Science and space travel – Part three

Leo Enright: "Well indeed there are some examples here in Ireland of applications of space technology. One that springs to mind immediately is CAPTEC in Malahide who have done a huge amount of work with robotic spacecraft going to the other planets.

"And CAPTEC developed in the course of all of this – very similar to what you were saying about software algorithms to reduce the amount of information you have to carry to deliver a good signal – they developed a system which is now being used by the regional hospital in Sligo to send heart images, three-dimensional images of people's hearts, to specialists in Dublin so that people don't have to travel to Dublin to have their heart ailments diagnosed. So there are definitely applications, even here in Ireland, from the space programme.

"Just to finish the whole story of humans travelling into space and the space station I should incidentally say, just to give you a perspective, before we leave the whole issue of the space station, we're looking along the long axis of the space station there.

"The space station is about the length of the football field in Croke Park – and those two panels that you see there, that span is four times the height of the Cusack Stand. So you're talking about a very large structure. It's by far the largest structure built by humans in space and it's one of the biggest civil engineering projects in history. So as I say, we might have some interesting conversations afterwards about what is the point of all this.

"But I thought that before maybe we leave humans in space, because we want to talk a little bit about Mars and the Moon and the future, did you ever meet any aliens?"

Audience member: "No."

Joe Edwards: "Me neither actually. But I have some measure of notoriety. I'm probably the only person you've ever met that has a two-page spread in the 'News of the World' written about them. In my case it was for bringing alien bodies from the Mir space station back to Earth.

"You know: the American government, all kinds of secrets and that kind of stuff. I don't believe that beings from another planet are visiting this Earth but I probably want that to happen more than anyone."

Enright: "You had a little joke with your friends about this, about this newspaper story."

Edwards: "Yes, we were flying; we flew to the Mir space station in 1998. We came back and this newspaper hit the stands during our – no you can just keep forwarding, we can always come back…"

Enright: "It must be gone. Never mind. OK, I think we've got a few young people here who are just bursting to ask questions."

Child: "How come when the robots have wheels when on Mars they don't float up into outer space?"

Edwards: "Why do you float up into outer space?

Child: "The robots – how do they not fly up into outer space?"

Edwards: "When the robots are on Mars – you know we have a couple of robotic vehicles on the Martian surface today – why don't they float up into space? Mars is a smaller planet than the Earth but there is enough gravity so that these rovers and the rocks that are on Mars and the sand and what have you stays attached to the planet. So it's gravity."

Enright: "Gravity, yes. It's just a little bit less than the gravity you have here. It's not like the Moon. We have a nice picture here actually from the Moon of an astronaut jumping. You can see just how high somebody can jump when they're on the Moon, just to illustrate the lunar gravity.

"That's Dave Scott, wonderful man. He lives in London, would you believe? But if you look closely you can see that Dave is a good metre off the surface of the Moon. And that's not just some huge piece of athletics. That's just a little jump and he suddenly found himself a good metre off the surface of the Moon. So the Moon obviously has a lot less gravity so our questioner probably wasn't entirely wrong in worrying about what would happen if you were on an alien surface. On some of them you could end up leaving the surface.

Child: "How long does it take to make a space shuttle?"

Edwards: "About two years."

Enright: "And how much does it cost?"

Edwards: "Four billion dollars. It's not cheap. It sounds like a lot of money but Bill Gates has about forty billion in cash so…"

Child: "Why is Mars a ball of gas?"

Enright: "Well, it's partly gas but it's mostly rock."

Edwards: "The Moon you mean?"

Child: "Mars"

Edwards: "Mars. Mars is rock. It has a very thin atmosphere. Jupiter and Saturn are two gaseous planets."

Child: "Yes. I meant Jupiter."

Edwards: "They are planets that formed kind of like our sun did but never quite got big enough to become a sun themselves."

Child: "Are they hot?"

Edwards: "They are hot."

Enright: "Yes, actually Jupiter is very hot once you get inside. Good question."

Child: "How hot?"

