

FLASH LESSON: SUPERNOVA 1987A - A STELLAR EXPLOSION!



The Moon is Earth's only natural satellite

SUPERNOVA: A STAR'S DAZZLING REBIRTH

Imagine a giant star, much bigger than our Sun. When it runs out of fuel, its core collapses in a dramatic explosion called a supernova! This explosion is so powerful it can briefly outshine the entire galaxy for a short time.

1987A: A SUPERNOVA RIGHT NEXT DOOR (KINDA)

In 1987, astronomers witnessed something extraordinary! A supernova, named 1987A, exploded in a nearby galaxy called the Large Magellanic Cloud. Although "nearby" on a galactic scale (about 168,000 light-years away!), it was the closest supernova observed in over 400 years, visible to the naked eye for several months!

STARDUST SHOWER: ELEMENTS FROM THE EXPLOSION

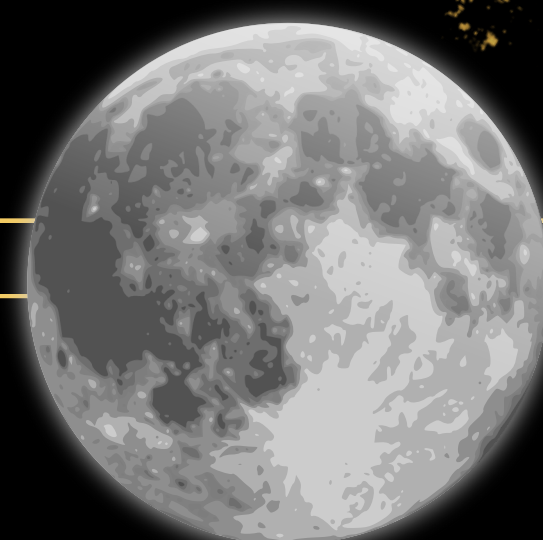
A supernova doesn't just vanish! The explosion throws out a vast amount of material, including the very building blocks of life – elements like hydrogen, oxygen, carbon, and even iron! These elements spread throughout space, eventually forming new stars and planets.

DISTANCE FROM EARTH

Approximately 238,855 miles (384,400 kilometers)

DIAMETER

2,159 miles (3,474 kilometers)



ORBITAL PERIOD

Approximately 27.3 days

GRAVITY

About 1/6th of Earth's gravity on the lunar surface

COMPOSITION

Primarily composed of rock and dust, with various geological features including craters, mountains, and plains

GRAVITY, BLACK HOLES, AND THE HUMAN CONDITION: A METAPHORICAL JOURNEY

Gravity is the invisible force that pulls everything together. Imagine it like a cosmic web, holding the universe in place. When a massive star explodes, its core can collapse under its own immense gravity, forming a black hole – a region of space with such strong gravity that not even light can escape.

Here's the metaphor: Just like too much mass creates a black hole, holding in our emotions for too long can create a feeling of heaviness or a "black hole" inside us. However, just like a supernova creates new elements, expressing our emotions in a healthy way can lead to growth and positive change.

REMEMBER: Sharing our feelings and seeking help when needed can prevent us from feeling overwhelmed.

BONUS: Dark matter is a mysterious substance that makes up most of the universe's matter, but we can't see it directly! Scientists are still trying to understand what it is.

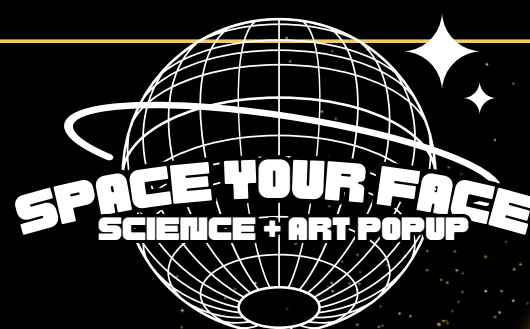
THE SUFFERING EQUATION

$$\text{PAIN} \times \frac{\text{EMOTIONAL REPRESSION}}{\text{TIME}} = \text{SUFFERING}$$

While pain is inevitable due to the human nervous system), how we deal with it matters. Bottling up emotion (repression) over time doesn't make them vanish. The more we repress, the more we suffer.

S () R

"BETWEEN STIMULUS AND RESPONSE THERE IS A SPACE. IN THAT SPACE IS OUR POWER TO CHOOSE OUR RESPONSE. IN OUR RESPONSE LIES OUR GROWTH AND FREEDOM." —VIKTOR FRANKL



BLACK HOLES

LEARN MORE
ABOUT THE
BLACK
HOLES



"NO-HAIR-THEOREM"

Black holes are characterized
by three properties:

MASS
ANGULAR MOMENTUM
ELECTRIC CHARGE

All information about matter
prior to the creation of the
black hole is lost because it
crosses the event horizon
(the boundary beyond where
nothing can escape).

