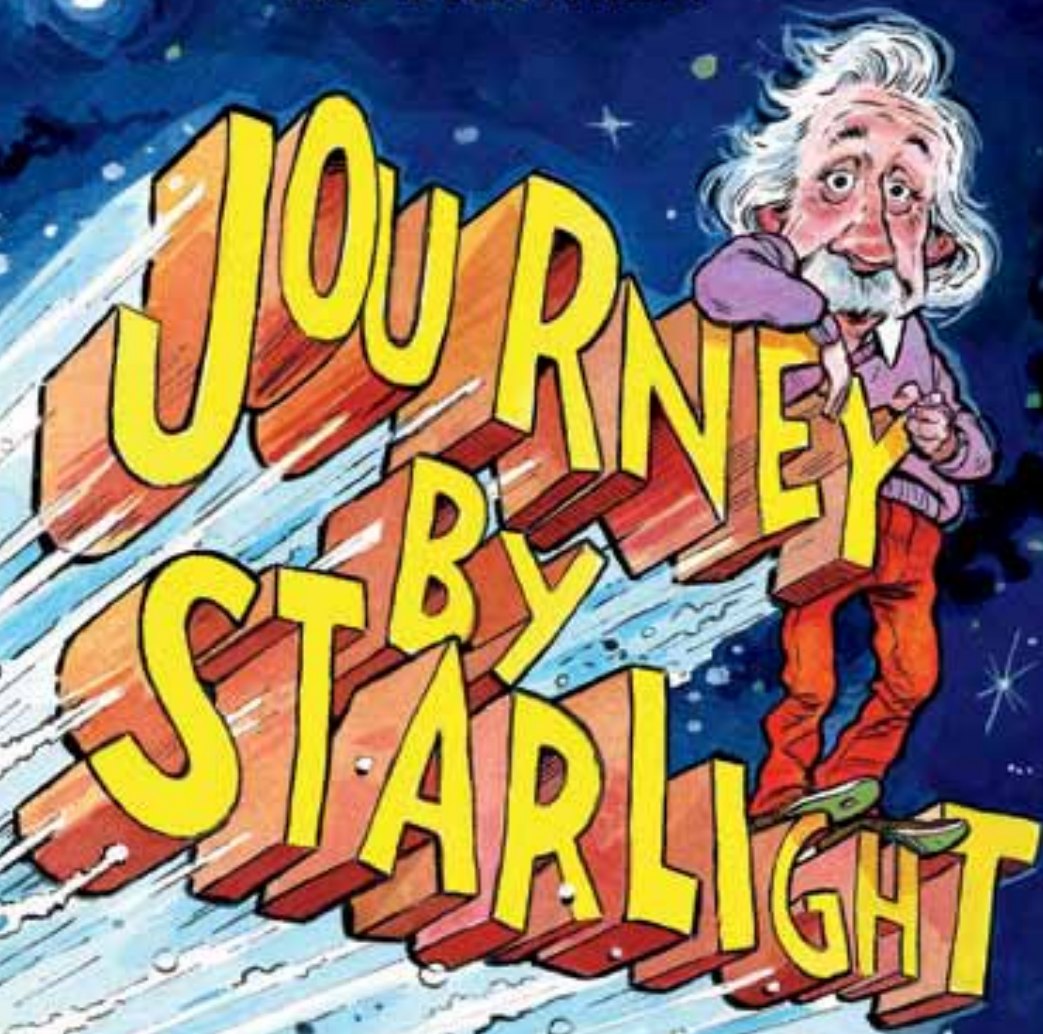


A TIME TRAVELER'S  
GUIDE TO LIFE,  
THE UNIVERSE,  
AND EVERYTHING



IAN FLITCROFT  
BRITT SPENCER

# **SOME BIG QUESTIONS TO GET YOU STARTED... (AND WHERE TO FIND THE ANSWERS)**

## **HOW BIG IS THE GALAXY?**

OF COURSE YOU KNOW IT'S REALLY BIG, BUT TURN TO PAGE 15 TO FIND OUT JUST HOW BIG. YOU'LL ALSO NEED TO KNOW ABOUT LIGHT-YEARS TO MAKE SENSE OF THE ANSWER. THESE ARE EXPLAINED ON THE SAME PAGE.

## **DOES THE UNIVERSE CONTAIN TRUTH AND BEAUTY?**

THE ANSWER TO THIS QUESTION INVOLVES QUARKS AND IS FOUND ON PAGE 27.

## **HOW ABOUT $E=MC^2$ ?**

YOU'VE HEARD OF IT, BUT WHAT DOES IT MEAN? ALL IS REVEALED ON PAGES 28-32, ALONG WITH THE STORY OF THE ATOMIC BOMB.

## **WHAT IS LIFE?**

EASY QUESTION, HUH? WELL, TRY AND ANSWER IT YOURSELF, AND THEN HAVE A LOOK AT PAGES 153-154.

## **HOW DID LIFE START IN THE FIRST PLACE?**

THIS SLIPPERY LITTLE QUESTION IS TACKLED ON PAGES 156-158.

## **WHY IS SPACE CALLED SPACE?**

TO FIND OUT, TURN TO PAGE 107.

## **WHAT IS THE BIG BANG THEORY?**

ONE CLUE: IT'S NOT A TV SERIES. TO DISCOVER WHAT THE BIG BANG IS REALLY ALL ABOUT AND HOW A CATHOLIC PRIEST INVENTED IT, FLIP TO PAGES 33-37.

## **WHAT DO MICROWAVE OVENS AND EXPLODING EGGS HAVE TO DO WITH THE UNIVERSE?**

QUITE A LOT, SURPRISINGLY! FIND OUT HOW ON PAGES 41-42.

## **COULD WIMPS AND MACHOS DECIDE THE FATE OF THE UNIVERSE?**

THEY JUST MIGHT. TO LEARN WHY, TAKE A LOOK AT PAGES 45-46.

## **WHY IS EVERY SINGLE PERSON ON THE PLANET ATTRACTIVE?**

IT HAS TO DO WITH APPLES, TREES, AND A BRILLIANT BUT GRUMPY ENGLISHMAN WHO ALMOST DIED THE DAY HE WAS BORN. FOR A MORE USEFUL ANSWER, TRY PAGES 47-56.

## **WHAT IS A BLACK HOLE?**

THE SCARY SPACE ONE IS EXPLAINED ON PAGES 63-66, BUT FOR A TOTALLY DIFFERENT TYPE OF BLACK HOLE, SEE PAGES 178-179.

