NEUTRON STARS

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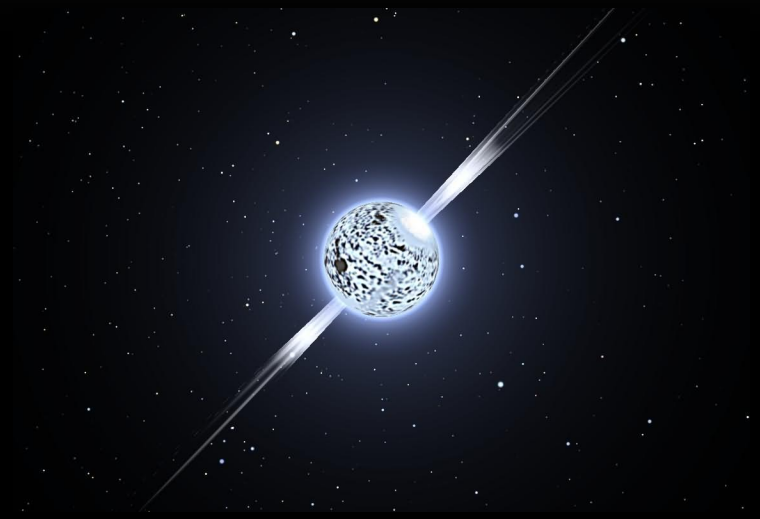
FORMATION

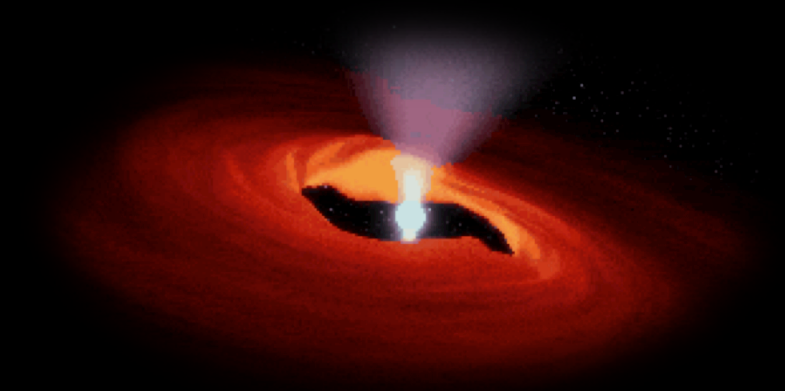
- NEUTRON STARS ESSENTIALLY FORM FROM THE DEATH OF MASSIVE STARS
- THE CLASSIFICATION OF THIS TYPE OF STAR USUALLY RANGES WITH A SIZE 8-15 TIMES LARGER THAN THAT OF OUR SUN
- DUE TO ITS SIZE, ONCE IT COLLAPSES TOWARDS THE END OF ITS LIFE, A DENSE INNER CORE REMAINS

