OUTWIT DAYLIGHT WITH GROWTH

OR HOW ASTRONOMERS CREATED A GLOBAL NETWORK OF TELESCOPES TO CHASE COSMIC EXPLOSIONS, MERGING NEUTRON STARS AND FLYING ASTEROIDS...

WHEN THE SUN DISAPPEARS BELOW THE HORIZON, IT OPENS ITS "DAYLIGHT CURTAINS" TO REVEAL TO US THE WONDERS OF THE UNIVERSE. AT DAWN IT PUTS THE CURTAINS BACK HIDDING THE COSMOS FROM US.

IT'S LIKE WATCHING A MOVIE AND TRYING TO FIGURE OUT THE PLOT WHILE SOMEONE BLOCKS YOUR VIEW EVERY ONCE IN A WHILE

SO HOW CAN ASTRONOMERS HAVE AN UNINTERRUPTED ACCESS TO THE COSMIC SKY? THEY CAN NOT STOP THE BREAK OF DAWN. AND THEY CAN NOT MOVE THEIR TELESCOPES.

TRUE, BUT THEY CAN BUILD TELESCOPES AROUND THE WORLD AND CONNECT THEM IN A NETWORK SO THAT WHEN DAWN BREAKS IN ONE LOCATION, OBSERVATIONS CONTINUE AT ANOTHER, WHERE NIGHT STILL PREVAILS.

THAT IS HOW WE "OUTWIT DAYLIGHT" AND MAKE SURE THE SUN NEVER RISES ON THE GROWTH NETWORK OF TELESCOPES. NOW, WE CAN SIT AND WATCH THE STORY OF THE UNIVERSE UNDISTURBED INCREASING OUR CHANCES OF UNDERSTANDING ITS WONDERFULLY COMLEX PLOT.

HOW DO WE OUTWIT DAYLIGHT AND WHY?


WHERE ARE OUR ?
PALOMAR OBSERVATORY, CA
MOUNT LAGUNA OBSERVATORY, CA
TABLE MOUNTAIN OBSERVATORY, CA
GEMINI NORTH OBSERVATORY,HAWAII
W. M. KECK OBSERVATORY, HAWAII
MURIKABUSHI OBSERVATORY, JAPAN
LULIN ONE-METER TELESCOPE, TAIWAN
HIMALAYAN CHANDRA TELESCOPE, INDIA
IUCAA GIRAWALI OBSERVATORY, INDIA
WISE OBSERVATORY, ISRAEL
STELLA OBSERVATORY, CANARY ISLANDS
NORDIC OPTICAL TELESCOPE, CANARY ISLANDS
FENTON HILL OBSERVATORY, NEW MEXICO
DISCOVERY CHANNEL TELESCOPE, ARIZONA
GIANT METRE-WAVE RADIO TELESCOPE, INDIA
EXPANDED VERY LARGE ARRAY, NEW MEXICO
SWIFT SATELLITE, SPACE

NEITHER DO ASTRONOMERS.

WE KNOW HOW MOST ELEMENTS ARE CREATED BUT NOT ALL. OXYGEN, CALCUIM AND IRON, FOR EXAMPLE RESULT FROM THE VIOLENT EXPLOSIONS OF DYING STARS CALLED SUPERNOVAE. HENCE THE POPULAR SAYING "WE ARE MADE OF STAR STUFF!"