## **WHICH FAMOUS ASTRONOMER WORE A FALSE NOSE AND HAD A PET MOOSE?**

IF YOU DON'T BELIEVE ME, TURN TO PAGES 123-124.

## **HOW CAN LIGHT GO AROUND CORNERS?**

REALLY! IT CAN. GO AND TAKE A LOOK AT PAGE 73.

## **IS THE SPEED OF LIGHT CONSTANT?**

LIKE A LOT OF THINGS, IT DEPENDS ON WHERE YOU ARE. FIND OUT MORE ON PAGES 95-101.

# **SOME BIG QUESTIONS TO GET YOU STARTED...** **(AND WHERE TO FIND THE ANSWERS)**

## **WHAT IS THE DIFFERENCE BETWEEN SPECIAL AND GENERAL RELATIVITY?**

WHAT DO YOU MEAN YOU NEVER KNEW THERE WERE DIFFERENT TYPES OF RELATIVITY? SHAME ON YOU! GO STRAIGHT TO PAGES 91-106.

## **HOW DO WE KNOW RELATIVITY IS REAL AND NOT JUST SOME CRAZY THEORY?**

THAT'S WHAT SCIENTISTS ARE FOR! FOR A QUICK ANSWER, CHECK OUT PAGES 102-106.

## **DID SCHRÖDINGER HARM ANY CATS IN HIS WORK ON QUANTUM MECHANICS?**

TO LEARN MORE ABOUT SCIENCE'S MOST FAMOUS FELINE, TAKE A LOOK AT PAGES 83-85.

## **WHERE DO SOME SCIENTISTS THINK IT RAINS DIAMONDS?**

WHY WAIT TO WIN THE LOTTERY? YOU JUST NEED A SPACESHIP, LOTS OF TIME, AND A LARGE SACK. FOR DIRECTIONS, SEE PAGE 136.

## **DO ALIENS EXIST?**

YOU COULD, OF COURSE, JUST ASK ONE, BUT IF YOU CAN'T FIND ONE NEARBY, READ PAGES 164-166.

## **WHY MIGHT PRESIDENT JIMMY CARTER BE THE FIRST HUMAN VOICE HEARD BY ALIENS?**

HONESTLY, THIS ISN'T SCIENCE FICTION! FOR THE FACTS, TURN TO PAGES 115-116.

## **IF THE SKY IS BLUE, WHY ARE CLOUDS WHITE?**

PEOPLE OFTEN ASK WHY THE SKY IS BLUE, BUT WHAT ABOUT CLOUDS? FIND OUT ON PAGE 175.

## **WHAT IS THE BIGGEST LIVING ORGANISM ON EARTH?**

THINK YOU KNOW THIS ONE? IF WHAT YOU'RE THINKING ABOUT ISN'T THREE MILES (4.8 KM) ACROSS, YOU'RE WRONG. THE REAL ANSWER IS ON PAGE 156.

## **HOW DOES DNA STORE OUR GENETIC INFORMATION?**

EVERYONE TALKS ABOUT DNA THESE DAYS, BUT DO YOU UNDERSTAND IT? IF NOT, TAKE A LOOK AT PAGES 154-156.

## **WHAT IS THE MEANING OF LIFE?**

IF YOU DON'T ALREADY KNOW THE ANSWER, READ PAGES 176-177 TO SEE IF THAT HELPS.

## **DID ALBERT EINSTEIN HAVE A REALLY BIG BRAIN?**

EINSTEIN WAS CERTAINLY VERY SMART, BUT TO FIND OUT THE SURPRISING STORY OF HIS BRAIN, FLIP TO PAGE 193.

## **WHY IS SEEING SO MUCH HARDER THAN IT LOOKS?**

THE ANSWER, MY FRIEND, IS BURIED INSIDE YOUR HEAD. IF YOU DON'T WANT TO OPEN UP YOUR SKULL TO FIND OUT, TRY PAGES 189-193 INSTEAD.

## **HOW CAN BLACK AND WHITE LOOK THE SAME?**

TO FIND OUT WHY SEEING ISN'T ALWAYS BELIEVING, SEE PAGE 179.

## **WHAT DOES TRAVEL FASTER THAN LIGHT (FINALLY PROVING EINSTEIN WRONG)?**

THERE REALLY IS ONE THING, AND YOU'LL HAVE TO READ THE BOOK TO FIND OUT... SORRY, I CAN'T GIVE AWAY ALL OF THE ANSWERS!



**A TIME TRAVELER'S  
GUIDE TO LIFE,  
THE UNIVERSE,  
AND EVERYTHING**

**JOURNEY  
BY  
STARLIGHT**

**IAN FLITCROFT  
BRITT SPENCER**

ONE PEACE  
BOOKS

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IAN STUDIED MEDICINE AT OXFORD UNIVERSITY, WHERE HE ALSO COMPLETED HIS DOCTORATE (D.PHIL) IN VISUAL PHYSIOLOGY BEFORE GOING ON TO COMPLETE HIS MEDICAL TRAINING AT ST MARY'S HOSPITAL, LONDON. AS A WRITER, HE HAS PUBLISHED MORE THAN 30 SCIENTIFIC PEER-REVIEWED PAPERS AND CHAPTERS IN MULTI-AUTHOR BOOKS. HIS WRITING HAS BEEN FEATURED IN *DO POLAR BEARS GET LONELY* (NEW SCIENTIST AND PROFILE BOOKS, 2008), AND HIS FIRST NOVEL, *THE RELUCTANT CANNIBALS*, WAS ONE OF THE WINNERS OF THE DUBLIN WRITERS CENTRE NOVEL COMPETITION 2012.

*JOURNEY BY STARLIGHT* IS BASED ON HIS AWARD-WINNING POPULAR SCIENCE BLOG ([WWW.JOURNEYBYSTARLIGHT.COM](http://WWW.JOURNEYBYSTARLIGHT.COM)), WHICH HAS BEEN VIEWED MORE THAN 700,000 TIMES. IAN LIVES IN DUBLIN WITH HIS WIFE AND THREE SONS.

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SINCE HIS ARRIVAL INTO THE COMMERCIAL ART WORLD, BRITT'S WORK HAS BEEN PUBLISHED INTERNATIONALLY AND BEEN RECOGNIZED BY THE DISTINGUISHED NEW YORK SOCIETY OF ILLUSTRATORS AND THE SOCIETY OF ILLUSTRATORS WEST. HE IS ALSO THE ILLUSTRATOR FOR SEVERAL CHILDREN'S BOOKS, INCLUDING PENGUIN/PHILOMEL BOOKS' *FLEAS!* (2008), *MAKE YOUR MARK, FRANKLIN ROOSEVELT* (2007), AND *ZARAFAS: THE GIRAFFE WHO WALKED TO THE KING* (2009).

