little stones at the bottom. That could be, for example, igneous rock or metamorphic rock for whatever reason. Maybe it's been pulled down there by a glacier or something. These little stones at the bottom. Then, obviously, it's all covered in water. There might be dust from the room that lands in the water, and then kind of just ends up in the water, causing the water to get dirty. And of course there's other stuff like fish poo. If you've got fish living in there, they poo, or maybe, sort of, dead scales from the fish end up in the water.

48:02

And also the green algae like plant life that might build up in the water or on the surface of the bowl itself. And eventually the water gets cloudy and dirty. And if you are not there to feed them the fish would probably die –I know it's the sad story– And then, over time all of that stuff in the water will eventually settle on the bottom of the tank. It sticks to the side of the tank and it settles on the bottom of the tank. And after three month you end up with like a layer of sediment including of... sadly a couple of dead fish and some... horrible sediments on the bottom.

Now, Imagine that process over millions and millions of years. Ok. Now, Imagine that there is the ocean which is... Also, in some part the ocean, washing over the surface of rocks and eroding them creating more sand which gets deposited onto the floor of the ocean. And also, think of all the sediment, things like the sand, a little stones that get washed into the oceans from rivers. Now, All that stuff is sediment and it find its way to the bottom of the ocean and it gets compressed, gets compressed by the weight of all the water and the weight of all the other sediment on top of itself.

Oceans or lakes don't last forever. And they sometimes dry out. The water just dries out it for whatever reason. And that then will expose all of the compressed sedimentary rock. And also that sedimentary rock that gets exposed –that sedimentary rock or sand depending on what stage of development it's at– That stuff might get blown by winds and it might get baked by the sun. And the wind might blow it into big sand dunes. The kind of dunes that you would find out in the Sahara desert for example.

So, all this... all this sediment that's just been exposed when the ocean dries up, gets blown by the wind and turns into sand dunes which then eventually compress as well. Over time the sand in those dunes at the bottom might compress into rock as well over many years. Or at least the sand

that was once at the bottom of the ocean or lake dries out in over time. It compresses until it becomes rock – sedimentary rock.

So, by the way, the word sedimentary, rock or sediment, isn't just useful for describing types of rock. The word sediment is used in other situations too, like for example, we get sediment at the bottom of the bottle of wine sometimes. Or you might get sediment at the bottle... the bottom of a bottle of fruit juice. Any stuff that settled at the bottom of liquid we can describe it as sediment. You know, for example, I don't know, you might...one day you might turn and turn on the taps in the bathroom.

51:00

And you're running the bath or you're filling the sink with water and you notice: "Ah, there's like stuff in the bottom of the... that's weird stuff in the water like bits of sand or something, and you know, you get someone round and go: Oh, you got sediments in your water tank. You got sediments on you water tank. And then the guy goes up to investigate your water tank –It might be in the loft– and he looks in the water tank and he goes: "Yeah, I'm sorry to say but you got a dead mouse in your water tank. That's where the sediments come it from. Ooohh, disgusting! Maybe... this sort of disgusting thing might happens if your water tank isn't covered properly. Sometimes some weird stuff like a mouse can fall in, and then it dies in the water tank, Aaahh!

But anyway, that sediment... you also might get sediments at the bottle... at the bottle... Why am I say bottle? At the bottom of the bottle of wine if, you know, in the process of making the wine some bits of fruit, whatever end up in the wine, in the bottle, and it gradually falls to the bottom, sediments. OK, it's not just about rocks and things, it's also for other stuff.

So, also metamorphic, metamorphic rocks, this is in the same word family as metamorphosis which is the process of when something changes into something else. For example the metamorphosis of a caterpillar into a butterfly. Or another example could be this one, like, she had undergone an amazing metamorphosis from a awkward schoolgirl into a beautiful women. That's... those are examples from the Oxford dictionary of the use of the word "metamorphosis". Changing from one thing into another, So, again, not just rocks. And also, similarly igneous, now igneous... Igneous rock is not really used for outside of the subject of rock We don't really use the word "igneous" to describe anything else other than rocks. It's just for rocks.

