PLANET Pi

Pi

$\pi = C/d$

ONE OF THE MOST WIDELY USED MATHEMATICAL CONSTANTS (THAT IS, A NUMBER THAT NEVER CHANGES), Pi IS THE RATIO OF ANY CIRCLE'S CIRCUMFERENCE TO ITS DIAMETER. WHILE MOST SIMPLE CALCULATIONS REQUIRE JUST A FEW DIGITS OF Pi (3.142 SAY), THE NUMBER ACTUALLY GOES ON FOREVER WITHOUT REPETITION OR PATTERN. DESPITE THAT, IT'S ACTUALLY VERY SIMPLE TO USE AND COMES IN HANDY ALMOST DAILY FOR NASA/JPL SCIENTISTS AND ENGINEERS STUDYING PLANETS IN OUR SOLAR SYSTEM AND EVEN WORLDS BEYOND! LEARN SOME WAYS THAT SCIENTISTS AND ENGINEERS USE Pi, THEN PUT YOURSELF IN THEIR SHOES AND SEE JUST HOW MANY THINGS YOU CAN DISCOVER ABOUT PLANET Pi BELOW WITH JUST ITS CIRCUMFERENCE -- AND, OF COURSE, YOUR NEW FRIEND Pi.

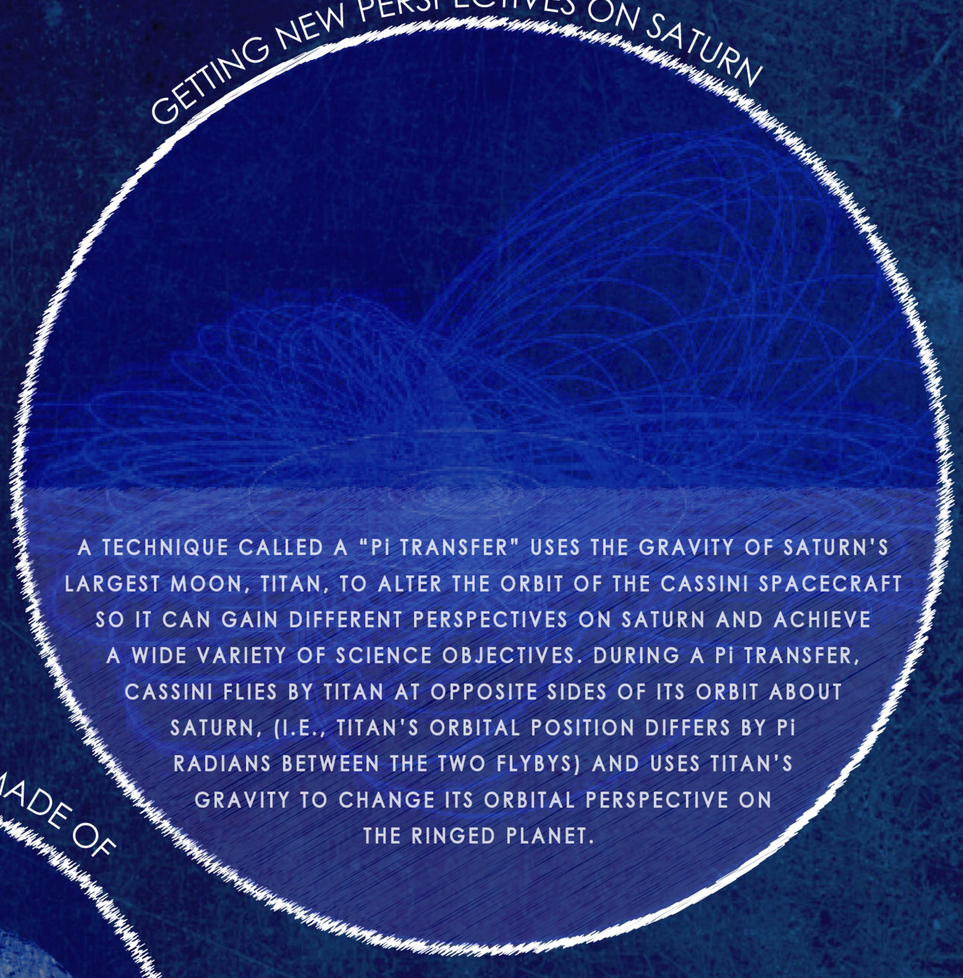
5 WAYS NASA USES Pi

YOU'D BE SURPRISED HOW MUCH Pi COMES UP AT NASA -- FROM SIMPLE USES LIKE CALCULATING THE AREA OF A CRATER TO APPLICATIONS AS COMPLEX AS CHANGING A SPACECRAFT'S ORBIT. BELOW ARE SOME WAYS SCIENTISTS AND ENGINEERS USE Pi -- WHEN THEY'RE NOT EATING IT!