BRITT LIVES IN SAVANNAH, GEORGIA. YOU CAN SEE MORE OF HIS WORK AT HIS WEBSITE ([WWW.BRITTSPECNER.COM](http://WWW.BRITTSPECNER.COM)).

*TO THE SUN AND PLANETS OF MY OWN LITTLE SOLAR SYSTEM:  
JEAN, CALLUM, MYLES, AND OLIVER.*

*TO THE FALLACY OF SUNK-COST.*

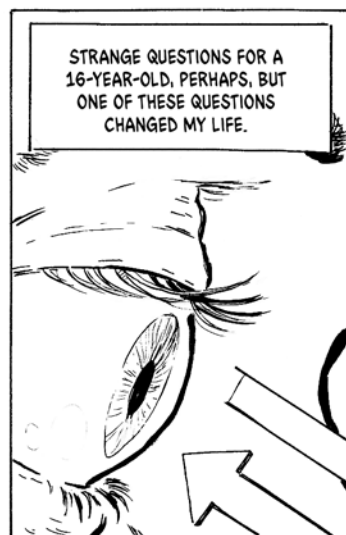
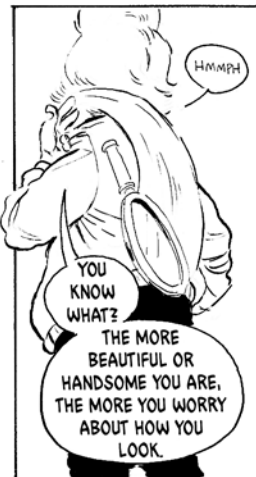


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# CHAPTER 1: THE POWER OF THOUGHT



IT TOOK ME HALF MY LIFE TO FIGURE OUT THE ANSWER, BUT IT WAS WORTH IT. NOW, I'M TRAVELING ON A BEAM OF LIGHT JUST FOR FUN.



THE NAME IS ALBERT. ALBERT EINSTEIN.



AT LEAST I REMEMBER BEING ALBERT EINSTEIN, UP UNTIL A POINT, AND THEN BACK IN APRIL 1955, IT ALL WENT BLANK.



BUT SUDDENLY, I'M BACK HERE IMAGINING THINGS ALL OVER AGAIN. WHO KNEW? HOW MANY PEOPLE GET A SECOND CHANCE LIKE THAT?



IT'S WONDERFUL. I GET TO DO ALL THE THINGS I NEVER DID THE FIRST TIME AROUND, LIKE THIS TRIP.



TRIP?

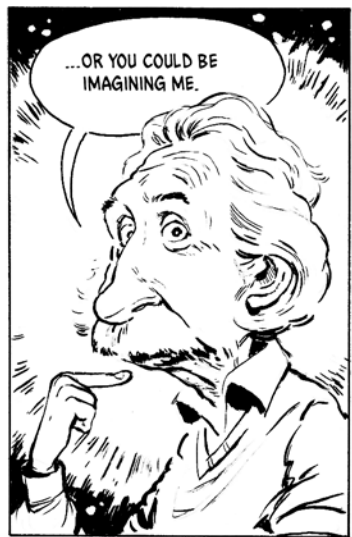
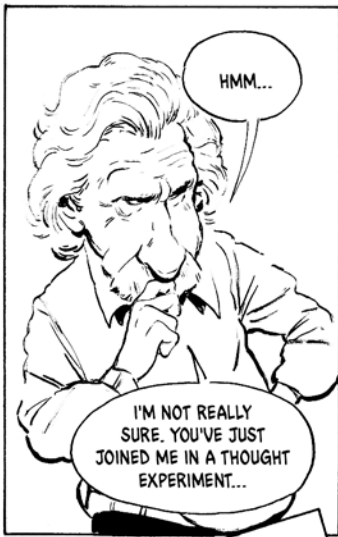
YES, I'M TAKING A JOURNEY ON A BEAM OF STARLIGHT. WANT TO JOIN ME?

ERR... SURE... BUT CAN I ASK A QUESTION?

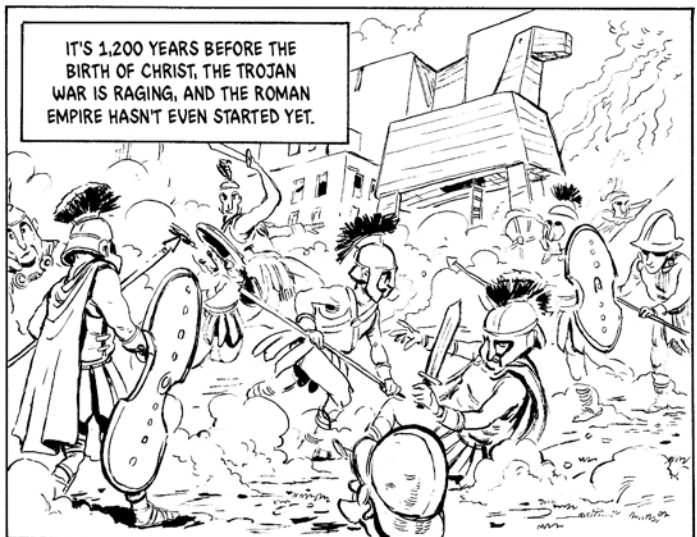
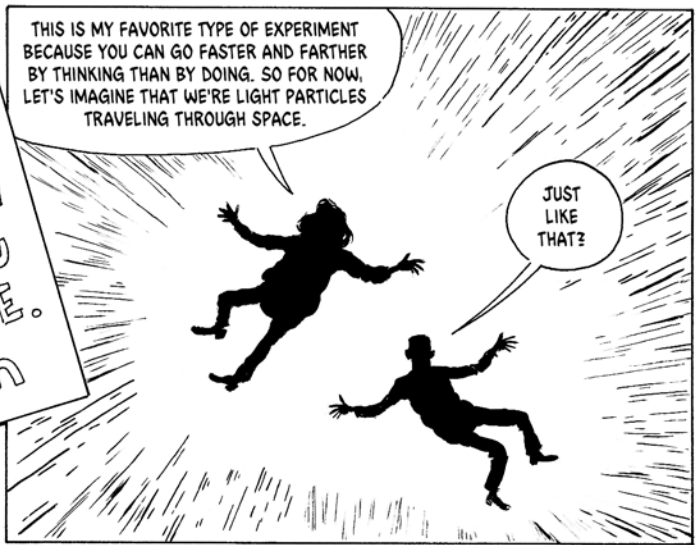


OF COURSE. THAT'S WHY YOU'RE HERE.