Except... Of course the fact that the word igneous is formed from the latin word ignus which means fire, okay? And so, similarly from ignus you get the word "igneous" rock, but also you get the English word "ignite" which is a verb –it's a good word– and it means, just start to burn or to make something start to burn. So, we do have the word "ignite", so it's related to "igneous". For example: Gas ignites very easily, or the hot weather made it much likely that the forest will ignite. Okay?

And ignite can also be used as a metaphor especially with words like controversy or debate, you can ignite controversy or ignite debate. For example: "Donald Trump's words ignited controversy for the 2nd time this week..." There you go. So that's igneous rock, metamorphic rock and sedimentary rock.

And I got a terrible joke for you. I got a terrible pun for you. Are you ready? Well, even if you're not ready, here it comes. So here's my terrible joke for people who like rocks, especially considering I just told you the words. Well the word sedimentary.

54:00

So Sherlock Holmes and Dr. Watson are on a Geology field trip walking around near a lake.

And Watson spots something interesting, and he said: "Holmes what kind of rock is this?"

And Holmes think about it for a second and then said: Sedimentary, my dear Watson!

L: it's rubbish, isn't it? Obviously, because it's Sherlock Holmes is famous for saying: "Elementary my dear Watson! That's his catch-phrases, isn't it? Although he never actually said it in any of the books, but anyway.

Sherlock Holmes is famous for the phrase: "Elementary my dear Watson! So, sedimentary my dear... is it? Oh, no! But is a pretty easy joke to adapt. If you want to make a similar joke, or you need something else that sounds like elementary, in this case is sedimentary.

So, here's another one for example. Sherlock Holmes and Dr. Watson are wandering through a weird alien landscape where everything is made of chocolate. And Watson wanders over to a tree, a strange tree, and he said to Sherlock Holmes: "What's this massive tree, with the red and yellow sweets on it?

And Holmes thinks about it for a second and then he goes: "A (55:13)_____ tree, my dear Watson.

L: I know, I know it's rubbish. But I challenge you to come up with the joke about different types of rock. Come up with the joke for igneous rocks or metamorphic rocks, I challenge you. Anyway, How do you know what kind of rock is which?

Well, here is a little guide:

-Got little bubbles in it? is igneous rocks, fine. Like pumice stone, the kind of stone that you might have in the bathroom. It's good for exfoliation. Pumice stone is igneous rock, it comes out of volcanos, don't it? And if it got simply a little bit that seems a bit shiny it's probably igneous rock as well. For example, granite. Granite, that hard gray rock which is used to build really good quality things. Like: Imagine really good quality very smart good quality walls outside a bank, or impressive modern monuments on the centre of town is probably made from granite. It's really hard and it's... it looks nice, it got almost some sort of shiny little... little elements in it too.

-Has it got some lines or bands in it, not musical bands at less is Stones or Junior, Low, has it got lines like... or bands in it? It's probably igneous rock as well.

-Has it got fosiles in it? Like dead animals, that got compressed, and preserved, and petrified? Well, it's probably sedimentary rock, like the rock in the Grand Staircase.

-Does it contain sand or pebbles? If it does, it's probably sedimentary rock.

-Does it break apart fairly easily? So you feel like you can break it apart in your hands? That's probably sedimentary rocks as well.

-Does it look like it's formed in layers? That's probably sedimentary rocks. Is it...

- Does it have a Glassy surface and sharp edges, a bit like flint? The kind of rock that you'd use to make an arrowhead in a sort of, you know, the stone age. Then that's metamorphic rock.

A big beautiful crystal? It's metamorphic

Diamonds? It's mine. It's fine, just give it to me.

57:02

-Is it basically a big beach for cristaux? even it's then metamorphic. Is it a diamond? If it is then it's mine, okay? It's fine, just given it to me, I'll look after it, no problem.

So, the atmosphere in Earth, the atmosphere, the air, was made from gases that were released from the bubbling cauldron of magma under the surface, and which were ejected into the air.