THE CLOSEST BLACK
HOLE TO EARTH IS
NAMED: GAIA BH1

SPAGHETTIFICATION

A term describing what happens
when matter gets too close to a
black hole. Matter is squeezed
horizontally and stretched
vertically, resembling a noodle.

SPOOKY SPACE

FLASH LESSON

QUANTUM ENTANGLEMENT

when two or more
particles are linked no
matter how far away in
the universe they are!
Whatever happens to one
particle affects the other!


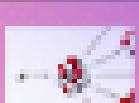


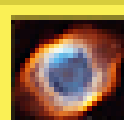

ASK YOURSELF

- ARE PARTICLES ON
EARTH LINKED TO
ANOTHER PLACE IN
THE UNIVERSE?
- ARE PARTICLES IN
YOUR BODY LINKED
TO ANOTHER PLACE
ON EARTH?

EINSTEIN FAMOUSLY CALLED
QUANTUM ENTANGLEMENT
"SPOOKY ACTION AT A DISTANCE."



solar system element origins

1 H	big bang fusion 										cosmic ray fission 										2 He						
3 Li	4 Be	merging neutron stars? 										exploding massive stars 										5 B	6 C	7 N	8 O	9 F	10 Ne
11 Na	12 Mg	dying low mass stars 										exploding white dwarfs 										13 Al	14 Si	15 P	16 S	17 Cl	18 Ar
19 K	20 Ca	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr										
37 Rb	38 Sr	39 Y	40 Zr	41 Nb	42 Mo	43 Tc	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe										
55 Cs	56 Ba			72 Hf	73 Ta	74 W	75 Re	76 Os	77 Ir	78 Pt	79 Au	80 Hg	81 Tl	82 Pb	83 Bi	84 Po	85 At	86 Rn									
87 Fr	88 Ra	Graphic created by Jennifer Johnson http://www.astronomy.ohio-state.edu/~jaj/nucleo/																		Astronomical Image Credits: ESA/NASA/AASNova							

57 La	58 Ce	59 Pr	60 Nd	61 Pm	62 Sm	63 Eu	64 Gd	65 Tb	66 Dy	67 Ho	68 Er	69 Tm	70 Yb	71 Lu
89 Ac	90 Th	91 Pa	92 U	93 Np	94 Pu	Very radioactive isotopes; nothing left from stars								

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|----------------|----------------|------------------|---------------|------------------|
| 1. Hydrogen | 23. Vanadium | 45. Rhodium | 67. Holmium | 89. Actinium |
| 2. Helium | 24. Chromium | 46. Palladium | 68. Erbium | 90. Thorium |
| 3. Lithium | 25. Manganese | 47. Silver | 69. Thulium | 91. Protactinium |
| 4. Beryllium | 26. Iron | 48. Cadmium | 70. Ytterbium | 92. Uranium |
| 5. Boron | 27. Cobalt | 49. Indium | 71. Lutetium | 93. Neptunium |
| 6. Carbon | 28. Nickel | 50. Tin | 72. Hafnium | 94. Plutonium |
| 7. Nitrogen | 29. Copper | 51. Antimony | 73. Tantalum | |
| 8. Oxygen | 30. Zinc | 52. Tellurium | 74. Tungsten | |
| 9. Fluorine | 31. Gallium | 53. Iodine | 75. Rhenium | |
| 10. Neon | 32. Germanium | 54. Xenon | 76. Osmium | |
| 11. Sodium | 33. Arsenic | 55. Cesium | 77. Iridium | |
| 12. Magnesium | 34. Selenium | 56. Barium | 78. Platinum | |
| 13. Aluminum | 35. Bromine | 57. Lanthanum | 79. Gold | |
| 14. Silicon | 36. Krypton | 58. Cerium | 80. Mercury | |
| 15. Phosphorus | 37. Rubidium | 59. Praseodymium | 81. Thallium | |
| 16. Sulfur | 38. Strontium | 60. Neodymium | 82. Lead | |
| 17. Chlorine | 39. Yttrium | 61. Promethium | 83. Bismuth | |
| 18. Argon | 40. Zirconium | 62. Samarium | 84. Polonium | |
| 19. Potassium | 41. Niobium | 63. Europium | 85. Astatine | |
| 20. Calcium | 42. Molybdenum | 64. Gadolinium | 86. Radon | |
| 21. Scandium | 43. Technetium | 65. Terbium | 87. Francium | |
| 22. Titanium | 44. Ruthenium | 66. Dysprosium | 88. Radium | |