KEEPING SPACECRAFT CHUGGING ALONG

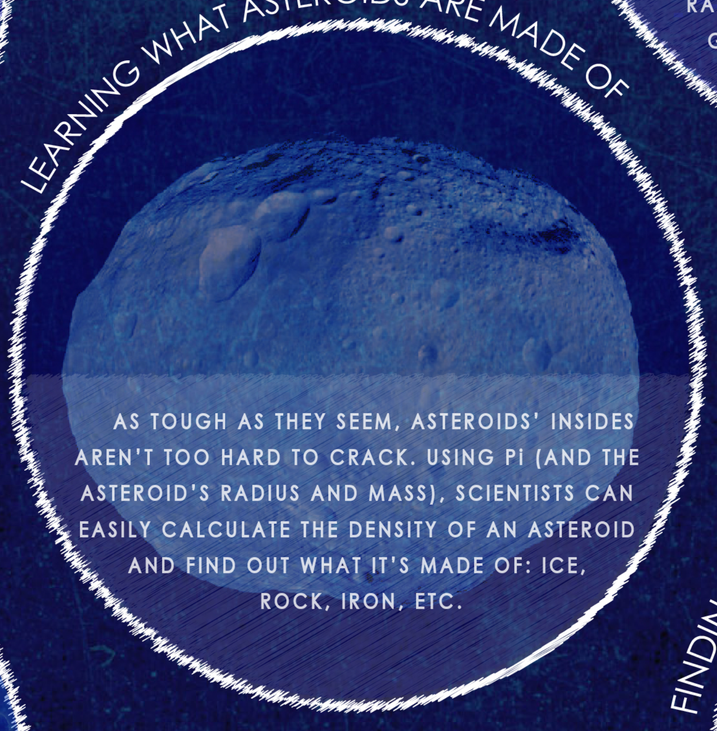
PROPULSION ENGINEERS USE Pi ALL THE TIME IN LOOKING AT THE VOLUME AND SURFACE AREAS OF PROPELLANT TANKS. IT'S HOW THEY SIZE TANKS AND CALCULATE LIQUID PROPELLANT VOLUMES TO KEEP SPACECRAFT GOING AND GOING AND GOING ... Pi IS ALSO USED TO DETERMINE THE DIFFUSION RATE OF PROPELLANT VAPORS THROUGH PROPELLANT LINES.

GETTING NEW PERSPECTIVES ON SATURN



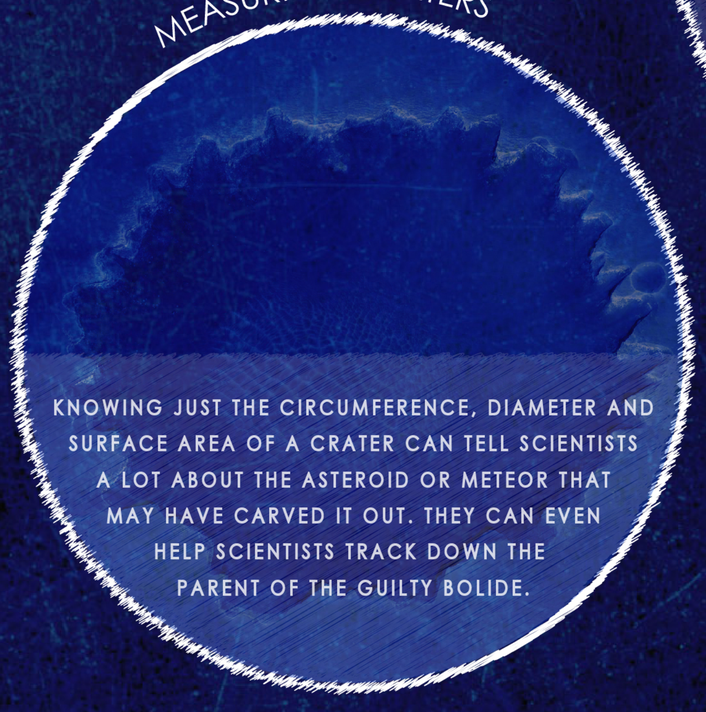
A TECHNIQUE CALLED A "Pi TRANSFER" USES THE GRAVITY OF SATURN'S LARGEST MOON, TITAN, TO ALTER THE ORBIT OF THE CASSINI SPACECRAFT SO IT CAN GAIN DIFFERENT PERSPECTIVES ON SATURN AND ACHIEVE A WIDE VARIETY OF SCIENCE OBJECTIVES. DURING A Pi TRANSFER, CASSINI FLIES BY TITAN AT OPPOSITE SIDES OF ITS ORBIT ABOUT SATURN, (I.E., TITAN'S ORBITAL POSITION DIFFERS BY Pi RADIANS BETWEEN THE TWO FLYBYS) AND USES TITAN'S GRAVITY TO CHANGE ITS ORBITAL PERSPECTIVE ON THE RINGED PLANET.