Through volcanos back in the days when the earth was still kind of on fire basically. All that gas created our atmosphere and we're lucky in this combination of gases in our atmosphere. It's just right for sustaining life. It's created the ozone layer and it's created this balance of different gases that make possible for life to exist. Lucky, really?

So, all the lands, and sea, and all of that stuff is on the surface of this tectonic plates, the hard crust that cool down on the surface of all that magma., So, all the land masses on the top which (58:09)_____ expose the both: the water layer, these are all the continents So, the tectonic plates under the ground, they move around under the time, very slowly, from our perspective, but they do move around all the time. And you know, there are a point where this tectonic plates meet each other a faultline. You know, that's often where the volcanoes and the earthquakes happen.

So, now, let's say that there're one point, the countries that we all live on, they were actually in different positions because the tectonic plates that underpin everything on earth, where actually, in different places, million and millions of years ago. So the land on top of these plates is made up of the outpouring of volcanoes and also the layers of sedimentary rocks which is the result of the erosion of different kinds, okay? So, rocks that spew out of volcanos get eroded over time and the sediments of that erosion carried down into the ocean lakes from glaciers at the top of mountains, down through rivers, and out into the sea. The sediments then become sand at the bottom of oceans and lakes. Now, there was... there was a big ocean over this part of the USA. The part we

visited. There was at one point an ocean over the top of that stuff, and that ocean dried up in the sun and revealed the sediments at the bottom. Now, it dried up in the sun.

Now, that part of the US where we were visiting Bryce Canyon and all of that stuff, that is where that is located now, that spot has actually occupied various different points of latitude over the years. Basically, that area in Arizona used to be further south. And at one point it was equatorial, it was kind of on the Equator. and became

60:00

Ans as the tectonic plates shifted, the continents moved and that area went North and became subequatorial. Ok?

Subequatorial, that means the part just above or just below the equator. Above in this case. That area, subequatorial, tends to be super hot and dry. And that is where you find deserts this days like the Sahara. The Sahara desert another extremely dry area tends to be subequatorial. So. As this area move up into the subequatorial latitude, the ocean dry up and the sandy settlement was exposed to the Sun in subequatorial conditions and it became a huge desert covered with sun's dunes being blown around by the wind. Those dunes built up and up over millions of years and the pressure of their own weight solidify into sandstone rock. Ok. Right. Big big layers of sandstone rock. The heat of the Sun beat it and also traces of iron in the stone reacted with some moisture causing this roast color rock that you see everywhere. And you know again like the roast appears on a old bike. So imagine a huge plateau of sandstone rock beat by the Sun. A huge plateau hundred of squared kilometers. A massive plateau that covers an area of hundred square kilometers sandstone rock beat by the Sun. Now I am not sure about the timeframe exactly here but we are talking stuff that happened over hundred of millions of years ago and changes that occurs over that period give or take a few hundred million years. I can't even imagine that much time. But it is a really, really long time even longer that this episode of the podcast. And by the way, here I am talking to you about geology, right? I am talking to you about geology but I am just an English teacher of course. There might be some of you out there listening to this who are actual geologists, and I don't want you to feel like I am like teaching my grandmother to suck eggs. Teaching your grandmother to suck eggs: is an old expression which means teaching someone just... teaching something to someone who already knows it. I don't know where this expression comes from. I mean, did you... did you grandmother know how to suck eggs? Who is sucking eggs? Anyway. I don't want you to feel like I am teaching my grandmother to suck eggs. You might already know more about all this geology than I do. But anyway I'm just trying to give some context about 3.5 billion years of context. Well, 13.8 billion years of context to be... to be exact.

Now, This stuff... This is all the stuff that I read about when I was there because it helps up to understand the significance of the place that we were visiting and I hope It will help you to understand it

too. By the way, If you want to read the words that I am saying, like if you feel like this vocab that you are missing, you can see all of this stuff printed on the page of this episode as is usually the case.