WHO AM I?



LOGIC WILL GET YOU FROM A TO Z; IMAGINATION WILL GET YOU EVERYWHERE.  
- Einstein



DURING OUR JOURNEY, ALL THE GREAT ANCIENT CIVILIZATIONS WILL COME AND GO.  
BY THE END OF OUR JOURNEY, IN 3,200 YEARS, THE HUMAN RACE WILL HAVE  
PROGRESSED—IF THAT IS THE RIGHT WORD...

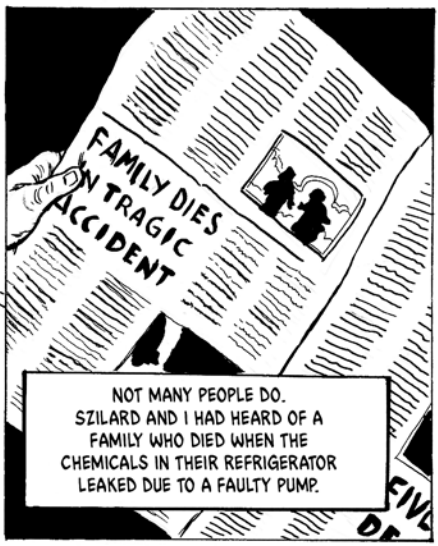






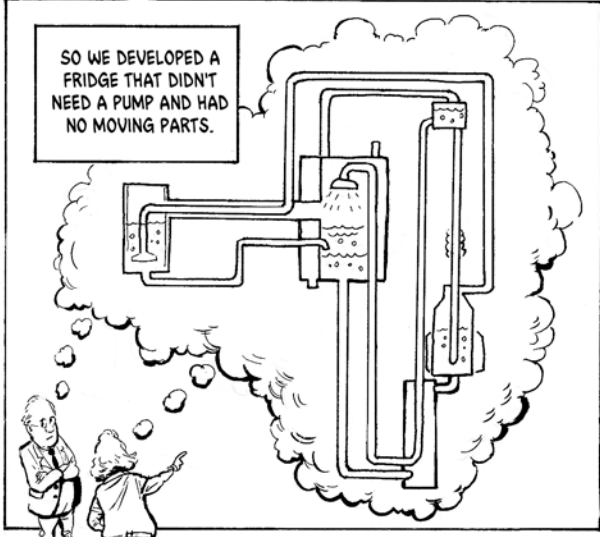
DID YOU KNOW I INVENTED A NEW TYPE OF REFRIGERATOR IN 1926, WITH MY FRIEND LEO SZILARD?

NO, SORRY.

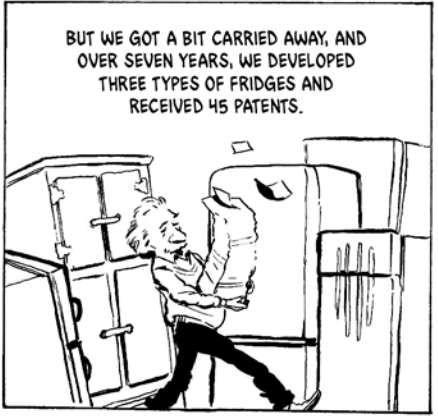


**FAMILY DIES IN TRAGIC ACCIDENT**

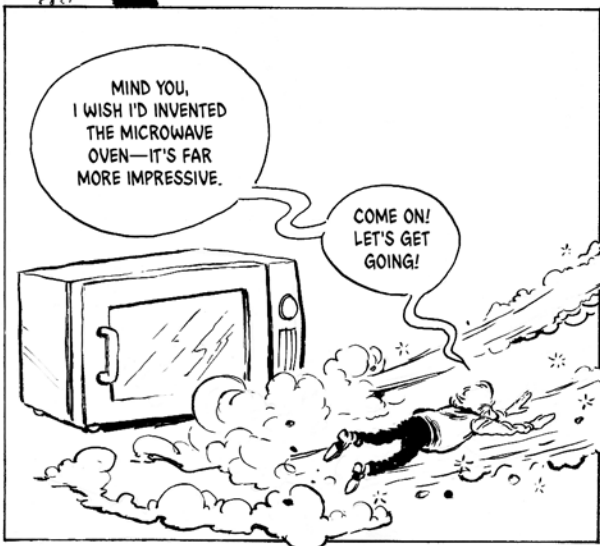
NOT MANY PEOPLE DO. SZILARD AND I HAD HEARD OF A FAMILY WHO DIED WHEN THE CHEMICALS IN THEIR REFRIGERATOR LEAKED DUE TO A FAULTY PUMP.



SO WE DEVELOPED A FRIDGE THAT DIDN'T NEED A PUMP AND HAD NO MOVING PARTS.



BUT WE GOT A BIT CARRIED AWAY, AND OVER SEVEN YEARS, WE DEVELOPED THREE TYPES OF FRIDGES AND RECEIVED 45 PATENTS.



MIND YOU, I WISH I'D INVENTED THE MICROWAVE OVEN—IT'S FAR MORE IMPRESSIVE.

COME ON! LET'S GET GOING!



YOU STILL HAVEN'T TOLD ME WHERE WE'RE GOING?

YOU'LL SEE...



**CHAPTER 2: LIGHT-YEARS, CHICKEN TAILS, AND ARMPITS**

IF THIS JOURNEY IS GOING TO TAKE OVER 3,200 YEARS, HOW FAR ARE WE GOING TO TRAVEL?

OH, LET'S SEE... 186,000 TIMES 60 MULTIPLIED BY... UM... THAT MAKES 18,811,601,193,600,000, OR ALMOST 19 QUADRILLION MILES (30 QUADRILLION KM). IT'S HARD TO IMAGINE WHAT THAT KIND OF DISTANCE REALLY MEANS, BUT IN CAR-JOURNEY TERMS, IT WOULD TAKE OVER 30 BILLION YEARS AT A STEADY 70 MILES PER HOUR (112 KM/H).

**EARTH: 18,811,601,193,600,000 MILES TO GO**

VAROOOOOM!

WAIT A MINUTE, IF IT WOULD TAKE 30 BILLION YEARS TO DRIVE, HOW CAN WE GET THERE IN JUST OVER 3,200 YEARS?