COMPOSITION

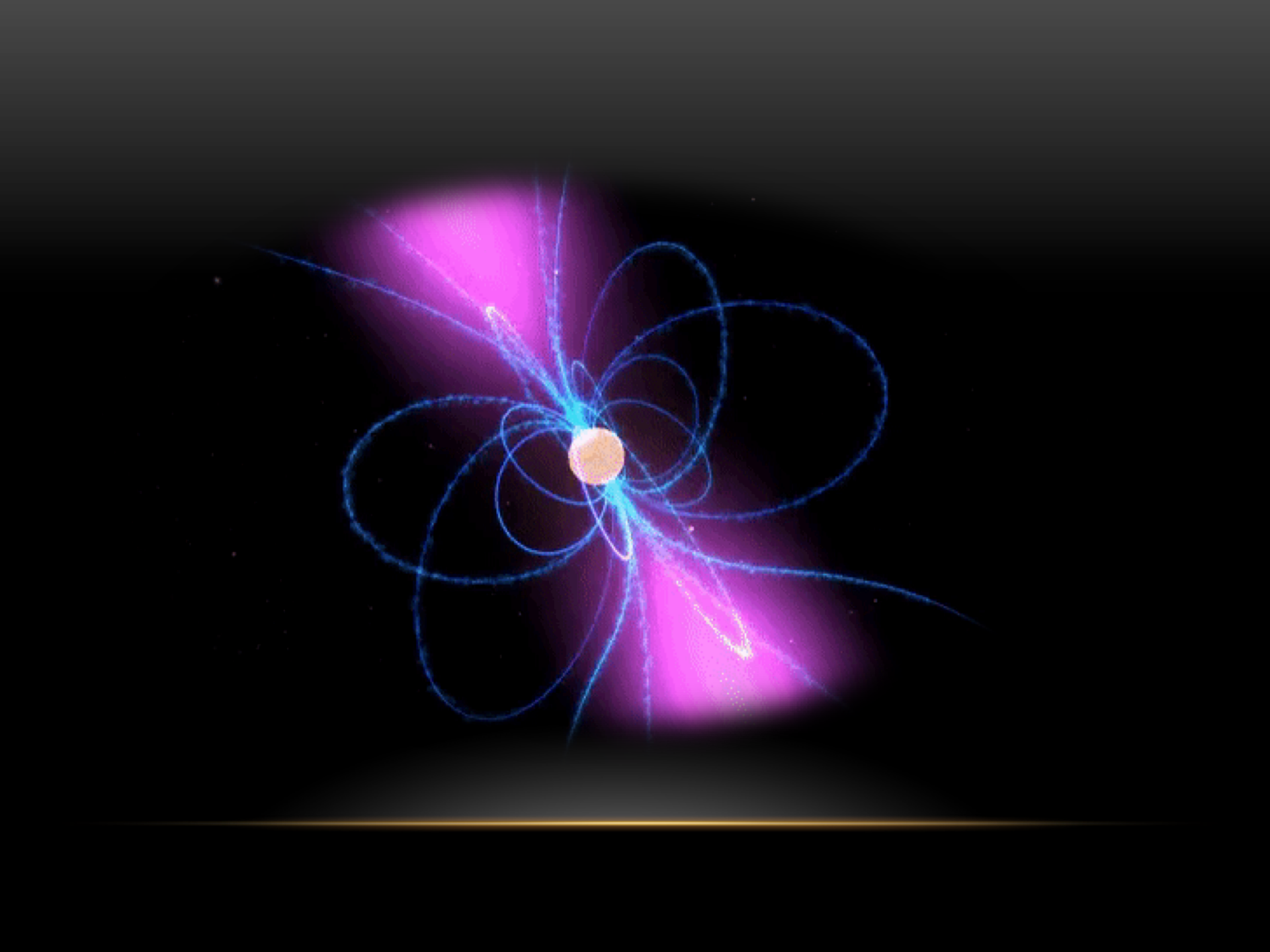
- ONCE THE CORE OF THE MASSIVE STAR COLLAPSES, BOTH PROTONS AND ELECTRONS ARE FORCED TOWARD EACH OTHER
- THIS LEAVES BEHIND A DENSE CORE OF NEUTRONS
- THE STRENGTH OF THIS COLLAPSE CAN ROUGHLY COMPACT NEARLY 2.5 SOLAR MASSES INTO A SPHERE OF 20 KM IN DIAMETER
- DUE TO THE IMMENSE PACKING OF MASS, THE MATERIAL CAN WEIGHT BEYOND 1 BILLION TONS



PULSARS



- PULSARS ARE A SUBCLASS OF NEUTRON STARS
- DUE TO THE FAST SPINNING BODY OF A NEUTRON STAR, IT EMITS A STRONG RADIATION
- THE SPIN CAN LAST FOR SEVERAL MILLIONS OF YEARS, BUT ONCE THEIR ENERGY IS DRAINED, THEY BECOME REGULAR NEUTRON STARS