63:00

So, Tectonic plates are moving under the surface all the time, okay? Sometimes the plates push against each other or rub over each other causing the land on the surface to rise. And remember the situation we are now here, in this part of the story, we've got a huge plateau of solid sandstone rocks. Sedimentary rocks that's been baked by the sun after the ocean dried up. The used to be sand dunes but it become like solid sandstone, a big plate massive plateau of solid sandstone rock. Now, because of the activity of the tectonic plates underneath all of this, sometimes this causes the land to rise. And often, like tectonic activity creates mountain ranges, and sometimes volcanos, like when, for example, macma comes up, and comes out of the surface creating huge mountains with lava flowing down the side like creating all of these probably igneous rocks flowing down the side the mountains. These mountains ranges like for example the rocky mountains to the North of Arizona, and those... and the Sierra Nevada and all of that, These kind of mountains ranges after the volcanes has cool down, they might get glaciers forming on the top as moisture collected there is snow at the top and the snow gets even more compact and turns into lakes of ice at the top of these mountains, glaciers. Those glaciers, slowly move down the mountains because of gravity, and as they move down, they scrape and crush all the rocks from the mountains covering out valleys as they go. As the glacier gets loa, loa, they... and they melt the rivers... the rivers are produced by the glaces, carry the stones and the sands and the rock sediments out of see, ok? So, these of the sediments need to make these big sandstone plateaus which are exposed when the oceans dried up.

In this case these mountains, of the rocky mountains to the Nord, that where all the sediments originally came from. So, these tectonic plates move everything on the surface around over million of years, so, for example Bryce canyon and the whole grand staircase area is actually shifted north from an equatorial zone, to a subequatorial zone to its present location.

Also, volcanic activity and the ground can push the land up. Not just forming mountains but the whole area can be lifted up. Like a general rise, like.. Almost like a very broad sort of babel the whole area can just sort of lift up like a big swelling. You might end up with the whole plateau rising up over many years very slowly turning it into high ground.

66:00

Not a sudden... like sti mountains but a gradual swell over hundred of miles, so that what was once the bed of the ocean, or the bed of a huge lake, becomes a huge plateau that's actually at quite high altitude and if you want to drive up it, you'd just be driving up a gradual hill, for hundreds of miles, before you actually get to the general top of this... sort of broad swell high plateau of sandstone. And that's exactly what happened at Bryce and the surrounding areas, okay? The

whole thing that used to be this ocean floor on a lake (66:31)___pace___?_ got pushed up, push slowly to form this high plateau Sandstone.

Now, a lot of it is also limestone, a lot that sandstone is actually limestone, it's a kind of sandstone formed from deposits of things like shells or animals la... animal matter that was in the water of that ocean or that lake.

So, there're loads of fosiles in this area and you can track the evolution of the animals by comparing evidences from each stage on the staircase. It's like a timelader, or something. It tells you the story of life.

So, this Sandstone or the limestone layer on top becomes this high plateau, and like I said before, remember, If you stand on the edge of Bryce canyon... If you are on the edge, like my wife and I did, you can see, in the distance, on the horizon, on the other side, the other part of this plateau. And at one point that was all connected but in the middle now there is this huge series of canyons, and these big sort of drops in the ground with massive bits of rocks that stick up in ridges and towers and things, and on the top of each ridge there're tall towers of rocks in these weird shapes and there're different lines of color depending of what layer in the Staircase they're from. So, the whole place, this weird alien landscape of Bryce canyon was formed from that plateau that I described earlier and here is how that happens. So, basically cracks form in the sandstone on this plateau as it rose up a bit like the way cracks appear on the top of a cake as it rises, okay?

Imagine, as a cake rises, eventually the little cracks appear on the top because it sort of stretches, doesn't it? Similarly, when this (68:11)___whole___?_ plateau of sand stone rose cracks appeared on the top. Now, over millions and millions of years, these cracks were subject to different forms of erosion. Erosion means; the way which rock is shaped, or when like the surface or the rock is warn away, by different things like, particularly water and ice, and maybe wind as well.

