Hi this is Steve Nerlich from Cheap Astronomy www.cheapastro.com and this is *New Horizons.*

Here in the 21st century, it is satisfying to know that people born today are going to grow up as part of a species that has sent a probe, well actually two probes if you count both the Voyagers, into interstellar space. Both probes were launched in 1977, Voyager 1 visited Jupiter and Saturn, Voyager 2 visited Uranus and Neptune as well and both are now right out at the very edge of the heliopause, And both, unlike the older Pioneers 10 and 11 are still sending back data and so are all set to become interstellar probes.

Now that it's over 30 years since the Voyagers launched, it's hard to talk about them without it all sounding a bit commonplace. But before then we hadn't launched *any* probes towards interstellar space - not even clunky wooden ones with clockwork gears. Indeed the whole idea of launching interstellar probes was completely unthought-of for much of human history, while we were busy figuring out:

- how to make it across the savannah without getting eaten:
- how to keep the rain out;
- how to cross large stretches of ocean with a group of companions diverse enough to maintain a breeding population;
- how to grow crops in one location so that we could stay in one location;
- how to communicate all the things we were learning onto the next generation;
- how to dig stuff out of the ground and then melt, burn, oxidise and otherwise amalgamate it into new materials that hadn't existed beforehand; and
- new materials made it possible to make new tools which could do things that no-one had even thought of before and the principles of science, technology. engineering and mathematics were established to carry us forward into whole new dimensions of tool use.

And then suddenly, there we were in 1977, building probes and sending them off to interstellar space - as though that was just what people did. That was the Voyager generation - with their safari suits, platform shoes and ABBA - and ABBA on cassette tape at that. It's hard not to get nostalgic about a time when the media was more interested in a new movie called *Star Wars* than yet another tedious derivative of the classic 1990s TV show *Iron Chef* (*Sound byte).* And don't get me wrong Iron Chef was a great idea in the 1990s - I mean who can forget the eggplant challenge, but twenty years on, isn't it just wearing a bit thin?

All that said though, maybe we haven't completely lost our way because here in the 21st century we have *New Horizons* - which after it completes its primary mission, might well become yet another interstellar probe. This high-tech digital age spacecraft was launched in 2006 - its 12 year mission to explore the outer limits of the Kuiper belt and beyond, including a flyby of the Pluto-Charon system - a system we now know to also include two more moons Nix and Hydra - and a recently discovered fourth moon S/2011 P 1, which is just crying out for a new name.

And of course the 12 year mission is just the warrantee period. The Voyagers are both still partially functioning after more than 30 years of operation, so there's a good chance New Horizons could go that long and more after it's done with scooting around the Kuiper belt.

Like the Voyagers, New Horizon is moving at a solar system escape velocity - which is why it has the potential to become an interstellar probe.

Now you might think that being a 21st century spacecraft, New Horizons must be about the fastest thing around, but it's not so simple. Once you are flying this far out - how fast you go is more about achieving fuel-efficient gravity-assist manoeuvres than it is about rocketry.

To set the record books straight, the fastest spacecraft ever was the 1970s vintage Helios 2 - which, as the name suggests was a solar probe, was launched in 1976 and put into a very close solar orbit. And if you are going to maintain an orbit that is close to the Sun, you have to move a heck of a lot faster than something that orbits the Sun from further away. It's Kepler's Third Law.

Helios 2 achieved a maximum velocity of around 70 kilometres a second during its mission. New Horizons is currently moving outwards at just 15 kilometres a second towards Pluto. Although, as some indication of its more modern technology, New Horizons did achieve the fastest ever spacecraft launch velocity from Earth of 16.5 kilometres a second - but from there, it gets progressively slowed down because it is flying outwards up the sides of the Sun's gravity well.

The Helios 2 spacecraft achieved a much greater velocity by flying downwards into the Sun's gravity well. Similarly, the currently active Messenger spacecraft, now in orbit around Mercury, achieved velocities of over 60 kilometres a second while it chased Mercury around the Sun.

You have probably realised by now that we are just fishing around for random factoids in this episode - because New Horizon's isn't there yet. It's due to do its closest point flyby of Pluto on 14 July 2015 and until then it's just on a long coast through fairly empty space.

We've sent probes on flybys past all the major planets already. Indeed, since Messenger went into orbit around Mercury in 2011 - we have had spacecraft in orbit around all the planets except Uranus and Neptune. When Juno arrives at Jupiter in 2016 we will have spacecraft *concurrently* orbiting around all the planets except Uranus and Neptune. Indeed, if the US economy gets back on its feet, a NASA mission to Uranus has been flagged for development sometime in the next ten years.

So, you know... pay your taxes and don’t borrow money you can’t pay back and we can all get on with exploring the universe.

Anyhow, come July 2015, Pluto will be the second ever dwarf planet we have sent a spacecraft to, because the Dawn spacecraft is going to get to Ceres in February 2015 - indeed Dawn is even going to go into orbit around Ceres - although by then it will be getting close to the end of its useful mission life.

When New Horizons flies by Pluto, its mission will just be getting started. During its flyby, it will make detailed observations of Pluto and its moons - which brings us to some more interesting factoids. The next two moons discovered after the largest moon Charon, were discovered after New Horizon's launch - and were called Nix and Hydra, with the N and the H acknowledging New Horizons.

You probably know that there's a similar thing with Pluto - where the P and L acknowledge Percival Lowell who built set up the observatory and predicted where Pluto (then called planet X) might be found. In this way, Lowell narrowed down the search area which allowed Clyde Tombaugh who was working at Lowell Observatory to actually discover Pluto in 1930.

What New Horizons does after its Pluto encounter is still in the planning phase. From Earth we are still struggling to resolve objects of a Pluto or smaller size - and ideally we want to find several such targets that are roughly on a straight-line trajectory past Pluto. After all, New Horizons can only change its course so much without running out of fuel.

We are yet to locate *any* such potential targets that will be in the right location between 2016 and 2020 - which is the expected to be the main phase of new Horizon's Kuiper Belt exploration period.

If you want to help here, you can join the Ice Hunter's project - which is checking sky survey images for signs of objects that have a proper motion against the background star field. This is pretty much how Clyde Tombaugh discovered Pluto – the main difference being that you can do it at home.

Thanks for listening. This is Steve Nerlich from Cheap Astronomy, www.cheapastro.com. Cheap Astronomy offers an educational website where the horizon is only 5 kilometres away if you are standing on the ground, but would be 111 kilometres away if you were standing on the 828 metre Burj Khalifa in Dubai. No ads, no profit, just good science. Bye.