

Science and space travel – part one

Padraig Dempsey: “Good evening ladies and gentlemen. My name is Padraig Dempsey, and on behalf of the Academy and Discover Science and Engineering I would like to welcome you all here tonight for this, the second of our Science Week lectures. This event is what we call a ‘public conversation’ or ‘public interview’. So what that means basically is that it gives you more of an opportunity to interact with our guest and ask your questions, so we hope you avail of that.

“Tonight’s guest is ex-NASA pilot astronaut, Joe Edwards Jnr, who piloted the last US crew member to the Russian Mir space station and flew the closest flying manoeuvres around an orbiting space station in the history of man’s space flight. The MC tonight is Leo Enright, well known broadcaster and journalist, and I hand you over to him now.”

Leo Enright: “Thanks indeed for that Padraig. Failte mór díobh go léir go dtí an áit starúil seo, óg agus aosta. This is a very historic venue. The Royal Irish Academy has been promoting science for centuries. Many of the great scholars who have been members of this institution have contributed to our understanding of space and time. Some day, when astronauts are flying close to the speed of light to distant galaxies, they will be talking about the Fitzgerald effect, named after a great Irish physicist in Trinity, just up the street here, a member of the Academy who made some of the great contributions of the twentieth century to our understanding of the time-space continuum.

“We won’t be going anywhere near as fast as that tonight. I’m very pleased to welcome Joe of course and I’m sure many of you have had a chance to talk to him already. We’ll have plenty of opportunity this evening because this is a very relaxed evening of conversation. If you gentlemen feel more comfortable sitting around here on the floor, please feel free to do so. If any of the young people want to come and join us on the stage you’re very welcome. We are just going to have a conversation. We would hope that particularly the young people will join with us in exploring space, which is a rather big place.

“Could I begin, before I talk to Joe, with just a little story? I got a phone call this afternoon from a woman down in Cork, Mary Deegan. The Deegans would be well known to Cork people. They run the big opticians shop there, just off Patrick’s Street. Mary rang me to say that she’d had a phone call from her son-in-law. Now, as it happens, Mary’s son is an astronaut, Dan Tani. Dan rang her from the space station where he lives. He lives in outer space. He rang her this afternoon and said, ‘How’s the weather?’ Mary says, ‘You rang me long distance from outer space to ask me what the weather’s like?’ ‘Ah yes,’ says Dan ‘We’re just about to fly over Ireland and I was wondering if it was worth getting out a camera.’

“So I mention that story by way of introduction because, as I mentioned, Dan is actually living aboard the space station. All his friends down in Kinsale and in Cork city will be following his flight quite closely. To everybody’s great delight, Dan managed to take a space walk. I don’t recommend doing this without a space suit, but he got out of the space station and he walked around in space doing some extraordinary engineering work. And he took a little bit of time, just a little bit of time, to enjoy the view. So I thought we would begin the evening, this was recorded in outer space about ten days ago as Dan Tani was in orbit. So we’ll roll that piece of video.”

Video: "Houston alpha step four, you have a go before turn to auto track. Houston copies. And by the way we can see beautifully from the [unclear]...I bet it's awesome. This is it. It's beautiful sky. And Dan? Yes? Are you there? On your left you can wave to Ireland and all your friends. Cool. I can't see it – it's cloudy of course because it's Ireland. Oh, I see some land over there. That's great Paul. Tell all my friends and family that I can't wait to get back there and tell them all about this. Wow, there's a moonrise over it too. That's fantastic. OK [unclear]...."

Enright: "That's Dan Tani. He had just a few moments to savour the view as he passed over Ireland. Joe Edwards, it's wonderful to have you here. Thank you very much for coming. What does Ireland look like from space?"

Joe Edwards: "You know in daylight, in a daylight pass, it looks like the little green jewel that it is. One of the fondest memories I have of flying over Ireland is a night pass during STS89 when we crossed the east coast of the United States and the sun set and as we were going across the Atlantic. We got a call from our geologist on board, Jim Reilly, who, as you might expect, has quite the Irish heritage himself, and he saw a little bit of land out there. And you know at night, flying over the Earth, you don't see land masses. All you can see are the little lights of civilisation outlining all the populated areas. So coming up on the horizon, from two hundred and fifty miles up was this little island. So he floated up to the cockpit and said, 'Joe, you know what that is?' And I said, 'Well Jim, you are the geologist here, if anyone should know what that is, you should.' And of course, it was Ireland.