LEARNING WHAT ASTEROIDS ARE MADE OF



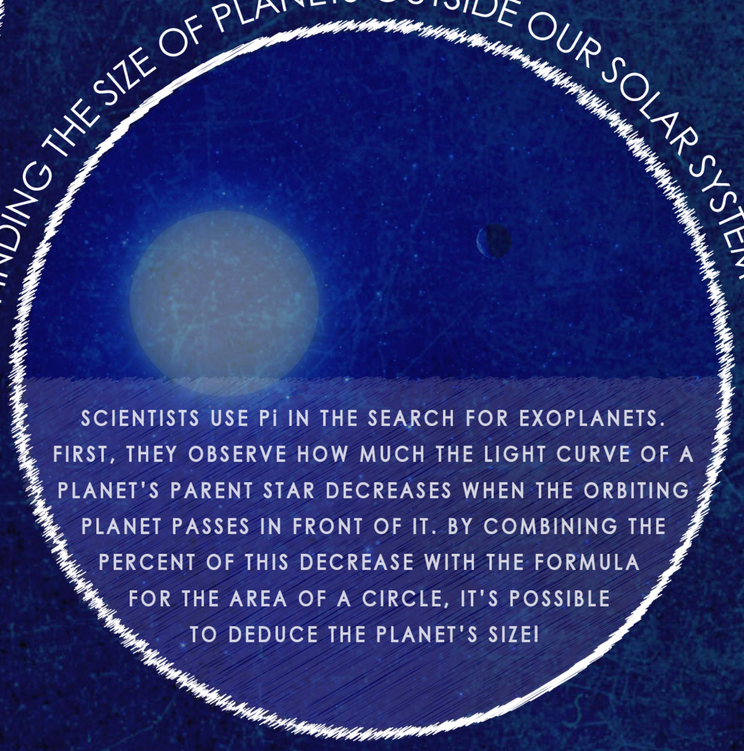
AS TOUGH AS THEY SEEM, ASTEROIDS' INSIDES AREN'T TOO HARD TO CRACK. USING Pi (AND THE ASTEROID'S RADIUS AND MASS), SCIENTISTS CAN EASILY CALCULATE THE DENSITY OF AN ASTEROID AND FIND OUT WHAT IT'S MADE OF: ICE, ROCK, IRON, ETC.

MEASURING CRATERS



KNOWING JUST THE CIRCUMFERENCE, DIAMETER AND SURFACE AREA OF A CRATER CAN TELL SCIENTISTS A LOT ABOUT THE ASTEROID OR METEOR THAT MAY HAVE CARVED IT OUT. THEY CAN EVEN HELP SCIENTISTS TRACK DOWN THE PARENT OF THE GUILTY BOLIDE.