Enright: "Well, hot enough to melt rock once you get down there, down deep."

Edwards: "Maybe 300 degrees or so. Very hot."

Enright: "Another question here? Did you want to ask a question?"

Child: "How can you sleep in space?"

Enright: "Very good question."

Edwards: "You float. You float in a bag. That's pretty close to the truth. We have sleeping bags that have tethers on them and we just strap ourselves in there. In fact, you have to strap your arms in as well, it's the strangest thing. When you sleep on orbit, when you're microgravity, zero G, and you don't restrain your arms, your arms float up like this. Everyone's do. Like Frankenstein.

"And it's the funniest thing, if you have to get up in the middle of the night and you have to go visit someplace, the men's room or something, three dimensionally you have to float around everyone because by the time anyone gets up in the middle of the night, all the arms have worked loose.

"And these bodies are floating in these sleeping bags and they're all like Frankenstein. You don't want to wake anyone up because you don't get much sleep as it is."

Child: "Do you get uncomfortable?"

Edwards: "No actually, I think it was very comfortable. It was like sleeping on air because you were. It's great."

Enright: "We had a lovely question from a young lady in Limerick who wanted to know do you dream in space. And if you do, what do you dream about?"

Edwards: "About space puppies? About aliens? Actually, no. About aliens attacking the shuttles? I hope not. About the ship exploding? No, I don't think so. You do dream in space but the most vivid memories that you have are of flying in space and sleeping is not dreams."

Enright: "OK, we've been around the Earth and we've been around the Earth and we've been around the Earth and we've gone around, and around, and around, and around. And really you begin to wonder when are we going to stop just going around and when are we going to go somewhere?"

Edwards: "Well, we are actually. We're going to go back to the Moon. In 2010, we'll stop flying the space shuttle. It'll be retired. We'll take the vehicles that are left and put them in the museums around the world and we're going to go back to the Moon. You know how many people have walked on the lunar surface? 12. Why would we want to go back to the Moon?"

Audience member: "To finish work that we started."

Edwards: "That's a pretty darn good answer actually. Anyone else? What was the work that we started?"

Enright: "We've got a suggestion here.

Edwards: "There were rocks that we didn't actually look at yet. OK, that's pretty much the answer."

Enright: "A budding geologist. I absolutely agree with you, you're absolutely right."

Edwards: "Let me give you the answer. This planet, we believe, based on our scientific research, was formed about four and a half billion years ago. About 500 million years into the life of the Earth a celestial body came careening through our solar system and hit our planet.

"And when it did, when this Earth was very young and obviously couldn't harbour life of any kind, it knocked off a huge chunk of our planet, and that body and the chunks that were knocked loose from our world, most of them were retained by the gravity of Earth and they formed, they coalesced into a planet that orbits our planet today that's called the Moon.

"It turns out that most of the Moon is actually that planet itself, it's not from the Earth at all. It's from somewhere else. We assume it was originally a body within our solar system. That's interesting. About 100 million years into the life of the Moon, a huge storm of asteroids entered the orbits of the Earth and the

Moon as well. In fact, most of the craters you see on the Moon, and you can see many of them with the naked eye, are a consequence of that asteroid storm. An interesting fact, though, is that we believe that nearly 10 times more material impacted the Earth other rather than the Moon itself.

“Additionally, occasionally rocks from space will track straight through our atmosphere and hit the Earth with such force that pieces of our planet will be knocked off. Some of them will enter an orbit around the Earth and eventually fall back down.

“Others will reach escape velocity and leave the gravitational influence of our planet. We believe that on the Moon there may be as much as 1,000 pounds of earth per square mile on the planet itself.

“Now, today we are only beginning to understand the geological and the climatic processes on our planet and we know that they are changing to a certain extent. We have some ideas as to why they may be changing, but we are pretty sure of this: that this planet has changed immensely throughout its life.

“When it was first formed it was probably very hot because there is a lot of molten lava around the planet. It was probably very volcanic. And the atmosphere was probably full of acidic gas, like sulphuric acid. Eventually the planet started to warm – we believe because there was an abundance of carbon dioxide in the atmosphere itself.