"And as we...you know flying at seventeen thousand three hundred miles an hour, we passed over Ireland and the British Isles, over the English channel, over France, into the Mediterranean, over Sardinia, we could see Sicily out to the right, and then over the boot of Italy. All of it in one pass, all of it at night, where you could not see any international borders at all, you could just see where all the human beings had populated this planet and turned on their electric lights. We flew over, for Jim and I, everything that was kind of associated with us, you know, back to the beginning of humanity. Our ancestors came from this island, as well as, in the case of myself, Scotland, Britain and France, the Normandy invasion in 1066; and then all of the flying we had done in our careers, the Mediterranean, during the Cold War and what have you, it was all encompassed in, literally, seventeen minutes, that flight. So it was a very beautiful thing and in my experience, the only thing that's ever surpassed the beauty of Ireland in the daytime, is Ireland at night, from two hundred and fifty miles up of course."

Enright: "We've a great plan. The plan is that the people of Kinsale, just before Christmas, they're going to organise to switch all the lights off, all the lights on, off and on, so that Dan will be able to spot Kinsale. It'll be blinking out there in the darkness. You mentioned there how far you travel and how quickly. I suppose a lot of us don't really appreciate, this is a hundred tonne space plane travelling at, what is it? Five times the speed of a rifle bullet?"

Edwards: "You know, in a way, it sounds pretty pedestrian when you talk about time travel and Star Trek, or science fiction, you know, what we do in the space programme. But the space shuttle Orbiter is a pretty

remarkably designed vehicle. It's remarkably designed because of the sound engineering and science that went into its design and construction, and the astronauts that fly it try to equal that in their proficiency.

"The vehicle starts at zero miles an hour and in eight minutes and thirty-two seconds. It's travelling over twenty five times the speed of sound and then it exits the Earth's atmosphere and circles the Earth at seventeen thousand five hundred miles per hour. So that's... the Sun rises and sets every forty six minutes and one rev is ninety two minutes long. Maybe to a very young person that reads Arthur C Clarke or watches the science fiction shows on cable television, it honestly can seem kind of pedestrian. But when it's your body in that spacecraft, in that rocket ship, it doesn't seem pedestrian at all."

Enright: "Do you have a sense of moving at that speed?"

Edwards: "Your body does not sense velocity. An example of that is, right now we are moving at around a thousand feet per second, that's the speed, the linear velocity of the Earth's rotation at the equator. But you do have a sense of acceleration. And if you have objects to reference, for example the Earth, clouds and particularly land masses, you're actually going around the thing pretty fast. For instance, when Dan was mentioning, 'Is it cloudy today in Ireland because I want to take a picture of it?' if you're going to take a picture of a spot on the Earth as you orbit it, you can't wait until you see it. You have to have a camera set up, set the lens and the speed and everything and be ready for it to come because there won't be enough time to see it and then set yourself up. So, the answer is yes."

Enright: "I know someone in a few minutes is going to ask, 'How come we don't all fly off the Earth if it's spinning that fast?' but we'll deal with that when we come to it. The sunrises and sunsets, they must be absolutely gorgeous."

Edwards: "If you look at this picture here, this image is of a sunset in space and it's taken with a telephoto lens and when you look at this image you kind of get the sense that this atmosphere is very robust but from space, without a telephoto lens, it's this very thin sliver. There are not very more beautiful things I've seen in my life than watching the sun rise and set from space, because it happens very quickly and you can even see the shadows lengthening on the ground if it's the pass in which you're watching the sun set."

Enright: "What scares me about that picture is I get the feeling, the impression, that if you're looking at the limb of the Earth, the edge of the Earth from orbit, your pinkie would cover the entire atmosphere."

Edwards: "Oh yes, much less than that. It looks about as big as your fingernail is thick. Humanity, in fact all life, has had a huge impact on the planet and will have a significant impact on how it is developing in the future. The fact is that we are the only species that we know of in the universe that can not only impact that but give ourselves the opportunity to populate other bodies in our solar system, perhaps even in our galaxy. That's the most basic, that's what we're really doing in NASA, is exploring the universe."