BECAUSE WE'RE NOT GOING TO DRIVE, WE'RE GOING TO FLY THROUGH SPACE.

WE'LL BE TRAVELING AT THE SPEED OF LIGHT. REMEMBER, WE'RE LIGHT PARTICLES NOW, AND NOT JUST ANY LIGHT, BUT THE VERY BEST TYPE OF LIGHT: STARLIGHT! SO TRAVELING AT LIGHT SPEED COMES NATURALLY TO US.

EVEN THOUGH THIS SOUNDS LIKE A LONG JOURNEY, IT'S REALLY A FAIRLY SHORT STROLL THROUGH THE MILKY WAY GALAXY—A JOURNEY OF A MERE 3,200 LIGHT-YEARS...

100,000 LIGHT-YEARS

...IN A GALAXY THAT IS OVER 100,000 LIGHT-YEARS ACROSS.

IS A LIGHT-YEAR THE SAME AS A NORMAL YEAR?

...AND IS HOW FAR LIGHT CAN TRAVEL IN A YEAR.

IT SOUNDS LIKE A LIGHT-YEAR OUGHT TO MEASURE TIME, DOESN'T IT? BUT A LIGHT-YEAR IS A MEASURE OF DISTANCE...

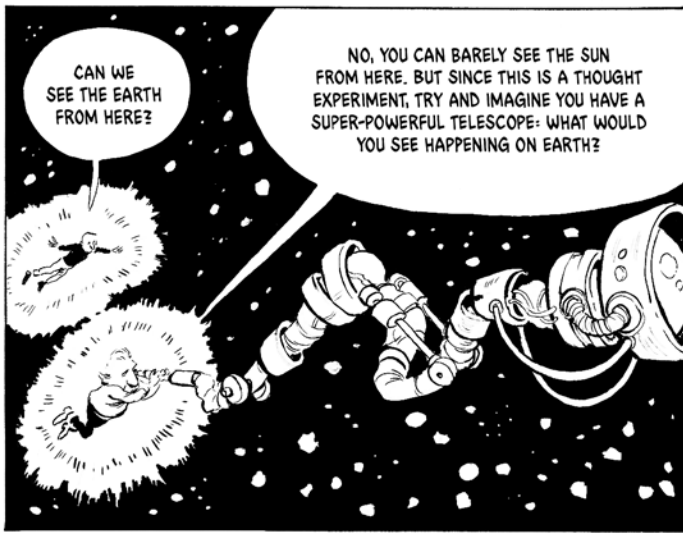
186,000 MILES/SECOND

AT 186,000 MILES PER SECOND (299,000 KM/S), AND WITH OVER 31 MILLION SECONDS PER YEAR, THAT MEANS LIGHT TRAVELS ALMOST 6 TRILLION MILES PER YEAR (OVER 9 TRILLION KM/YR).

TO GIVE YOU SOME IDEA HOW FAR A LIGHT-YEAR REALLY IS, THE EARTH'S MOON IS ONLY A LITTLE OVER A LIGHT-SECOND AWAY\*.

1 SECOND

\*THE MOON IS ACTUALLY 1.28 LIGHT-SECONDS AWAY.



CAN WE SEE THE EARTH FROM HERE?

NO, YOU CAN BARELY SEE THE SUN FROM HERE. BUT SINCE THIS IS A THOUGHT EXPERIMENT, TRY AND IMAGINE YOU HAVE A SUPER-POWERFUL TELESCOPE: WHAT WOULD YOU SEE HAPPENING ON EARTH?



OK, WELL, I'D SEE PEOPLE DRIVING AROUND DOING NORMAL THINGS, I SUPPOSE.

ACTUALLY, YOU'D SEE WHAT PEOPLE WERE DOING 3,200 YEARS AGO. IF LIGHT TAKES THAT LONG TO TRAVEL FROM HERE TO THE EARTH...



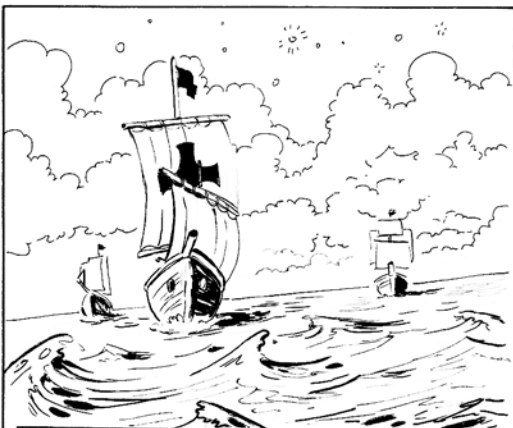
...IT WILL TAKE THAT LONG TO GO THE OTHER WAY...  
...SO THE LIGHT FROM EARTH REACHING YOUR TELESCOPE WOULD BE 3,200 YEARS OLD.



IF LITTLE GREEN MEN SITTING IN A SPACESHIP OUT HERE POINTED A HUGE TELESCOPE TOWARD THE EARTH TODAY, THEY WOULD SEE THE EARTH AROUND THE TIME OF THE TROJAN HORSE.

SO IS ALL STARLIGHT THAT OLD?

THERE'S STARLIGHT THAT BEGAN ITS JOURNEY TOWARD EARTH BEFORE THE TIME OF THE ANCIENT GREEKS AND ROMANS...



...AND THERE'S STARLIGHT THAT'S BEEN TRAVELING SINCE BEFORE COLUMBUS FIRST SET FOOT IN AMERICA.

AS YOU LOOK AT THE NIGHT SKY, THERE IS ALSO STARLIGHT THAT LEFT ITS STAR IN THE YEAR YOU WERE BORN\*, AS WELL AS LIGHT FROM GALAXIES MILLIONS OF YEARS OLD.



DON'T SOME PEOPLE CLAIM TO TELL THE FUTURE BY LOOKING AT THE STARS?



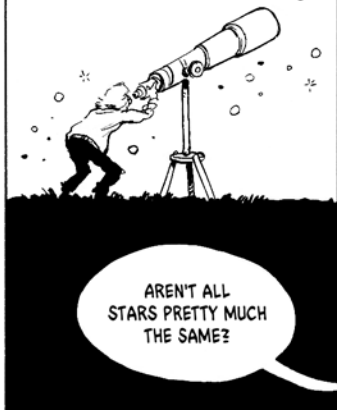
OH, ASTROLOGERS DO. BUT WHEN YOU LOOK AT THE STARS, YOU'RE LOOKING AT THE PAST, NOT THE FUTURE.

