The Chandra X-ray Observatory orbits high above the Earth, peering into the blackest reaches of space.

Exploring the most menacing and magnificent features of the cosmos, this remarkable telescope is revealing what our eyes can't, taking us beyond visible light.

NARRATOR: The cosmic ocean twinkles and transforms with the birth of stars and their explosive demise into supernovas.

Brilliantly bright and wrought with destructive power, supernovas and their gaseous remnants are a frequent target of NASA's Chandra X-ray Observatory because of the clues they give us about their earlier lives as stars.

Equipped with X-ray detectors to cut through the clutter and glare that blind optical telescopes, Chandra's revealed details about supernovas that help to shown them for the stars that they once were.

DR. PAT SLANE: You see the effects of the swept-up interstellar medium lighting up a ring of X-ray emission.

You see the effects of the back pressure from that, pushing back toward the inside of the explosion where all the ejecta,

the stuff that was formed in the explosion in the interior of the star, flying out.

That's being compressed and heated to X-ray temperatures, as well.
NARRATOR: Stars can burn anywhere from millions to billions of years.

Exactly how long they thrive for depends on the amount of gas they have to feed their nuclear furnaces.

Eventually though, their fuel is exhausted and the fire goes out.

Like a baby's first glimpse into the outside world, the Chandra X-ray Observatory's first sight in deep space was a bright supernova remnant called Cassiopeia A.

There was a little point source at the center, which is probably the collapsed core of the star that exploded when the supernova went off. It's either a neutron star or black hole, we're still not sure which, but people are still studying it and no one had ever seen it before.

Ultimately, the death of stars may spawn the formation of other new planets and stars in the universe.

Such objects are made up of elements like carbon, hydrogen and iron.

These elements are forged deep in the hot interior of stars and need a self-destructive explosion to unleash them.

What we're doing is studying essentially a star that's turned itself inside out, very conveniently, and shown us what it's made of and what atomic elements might have been
synthesized in the star and are being returned to the interstellar medium where they're going to eventually mix in with other material and form new stars, new planets and maybe life somewhere if there's enough of the right material and the right conditions.

NARRATOR: Whether or not supernovas seed the universe with these building block elements still remains to be proven.

If they do, it'll mean the death of stars brings new life to the cosmic ocean by spreading it from starry sea to sea.