FINDING THE SIZE OF PLANETS OUTSIDE OUR SOLAR SYSTEM

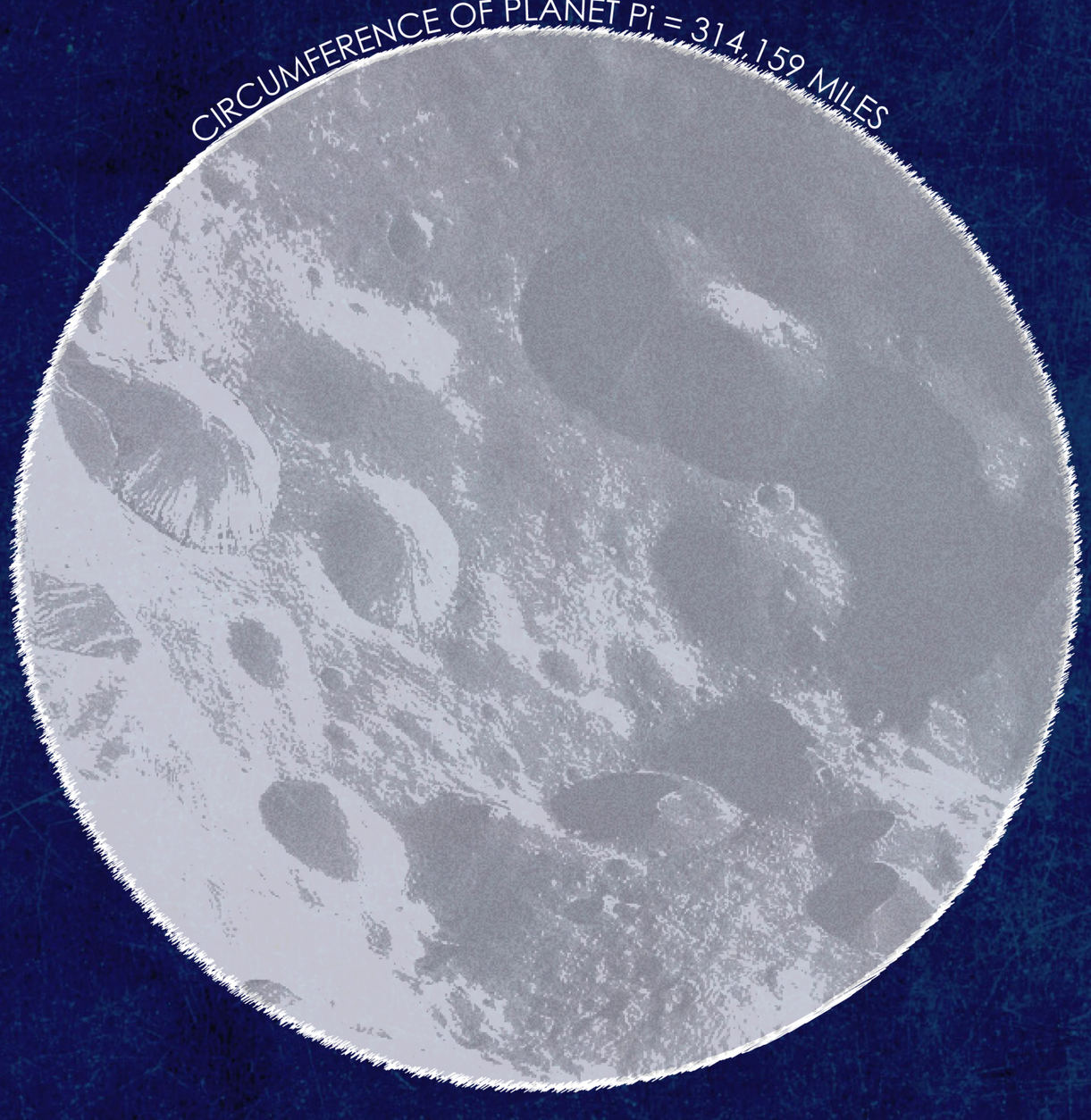


SCIENTISTS USE Pi IN THE SEARCH FOR EXOPLANETS. FIRST, THEY OBSERVE HOW MUCH THE LIGHT CURVE OF A PLANET'S PARENT STAR DECREASES WHEN THE ORBITING PLANET PASSES IN FRONT OF IT. BY COMBINING THE PERCENT OF THIS DECREASE WITH THE FORMULA FOR THE AREA OF A CIRCLE, IT'S POSSIBLE TO DEDUCE THE PLANET'S SIZE!

Pi CHALLENGE:

NOW IT'S TIME TO PUT YOURSELF TO THE TEST! USING ONLY THE CIRCUMFERENCE OF PLANET Pi BELOW, CAN YOU FIND ITS DIAMETER, RADIUS, AREA, SURFACE AREA AND VOLUME? WHAT ELSE CAN YOU DISCOVER ABOUT PLANET Pi? USE THE TOOLKIT OF Pi BELOW TO GET STARTED!

CIRCUMFERENCE OF PLANET Pi = 314,159 MILES



TOOLKIT OF Pi - FORMULAS

CIRCUMFERENCE	THE DISTANCE AROUND THE EDGE OF A CIRCLE	RADIUS	THE DISTANCE FROM THE CENTER OF A CIRCLE TO ITS EDGE	SURFACE AREA (SPHERE)	THE TOTAL AREA OF THE SURFACE OF A 3-D OBJECT (SPHERE)
$C = \pi d$		$R = C / 2\pi$		$S = 4\pi r^2$	
DIAMETER	THE DISTANCE FROM ONE SIDE OF A CIRCLE TO THE OTHER	AREA (CIRCLE)	THE SIZE OF A SURFACE (CIRCLE)	VOLUME (SPHERE)	THE SPACE CONSUMED BY OR CAPACITY OF A 3-D OBJECT (SPHERE)
$D = C / \pi$		$A = \pi r^2$		$V = (4/3)\pi r^3$	

VISIT WWW.JPL.NASA.GOV/EDUCATION FOR MORE EDUCATIONAL RESOURCES, ACTIVITIES AND GAMES FROM NASA/JPL