Enright: "Now I think we all agree that you've managed to make us all green with envy to watch this from almost a God-like position in the sky. How do you get to be an astronaut? How did you start?"

Edwards: “Well, let me move to a different slide here. Apart from good looks there is no real secret to the whole thing. Astronauts come in all shapes and sizes. Men, women, they are all nationalities. I can't tell you the number of times in the last forty eight hours that I've had people say here, 'We're just waiting until an Irish astronaut flies.' I don't know if there's a family who emigrated in the last hundred years to the United States who doesn't have Irish blood in them in some form or fashion. Myself, easily one half of me is Irish, and John Young certainly is and he did it long before I did – so many Irish people have flown. The next comment I got was, 'Well, we'd like to hear someone with an Irish accent.' And I said, 'Well, a good six months in the States and we pretty much turn you into some sort of accent, you just pick one part, one region of the country that you'd like to speak.

“We have military pilots who are astronauts, we have doctors, we have a veterinarian, we have scientists and teachers. But myself, to cut a long story short, I started out in military aviation. I was a Navy fighter pilot, a US fighter pilot. I was a test pilot. In fact, all the pilot astronauts we have at NASA and always have had are former military test pilots. Why is that? There is no military aspect to the programme, but the military is really the only place in the world – and it doesn't have to be the US military, could be Canadian, could be Russian – that you can get the experience quickly enough that you can actually pass the flight physical to enter the place.

“For all the young people out there, the average age of an astronaut when he shows up at NASA is thirty-five, which sounds really, really old to a few of us in the audience – to other people I see out there it doesn't seem old at all any more. I feel the same way. That basically is my story of how I showed up there.

“You know you have to pass a pretty rigorous physical but more than anything, you have to be interested in the line of work. And you know, as a young person, as parents out there like myself, you can see that in a young person fairly early. An interest in maths and physics, those are the heart of what we do at NASA, and without it we wouldn't have a space programme at all.”

Enright: “Tell us the story of this picture. It's quite interesting.”

Edwards: “This is a - I'll make this really short - it's a...back during Desert Storm actually, in 1991, I was flying this particular airplane. It's a picture of me landing it. The entire front of the airplane, the nosecone, came off. You see the airplane at the very top of the picture? And you see the picture that's in the middle? You don't have to be an aerospace engineer to know that generally you want the nose of an airplane to be pointy rather than flat. So this thing came off smashed into the canopy, injured me, blinded my right eye, broke my collar bone, collapsed my right lung and broke my right arm, destroyed all the flight instruments. And we were going at about six hundred miles an hour at twenty-nine thousand feet at the time. It was just a material failure of the thing.

“We had to bring it back and land it and frankly, I was thirty-five miles from the ship and one hundred and twenty five miles from a little island in Bahrain in the Persian Gulf, and I thought my backseater was

severely injured or worse, so I wanted to get him back to the ship where I knew he would have good medical attention, so I had to bring the aircraft back and land it on the boat. And I was very fortunate.

"Couple of things, one is that I had landed on the aircraft carrier six hundred and forty-nine times before that and I knew that this was going to be my last carrier landing because, you know, they don't keep Navy pilots out there that only have one eye. I ended up literally having to hang my head out of the cockpit at one hundred and sixty miles an hour, close one eye and land the aircraft with no instruments. May sound cool. It wasn't really. You know, it was a really good day, but there was one microsecond of it that was really, really bad.

"But it's an example of team work. You see it on the athletic field, you see it at NASA, on the aircraft carrier as well, because there's a whole team of people, the flight deck crew, the captain of the ship and what have you, who do a lot of things that actually allowed us to use the backup procedures and actually land that aircraft on the ship. And it's no different at NASA. I have the great honour of being with you here tonight but the engineers, the scientists, the technicians, who design, build and maintain the space shuttle Orbiter, or the Mercury, Apollo or Gemini spacecraft, they don't have the opportunity to spend some time with you. So we put a little video together for you here.

"The audio is not important, but we tape every landing on the ship. I was a very handsome man before this happened. I told you the story before I showed you the video because the video makes it look really, really easy, but man it wasn't, I have to tell you. OK, we'll go to the next slide, thanks."