“And that carbon dioxide caused life to spawn, or at least it fermented, or stimulated the growth of life, such that organisms began consuming the carbon dioxide and excreting oxygen. And then the atmosphere became relatively rich in oxygen. At one point, we believe, this planet was completely covered in ice, though we believe that life still existed.

“So why do we want to go back to the Moon? Because, certainly not at the level of my education even, perhaps the level of some of your education, if you’re a geologist who has spent his or her life studying this planet and all the other bodies in our solar system and our galaxy, you can glean a great deal of information and data from understanding, by investigating the Moon, by finding our why it died geologically and being able to examine the material that exists on that planet.

“So bettering life here on Earth and understanding it better on a scientific level is a reason to go back to the Moon. The other part of it is exploration.

“We’re not going to just stop at the Moon – we’re going to Mars. American, Canadian, Irish, English, Russian crews, we’re going to go back to the Moon and we’re going to go on to Mars. We want to go to Mars because Mars is a planet a little bit bigger than the Moon that, we believe, about 200 million years ago had an atmosphere much like our planet’s, but it’s very different now.

“Today the atmosphere on Mars is about as thin as it is on the Earth at about 100,000 feet and it cannot harbour most of the life we have here on Earth.

“But also, we believe in our hearts that it’s time to get off of this rock, you know, and explore the rest of the solar system and see if humankind can live on another planet and see if we can begin to populate this solar system and perhaps go beyond that.

“In this image you can see the poor Moon, God bless him. He’s just taking it on the chin for eons. And he has a huge crater up at the rim, at the horizon; you can see a crack going through the crust. The Moon, when it was very early in its life, was geologically active. It actually had liquid magma right underneath the surface.

“And if you go to the next slide there, the Moon looks quite featureless and dead from here on Earth. In fact, it even does when you’re orbiting it. But the entire periodic table practically is found on the lunar surface, and in this enhanced image every different change and shade of colour basically represents a different mineral, a different number on the periodic table.

“We know that we can actually take lunar material, crush it into powder, and extract hydrogen and oxygen out of it. We can make rocket fuel with that. We can breathe the oxygen. In fact we can take the hydrogen and oxygen and make water as well.

“So we’re going to establish a permanent human presence on the lunar surface and we’re going to develop the processes and procedures and the machinery we need to go to Mars.

“Mars is so similar to Earth in so many ways, but for some reason things went desperately wrong on that planet. Did its orbit change? Did something impact it? Was it destined to become what it is from its very birth? We just don’t know the answer.

“But we do know this: there’s enough water at the poles of the Martian planet and in its surface that were it all to melt, there would be water to a depth of 33 feet across the entire planet. And we know that everywhere on Earth that there is water, even at the depths of the Marianas trench where there’s really no oxygen, where it’s very, very cold, and pressure is tremendous, there is still life.

“It’s not life that survives by photosynthesis, in this instance it’s a microbe that feeds on sulphur, and lives down there at the base of the ocean. Everywhere that we look on this planet that there’s water, there is life.

“We know that water is much more prevalent in the universe and in the solar system than we thought it was when I was taking ninth grade science, back in Lineville, Alabama in the good old US of A.

“And like I say, everywhere on Earth that there’s water there’s life. It seems that, at this point in our scientific research, it appears that there’s been one substance that is viable to have life, and that is water. Any place that there’s water, somehow life finds a way. Well, we want to find it, you know?

“Certainly there are all kinds of benefits to us here on Earth. Cordless power tools, groove tyres, spending 17 billion dollars a year which, by the way, is less money than is spent on carry-out pizza in the United States every year, and it’s less money than women spend on makeup in the United States every year.

“Not that there’s anything wrong with that but that’s just the way it is. Some people have that drive for exploration. That’s what NASA’s all about and we are taking one step, the international space station, another step, back to the Moon, and then we want to get to Mars and the outer planets.