So, top of the plateau with this cracks in it, moisture freezes in winter to become ice. Because, you know, you see this places in the Summertime, like when we were there, they were hot dry, but in the winter everything is covered in frost, and the ice in Winter sits like a layer on top of all of these rocks.

69:00

Imagine before bryce Canyon was formed. Just this plateau with cracks in it, so the ice sits on the top lake a layer on top of everything. Now, during the day, when the sun is high in the sky, it melts the ice a bit, and the ice then melts and trickles flows into the cracks. And then it's night again when it gets below 0° C, all that water that's trickle down freezes again –and we know what the water expands when it freezes– imagine for example; leaving a bottle of beer, or bottle of wine, in the freezer, and then forgetting about it, like you go on holiday for three months, and you leave your bottle of wine in the freezer. When you find it again, obviously you'll that the bottle has cracked often, or the top's come out, and the frozen beer or frozen wine has pushed the top out, or at least broken the glass. That's because the liquid has expanded as explosion, okay? Same thing

here; water from ice melts into the cracks, and then at night freezes, and the water that's trickled into this tiny cracks freezes and expands and it breaks the rocks. And then during the day, and then during the night it freezes again, and then during the day it melts again, and goes further and further in, and so basically, the ice every night is cracking the rock, and breaking the rock up at different places, then the water, or ice, work its way down, cracking the rocks as it goes deeper and deeper. Some of the rock is harder than another, some rock is more durable than other rocks, and so not all of it get cracked, not all of it disintegrates, when the rock cracks it turns into like smaller pieces of rocks or sand which get blown away or washed away by, you know, some stream of water or wind. And So, what happens then is that these creepy looking towers, over million of years, are left behind by the erosion of the ice and water. You end with these weird sort of shapes of these rock... pieces... rock towers which didn't get cracked by the ice, and so remain there while all the other sands around them with basically sort of broken down by this process of erosion from ice and water. It's like the ice and the water and just simply the passage of time have work on this tower of rocks, sculpting them into different shapes that stand now like statues above the open space of the canyon below them.

Below that, at the bottom, you get like trickling water, and wind, and this thing smooth out these galleys and cripples that go down and down into the canyon. So, you can actually now work down into... you can work down the canyon walls into these rivers beds, you can work down less sizes of the canyon, and walk around looking up at this towers of rocks you can kind of (71:56)_comune_?_ with the rock formation

72:00

Until to the native Americans, who were the first people to ever visit these spaces and to live there, these spaces were deeply sacred and especial and they believe the spirits live in the rocks. They were really, really important sights. In fact, they saw the faces of loads of different spirits and gods in the stones when they looked to them. In fact, as you see all of this abstract shapes, these strange rock formations like for example the one called Zeus hammer which is like a huge... it looks like Zeus hammer standing on the edge of this out proper rock lie just... really amazing. Also some of them look statues of people and stuff. As you look at all these abstract shapes, your mind attempts to make sense of it all. It's very easy to see faces and animals, and even sort of little stories in the formation, you know, you can see what look like sort of scenes, like sculptures and stuff.

So, really, it's just random stuff, but your mind start to kind of see faces and see different forms and things. You know like when you see big clouds in the sky on a really sunny day when there're big white clouds in the sky, sometimes, you can see these clouds and it looks like the clouds form different shapes, They look like things. Like, you know, can say: "Eh, that looks like a dog, or that one looks like a face, or that one looks like Donald Trump and King John kissing or something—that's quite red, to be honest, usually is a dog or a face isn't it?" or something like that. It's the

same kind of thing, you know, you look at the rocks and you can just see hundreds of faces in the rock. It's really stunning to look at. And actually, seen faces or shapes in rocks and clouds, that's actually a recognised phenomenon which is called... How do you say... pareidolia. Pareidolia is a psychological phenomenon in which the mind respond to stimulus, usually in images or sound, by perceiving a familiar pattern when non actually exist. For example; in random datas and random patterns. So, it's when your mind perceives a certain pattern when in fact there's not pattern.