DON'T CONFUSE ASTROLOGY WITH ASTRONOMY. ASTROLOGY IS THE ART OF TELLING PEOPLE WHAT THEY WANT TO HEAR...

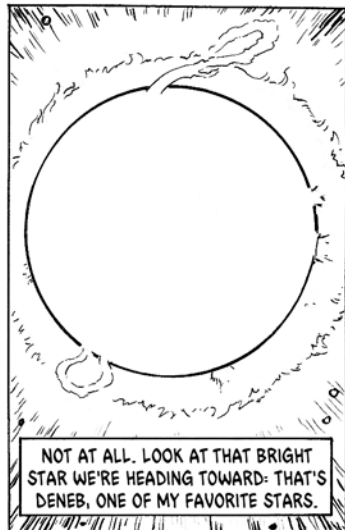


TRUST ME, SHE LIKES YOU A LOT

...ASTRONOMY IS THE SCIENCE OF STARS AND THE UNIVERSE OUT HERE.

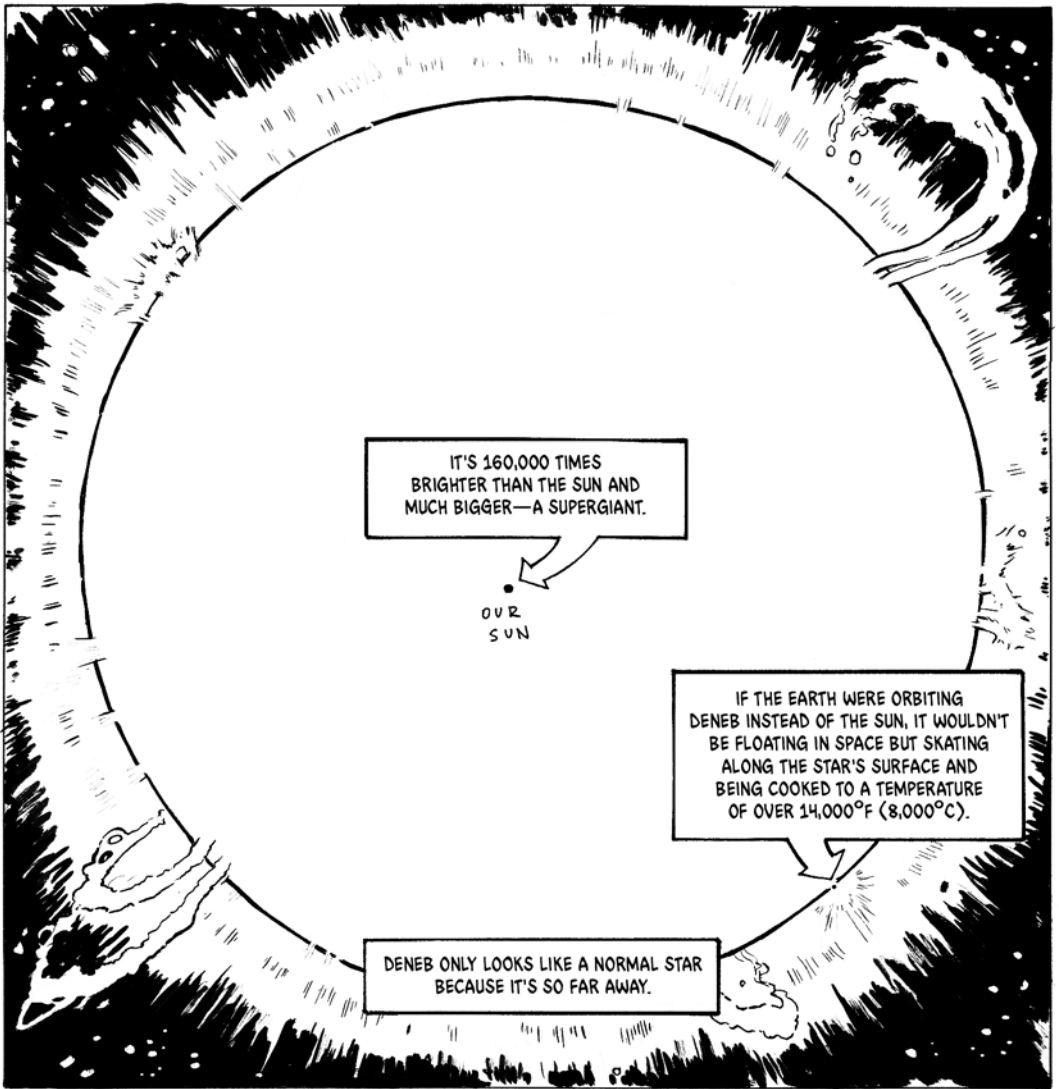


AREN'T ALL STARS PRETTY MUCH THE SAME?



NOT AT ALL. LOOK AT THAT BRIGHT STAR WE'RE HEADING TOWARD: THAT'S DENEK, ONE OF MY FAVORITE STARS.

\*AS LONG AS YOU ARE AT LEAST 7 YEARS OLD. THERE ARE ALSO TWO STARS FOR 4-YEAR-OLDS AND ONE FOR 5-YEAR-OLDS, BUT NONE FOR 6-YEAR-OLDS.

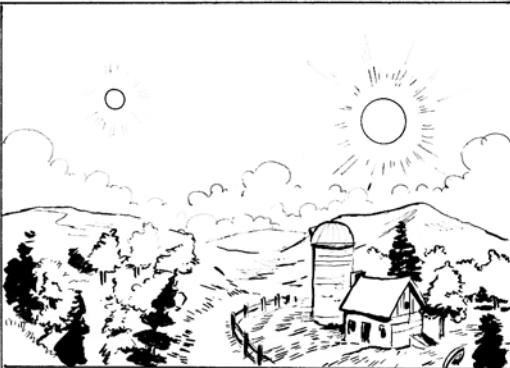


IT'S 160,000 TIMES BRIGHTER THAN THE SUN AND MUCH BIGGER—A SUPERGIANT.

OUR SUN

IF THE EARTH WERE ORBITING DENEB INSTEAD OF THE SUN, IT WOULDN'T BE FLOATING IN SPACE BUT SKATING ALONG THE STAR'S SURFACE AND BEING COOKED TO A TEMPERATURE OF OVER 14,000°F (8,000°C).

DENEB ONLY LOOKS LIKE A NORMAL STAR BECAUSE IT'S SO FAR AWAY.