MAGNETARS

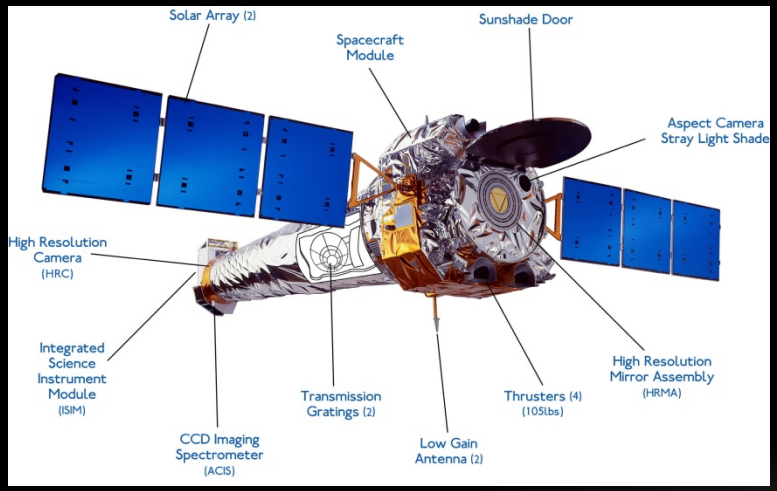
- NORMALLY THE MAGNETIC FIELD OF A NEUTRON STAR IS APPROXIMETELY 10^{12} BUT THAT OF A MAGNETAR IS ANOTHER 1000 TIMES STRONGER
- THE CRUST OF A NEUTRON STAR IS CONNECTED WITH THE MAGNETIC FIELD, ONE AFFECTS THE OTHER
- IF THE CRUST IS UNDER STRAIN, EVEN SMALL MOVEMENT CAN BE EXPLOSIVE, ESPECIALLY WITH A HUGE MAGNETIC FIELD OF A MAGNETAR
- THESE MOVEMENTS CREATE A VAST AMOUNT OF ELECTROMAGNETIC RADIATION

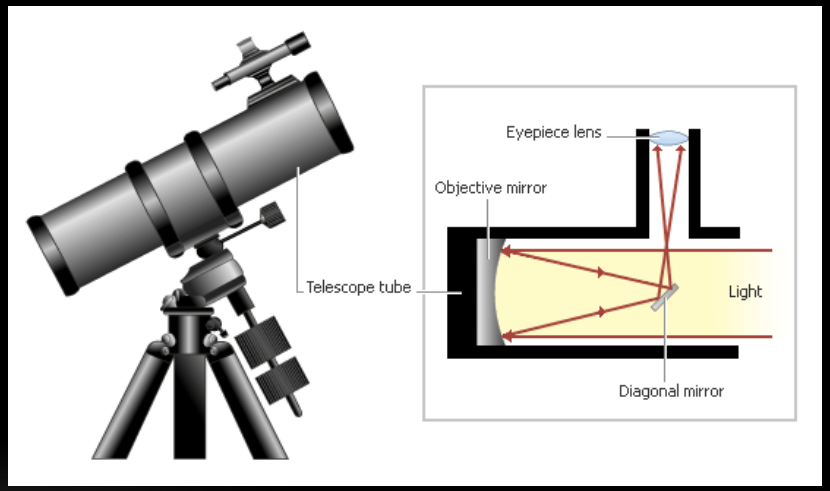
SGR 1806-20

- THIS MAGNETAR HAD A BURST RECORDED IN 1979 WHERE IS EMITTED MORE RADIATIVE ENERGY THAN OUR SUN HAS IN THE LAST 100,000-200,000 YEARS

HOW CAN WE DETECT NEUTRON STARS?

- X-RAY AND OPTICAL LIGHT TELESCOPES ARE USED TO RECORD AND ANALYZE THE PROPERTIES OF NEUTRON STARS
- GRAVITATIONAL WAVES CAN ALSO BE DETECTED WHEN TWO (OR POSSIBLY MORE) NEUTRON STARS MERGE TOGETHER





OTHER CHARACTERISTICS

- TEMPERATURE INSIDE OF A NEWLY FORMED NEUTRON STAR IS AROUND 100 BILLION TO 1 TRILLION KELVIN (DEADLY!!!)
- THE HUGE NUMBERS OF NEUTRINOS IT EMITS CARRY SO MUCH ENERGY THAT THE TEMPERATURE OF AN ISOLATED NEUTRON STAR FALLS AROUND 1 MILLION KELVIN.
- THE SURFACE CAN BE VISIBLY DETECTED THAN THE BLACK HOLES (OBVIOUSLY!!!).
- NEUTRON STARS PULLING AWAY MATERIAL FROM OTHER STARS HAVE BEEN OBSERVED TO UNDERGO BURSTS OF X-RAYS CAUSED BY THERMONUCLEAR EXPLOSION ON THEIR SURFACE.
- ASTRONOMERS HAVE FOUND LESS THAN 2000 PULSARS, YET THERE SHOULD BE ABOUT A BILLION NEUTRON STARS IN OUR MILKY WAY GALAXY (ALMOST THERE).