Common example of this are perceived images of animals, or faces, or objects in cloud formations, or the example of the man in the moon. When you look at the moon it looks like a face, or the moon rabbit, when you look at the moon, it looks a bit like a rabbit. I don't know if you have ever seen that? Mi that thinks that the moon looks like a rabbit. Yeah, I know. I mean, if you look at the moon in a certain way some of the features can start to appear like the shape of the rabbit. Usually is a face, right? when I look at the moon it looks like a face. Kind of going: "Hooooo..." like that.

74:55

That what the moon looks like to me. Obviously they're just... it just craters on the surface of the moon and your mind makes it looks like a face. It's not actually a face. Also this related to things that hidden messages, perceived hidden messages within recorded music played in reverse like for example, you know, certain evidences that people give for this conspiracy theory that they think Paul McCartney is dead, if you play... if you... play certain records backward they say that you can hear messages... And they are going: "look, it sounds like Paul is dead"... "Paul is dead, Paul is dead"... No. it's not Paul is dead, that's just random noise. It's just Pari... pari... pareidolia mate. Next time someone said that: " hey, listen to this it sounds like it saying I've buried Paul?" It's like... Noo, it's just Pareidolia mate!

Yeah, have you ever done that? I don't know if you've ever done that, it's people, they used to do that in the 70s, they played records back and go: "listen to that! Itjs like the voice of Satan " and you were: "Eh, come on!" yeah, anyway. What was it the joke...? There's a joke by (76:09)_____ which is like if you're playing your records collection backward, you're a Satan That's a great way to destroy your ... the needle on your record player. Anyway, so, perceive the images about animal or faces in cloud formations for example. Or hearing indistinct voices in random noises, basically is just pareidolia. So when your mind if presented with the stimulus like a pattern random sounds, it tries to make sense of it, and often will kind of read the stimulus as something familiar. And it's probably accounts for the way that people can see ghosts in swirling mist, you know, start to resemble a person, or a face, but really it's just random mist. And all is when people see images of like Jesus in a piece of toast or something. You know, every now and then, someone, like in the newspapers, or online, it's like if someone discover the face of Jesus in some toast, and the toast, you know, you look at the piece of toast... It looks vaguely like Jesus.

So, it's probably just pareidolia, either that or Jesus just trying to communicate to us in some way, and he is putting his face in toast is the only way that you can do it.

Anyway, these towers in Bryce Canyon that look like faces, they called Hoodoos, which is kind of a cool name. It sound a little like vudu doesn't it? And some of them have very human forms, they look a bit like old Roman statues that have been warm away by the rain, or they look a bit like architecture by Gaudy, the guy who designed various buildings in Barcelona, like the Sagrada Familia Cathedral.

So, they look a bit like weird Gaudy designs or statues... old Roman statues, broken Roman statues or something.

78:00

In any case, these weird rocks, they're just like... they look like spooky, ghostly, statues standing in this huge auditoriums made from the erosion of rocks over millions of years. It's incredible and it's a lot more powerful than any of these awkward that we saw in Los Angeles. It's genuinely breathtaking stuff. So after an afternoon of being wowed by this particular hoodoos and a big naturally (78:22)_occurring_?_ bridge as well in the rock that's one point where there's just this huge bridge in the rock and it just was formed by nature, just by.. Like erosion flowing down the side of the cliff face and just eating away the rock bit by bit, eating away the bit underneath and the wind and stuff and it end up with this amazing sort of bridge absolutely stunning. So, after all these... we did a little hike into the canyon. It was late afternoon so the whole place got flooded with this incredible orange pinkish rust color late, it was absolutely amazing. So, after our experience there we drove to our accommodation, sort of an hour and a half down the road, and that night we stayed in a mounting ranch, like a kind of a old farm ranch kind of thing with this little wooden hut. So, we slept in a wooden hut that night.