IF DENEB WERE AS CLOSE TO EARTH AS THE NEAREST STAR, PROXIMA CENTAURI, WHICH IS ONLY FOUR LIGHT-YEARS AWAY, IT WOULD BE BRIGHT ENOUGH TO CAST SHADOWS AT NIGHT AND BE VISIBLE DURING THE DAY.



BUT OUR BEAM OF STARLIGHT COMES FROM AN EVEN BIGGER STAR.

WHAT'S IT CALLED?

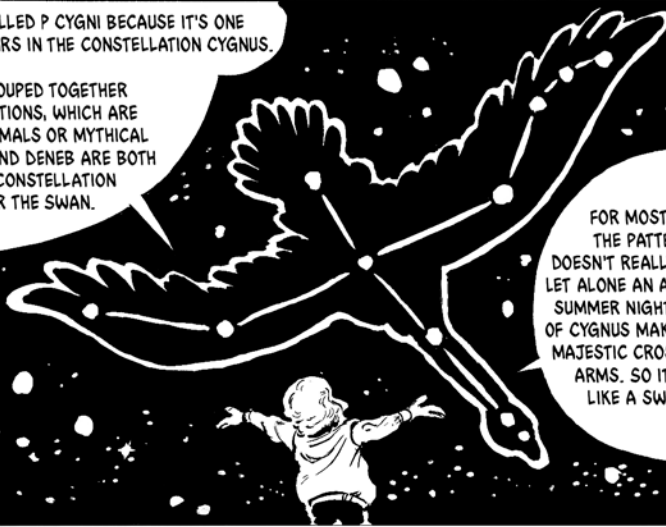
P CYGNI—A FASCINATING STAR THAT KEEPS CHANGING BRIGHTNESS.

THAT'S A STRANGE NAME.

IT'S CALLED P CYGNI BECAUSE IT'S ONE OF THE STARS IN THE CONSTELLATION CYGNUS.

STARS ARE GROUPED TOGETHER INTO CONSTELLATIONS, WHICH ARE NAMED AFTER ANIMALS OR MYTHICAL BEINGS. P CYGNI AND DENEK ARE BOTH PART OF THE CONSTELLATION CYGNUS, OR THE SWAN.

FOR MOST CONSTELLATIONS, THE PATTERN OF THE STARS DOESN'T REALLY LOOK LIKE ANYTHING, LET ALONE AN ANIMAL, BUT ON A CLEAR SUMMER NIGHT ON EARTH, THE STARS OF CYGNUS MAKE THE SHAPE OF A HUGE MAJESTIC CROSS WITH OUTSTRETCHED ARMS. SO IT REALLY DOES LOOK LIKE A SWAN IN FULL FLIGHT.



DOES IT?



WELL, SORT OF LIKE A SWAN, IN THE SAME WAY A STICK FIGURE LOOKS LIKE A PERSON.

DENEK IS THE TAIL OF THE SWAN AND P CYGNI IS NEAR THE MIDDLE. FROM EARTH, THEY LOOK CLOSE TOGETHER BECAUSE THEIR LIGHT COMES FROM A SIMILAR DIRECTION; IN REALITY, THEY'RE THOUSANDS OF LIGHT-YEARS APART.



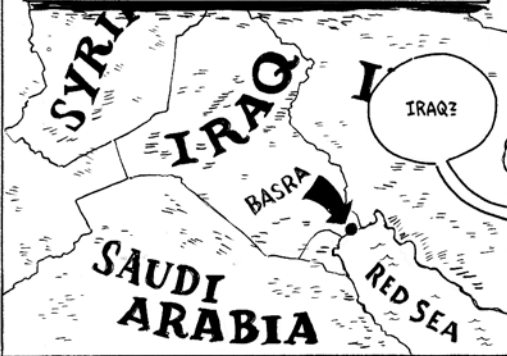
WHERE DO THESE STAR NAMES COME FROM?

MOST OF THE BRIGHTER STARS, LIKE DENEK, WERE GIVEN NAMES BY THE ANCIENT ARABIC ASTRONOMERS. BUT P CYGNI DIDN'T BECOME VISIBLE FROM EARTH UNTIL THE YEAR 1600, SO IT DOESN'T HAVE AN ARABIC NAME.



THE ROMANS NAMED MOST OF THE PLANETS AFTER THEIR OWN GODS, BUT DIDN'T SEEM TO BOTHER NAMING THE STARS.

AFTER THE GREEK AND ROMAN EMPIRES DIED OUT, AND BEFORE EUROPE EMERGED FROM THE DARK AGES, THE ARABIC UNIVERSITIES IN PLACES LIKE BASRA IN MODERN-DAY IRAQ BECAME HOME TO THE WORLD'S BEST MATHEMATICIANS AND ASTRONOMERS.



OH, IRAQ WAS PART OF A GREAT CIVILIZATION A THOUSAND YEARS AGO, WITH THE MOST IMPORTANT UNIVERSITIES AT THE TIME. HAVE YOU EVER WONDERED WHY EUROPEANS SPEAK DIFFERENT LANGUAGES BUT WRITE NUMBERS IN THE SAME WAY?

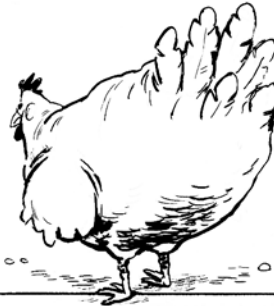


NO, BUT NOW THAT YOU MENTION IT, WHAT AN AMAZING THOUGHT.

THEY STILL USE THE SYSTEM TAUGHT BY ARABIC MATHEMATICIANS, WHICH THEY LEARNED FROM HINDU MATHEMATICIANS IN INDIA.



ANYWAY, DENEK GOT ITS NAME FROM THE GREAT ARABIC ASTRONOMERS, THOUGH OVER THE CENTURIES, IT CHANGED SLIGHTLY—ITS NAME COMES FROM THE ARABIC *AL-DHANAB AD-DAJAJAH*, OR 'THE TAIL OF THE HEN.'