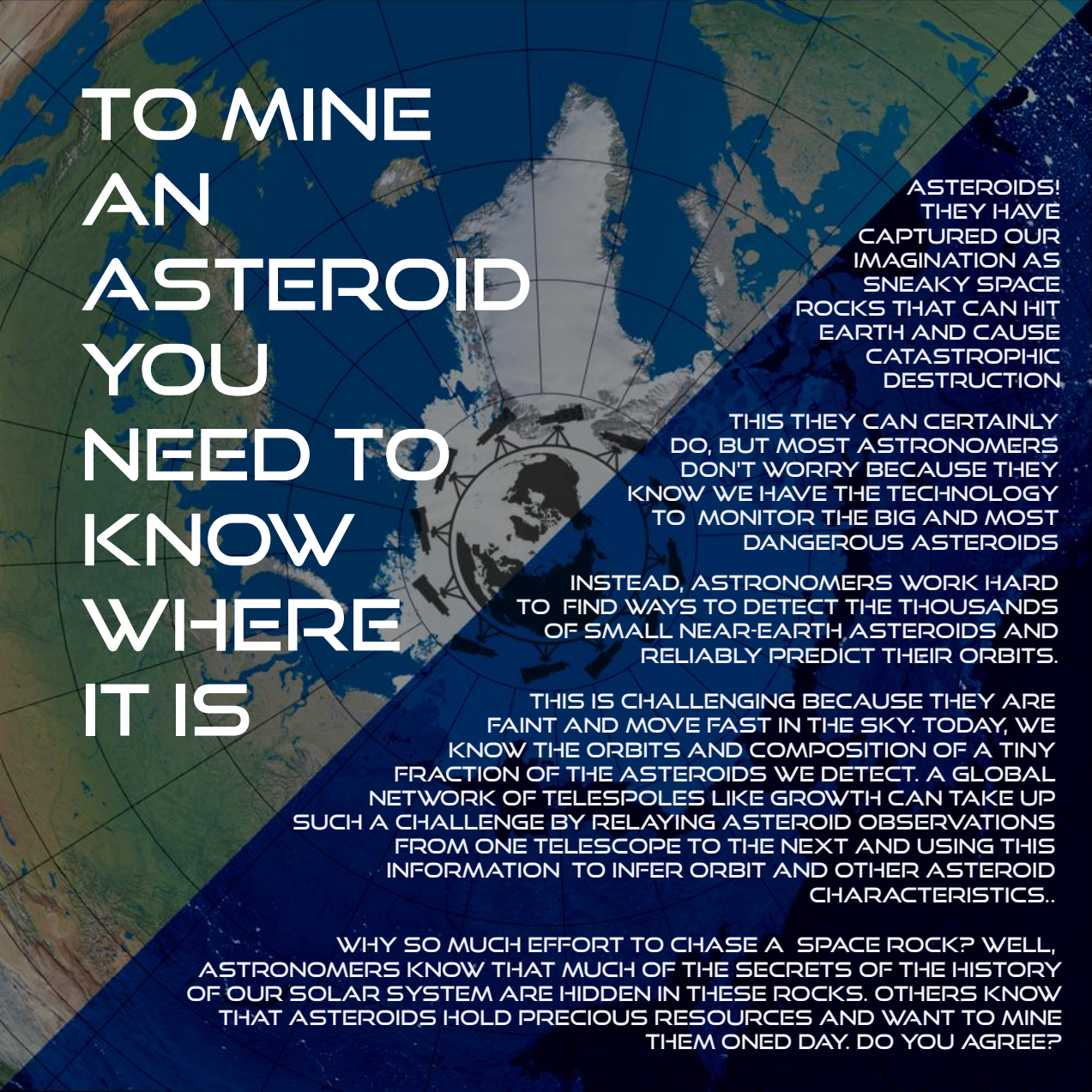
BUT AS POWERFUL AS THESE EXPLOSIONS ARE, THEY CANNOT PRODUCE MOST OF THE HEAVY ELEMENTS LIKE GOLD OR PLATINUM. MORE FORMIDABLE FORCES MUST BE AT PLAY...

THESE FORCES, ASTRONOMERS BELIEVE, CAN BE RELEASED DURING THE MERGING OF NEUTRON STARS. JUST LIKE MERGING BLACK HOLES, THEY CAN PRODUCES FAINT GRAVITATIONAL WAVES THAT WILL BE DETECTED BY LIGO.

AS SOON AS LIGO DETECTS GRAVITATIONAL WAVES, IT SENDS A NOTE TO OUR GLOBAL NETWORK OF TELESCOPES. WE LOOK UP AND TRY TO CAPTURE THE LIGHT FROM MERGING NEUTRON STARS BEFORE IT QUICKLY FADES AWAY. THIS LIGHT MAY BE HIDING THE ANSWER TO WHERE GOLD REALLY COMES FROM.

DO YOU KNOW WHERE GOLD CAME FROM?