The ranch was cool, we had to... like drive along a little track through a field, apparently there was buffalo in the field that we can not see then because it was dark, and in the morning they weren't there, they were in the other end of this massive field, which is a bit disappoint but I wanted just see a buffalo, i couldn't see any. And then were chicken running around, and cows, and horses in the field and stuff like that. We slept in this wooden cabin which was amazing. And well, I said amazing, I mean, there were like spiders and things which was a bit creepy if you're a city boy like I am now, like: "Oh, spiders!"

I saw one spider and I didn't tell my wife about it, I just sort of managed to deal with it without letting her know because if she'd known, she would've been... she would've freak down because, you know, she is from Paris, she is not from the countryside.

So, anyway, that night, out on this ranch we took a look at the nice sky because there wasn't any light pollution rout there, and the night sky with no light pollution is unbelievable, I don't where you are in the world, maybe you're in a place were there isn't much light pollution so you know what I'm

talking about, or maybe you've just seen it or you're aware of whatever but anyway, in Paris, if you look at the sky in the middle of the night you can't really see there many stars because there's so much light from the ground flooding up into the air and you can't really see it. But the night sky that we saw was just unbelievable, the milky way is insane, I mean, there is so many stars, it look like a mist.

81:00

And the Milky way is like this... it's like if someone has poured milk into coffee You know the way that milk bellows into black coffee? It looks... the Milky way looks a bit like that, it's like someone sort of throw some milk into the black coffee and it's all spilled out across the Universe in this big stream, this mist is just mind blowing.

The next part of our trip is to drive through into the Navajo Nation and... Oh god! What am I going to do now? I think I'm going to stop here because of time. But I want... the next episode to be the last in this holiday diary series. So what I'm going to try and do is... In the next episode I am going to try tell you the stories of the thing that we saw and experienced in the Navajo Nation area. And that means kind of talking about the Navajo, which is, you know, a tribe of American indians, and it was really interesting to go there because a lot of places like for example, Monument Valley, a lot of these areas, especially Navajo territory, it's a sovereign State, the Navajo actually have their own territory with their own President and stuff, It's considered to be a sovereign State within America, within the United States. And anyone who live there, all the people who work in the shops, in the hotels, they're all Navajo indians and that was really interesting and it meant that I sort of found out something about the Navajo that I found to be very cool, and I met a couple of like Navajo people who... Obviously, they... these days it's just like sort of modern people and they wear clothes like everyone else but still was really interesting to meet some of those people. So, I got some others stories to tell about stuff that happened to us as well and things like that. So, I guess I'm going to try to finish it all up in the next episode talking about the Navajo Nation and then, maybe one or two other things at the end. And then now up to the end of the holidays diary series

83:11

I really hope that you enjoyed coming with me on this trip. I hope you've appreciated the things that I've been attempting to explain to you. All that I've trying to do is get across to you how impressive it was for us. And it's impossible to put into words really the way it feels when you're exposed to this massive landscape with and these millions of years of history just there in front of you. It's really hard to summe it up but it's moving, and amazing, and it makes you feel like small in the grand scheme of things.

So, anyway, I hope that you've enjoyed listening to it and that I've managed to get across some of the feelings that we had when we were there and saw it all for ourselves, okay? So, there'll be another one these coming and then I'll be back to a normal podcast in, with some conversations with guest on the podcast. okay? Alright then.

Yeah, alright, have a nice day, or morning, or night, or evening, or whatever is you doing, if you're on a bus then don't miss your stop, and if you're somewhere don't forget to take the right exit of the highway or whatever is you doing, or whatever are you going. And get in touch, leave a comment on the website, check out the page for the episode and you can see some photography's there, okay? Alright. Speak you again on the podcast very soon but for now goodbye, bye, bye, bye, bye

Jingle: thanks for listening to LEP. for more information visit teacherluke.co.uk

The episode lasts 85:00 min and it's being transcribed by The Orion team: Guido, Marta-KL, Alexander G, Tomasz K, Greg, arreche, Alexander Kartavenko, Sunwoo, ptholome
22/11/2017

The End.