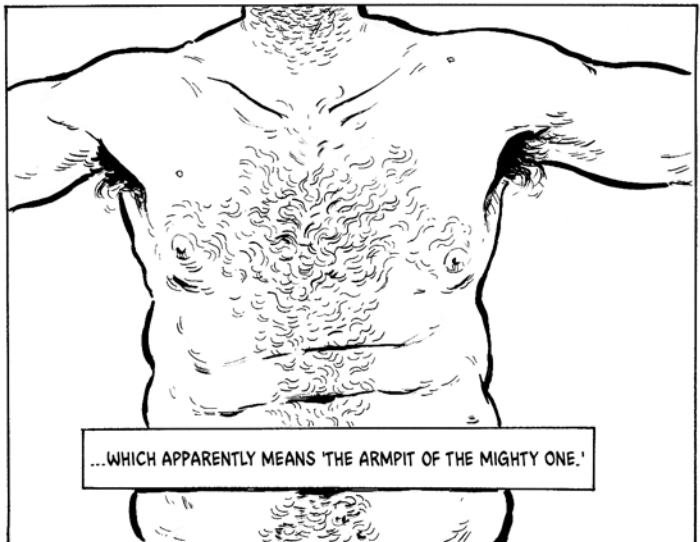


I THOUGHT IT WAS A SWAN.



WELL, THINGS HAVE GOTTEN A BIT MIXED UP THROUGH THE YEARS, BUT, OVERALL, IT'S NOT AS BAD AS SOME STARS.

TAKE BETELGEUSE, FOR EXAMPLE, THE BIG RED STAR IN THE CONSTELLATION ORION, THE HUNTER—THIS STAR STARTED WITH THE ARABIC NAME *YAD AL-JAUZA*, OR 'HAND OF ORION,' BUT SOMEHOW ENDED UP AS *BAIT AL-JAUZA*, OR 'BETELGEUSE...'



...WHICH APPARENTLY MEANS 'THE ARMPIT OF THE MIGHTY ONE.'

CHAPTER 3: STARS, ATOMS, AND LEGO®



ALBERT,  
HOW DO STARS  
SHINE SO  
BRIGHTLY?

DON'T  
YOU KNOW?

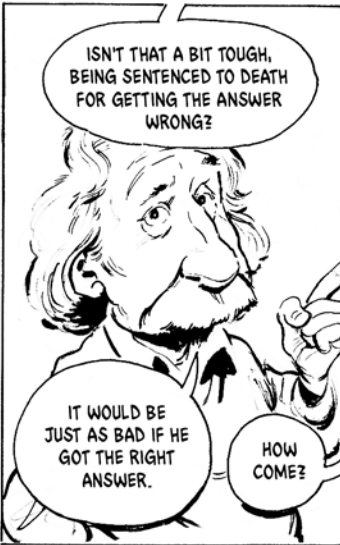
GOOD QUESTION.  
LET'S USE MY  
IMAGINARY-O-SCOPE  
TO FIND OUT IF THOSE  
EARTH-FOLK KNOW  
THE ANSWER.

OF COURSE I KNOW,  
BUT HALF THE FUN OF  
SCIENCE IS EXPLAINING  
IT TO OTHERS!

AH, YES, IT'S ABOUT 500 BC,  
THE TIME OF THE ANCIENT GREEKS.  
ANAXAGORAS OF CLAZOMENAE HAS JUST  
BEEN SENTENCED TO DEATH FOR SAYING  
THAT HE THINKS THE SUN IS A VERY  
LARGE, VERY HOT LUMP OF ROCK.

IT'S NOT  
A HOT  
ROCK?

OH  
NO.

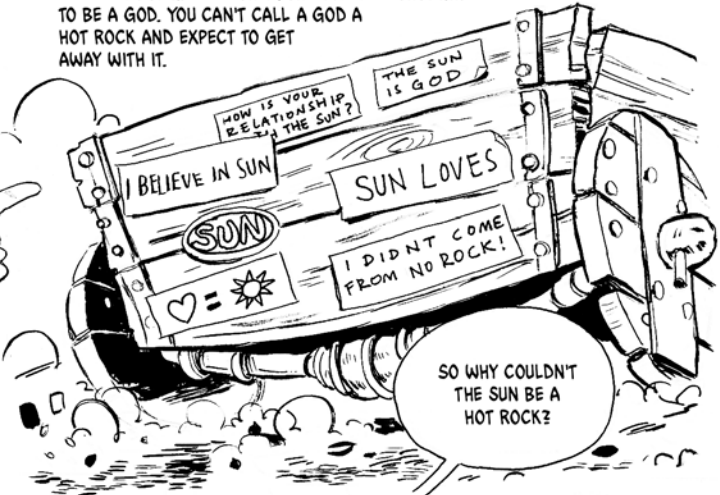


ISN'T THAT A BIT TOUGH,  
BEING SENTENCED TO DEATH  
FOR GETTING THE ANSWER  
WRONG?

IT WOULD BE  
JUST AS BAD IF HE  
GOT THE RIGHT  
ANSWER.

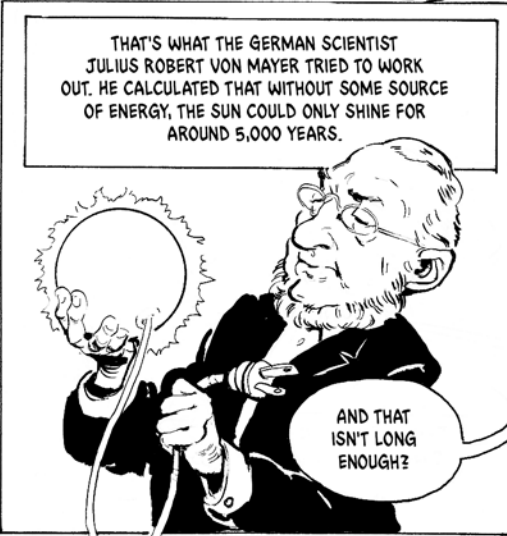
HOW  
COME?

BY THINKING UP CRAZY, NEW IDEAS, HE'S SAYING THAT EVERYONE  
ELSE IS WRONG. BACK THEN, THE SUN WAS THOUGHT  
TO BE A GOD. YOU CAN'T CALL A GOD A  
HOT ROCK AND EXPECT TO GET  
AWAY WITH IT.



SO WHY COULDN'T  
THE SUN BE A  
HOT ROCK?

THAT'S WHAT THE GERMAN SCIENTIST  
JULIUS ROBERT VON MAYER TRIED TO WORK  
OUT. HE CALCULATED THAT WITHOUT SOME SOURCE  
OF ENERGY, THE SUN COULD ONLY SHINE FOR  
AROUND 5,000 YEARS.



AND THAT  
ISN'T LONG  
ENOUGH?



NOT FOR SCIENTISTS. MIND YOU, SOME  
PEOPLE THOUGHT THE EARTH WASN'T  
MUCH OLDER. AN IRISH ARCHBISHOP,  
JAMES USSHER, CALCULATED THAT THE  
WORLD BEGAN ON OCTOBER 23, 4004 BC.