TO MINE AN ASTEROID YOU NEED TO KNOW WHERE IT IS



ASTEROIDS! THEY HAVE CAPTURED OUR IMAGINATION AS SNEAKY SPACE ROCKS THAT CAN HIT EARTH AND CAUSE CATASTROPHIC DESTRUCTION

THIS THEY CAN CERTAINLY DO, BUT MOST ASTRONOMERS DON'T WORRY BECAUSE THEY KNOW WE HAVE THE TECHNOLOGY TO MONITOR THE BIG AND MOST DANGEROUS ASTEROIDS

INSTEAD, ASTRONOMERS WORK HARD TO FIND WAYS TO DETECT THE THOUSANDS OF SMALL NEAR-EARTH ASTEROIDS AND RELIABLY PREDICT THEIR ORBITS.

THIS IS CHALLENGING BECAUSE THEY ARE FAINT AND MOVE FAST IN THE SKY. TODAY, WE KNOW THE ORBITS AND COMPOSITION OF A TINY FRACTION OF THE ASTEROIDS WE DETECT. A GLOBAL NETWORK OF TELESPOLES LIKE GROWTH CAN TAKE UP SUCH A CHALLENGE BY RELAYING ASTEROID OBSERVATIONS FROM ONE TELESCOPE TO THE NEXT AND USING THIS INFORMATION TO INFER ORBIT AND OTHER ASTEROID CHARACTERISTICS..

WHY SO MUCH EFFORT TO CHASE A SPACE ROCK? WELL, ASTRONOMERS KNOW THAT MUCH OF THE SECRETS OF THE HISTORY OF OUR SOLAR SYSTEM ARE HIDDEN IN THESE ROCKS. OTHERS KNOW THAT ASTEROIDS HOLD PRECIOUS RESOURCES AND WANT TO MINE THEM ONED DAY. DO YOU AGREE?

WHAT EXACTLY EXPLODES AND HOW?

MANY OF US ARE CAPTIVATED BY THE BEAUTY OF IMAGES FROM THE HUBBLE SPACE TELESCOPE, ESPECIALLY THOSE OF COLORFUL NEBULAE ...

SOME OF THESE NEBULAE ARE WHAT IS LEFT AFTER STARS END THEIR LIVES IN A TRULY GRAND WAY AS A SUPERNOVA.

WHILE WE ENJOY THE SPECTACULAR AFTERMATH OF SUPERNOVAE, ASTRONOMER ARE FAR MORE INTERESTED IN WHAT LEADS TO THESE POWERFUL COSMIC FLASHES. FOR YEARS NOW, THEY HAVE BEEN STUDYING AND CLASSIFYING SUPERNOVAE, YET THEY STILL DEBATE ABOUT WHAT REALLY EXPLODES AND EXACTLY HOW

TO FIND THE ANSWER, ASTRONOMERS HAVE TO OBSERVE AS MANY SUPERNOVAES AS THEY CAN AS SOON AS THEY ARE DETECTED AND BEFORE THEIR LIGHT DIES OUT

CATCHING THE LIGHT FROM SUPERNOVAE IN THE FIRST 24 HOURS AFTER EXPLOSION IS CRITICAL TO FINDING OUT WHAT KIND OF STAR JUST DIED. THEREFORE OUR GLOBAL NETWORK OF OBSERVATORIES IS ALWAYS READY AND ON STAND BY TO OBSERVE. SUPERNOVAE APPEAR QUITE OFTEN IN THE SKY AND WE EXPECT TO RECORD THE LIGHT FROM MANY OF THEM. ENOUGH TO TELL US WHAT EXACTLY EXPLODES AND HOW.

HOW CAN I BE PART OF THIS?

I AM AN UNDEGRADUATE INTERESTED IN ASTRONOMY

WE OFFER UNDERGRADUATE STUDENTS FROM PARTNER INSTITUTIONS (SEE BACK COVER) THE OPPORTUNITY TO CONDUCT RESEARCH ABROAD DURING THE SUMMER MONTHS. FOR MORE VISIT

GROWTH.CALTECH.EDU/INTERNSHIPS

I DON'T PURSUE ASTRONOMY AS A CAREER BUT I LOVE THE COSMOS

WE SHARE WITH THE PUBLIC ALL EXICITING DEVELOPMENTS AND DISCOVERIES ON OUR WEBSITE AND VIA SOCIAL MEDIA (SEE BACK COVER)

I AM A PROFESSIONAL ASTRONOMER...

GROWTH IS OPEN TO NEW MEMBERS WHO CAN MAKE SCIENTIFIC CONTRIBUTIONS. FOR MORE VISIT OUR WEBSITE

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