



***PROLOGUE***  
**A TALE THAT BEGINS  
ON THE MOON**

KOUKI HIGH SCHOOL

O ROMEO,  
ROMEO!

WHEREFORE ART THOU  
ROMEO?

THERE IS  
NO ROMEO!

WE DON'T HAVE  
ANYONE TO  
PLAY HIM.

WE DON'T HAVE  
MUCH TIME LEFT  
BEFORE THE ARTS  
FESTIVAL...

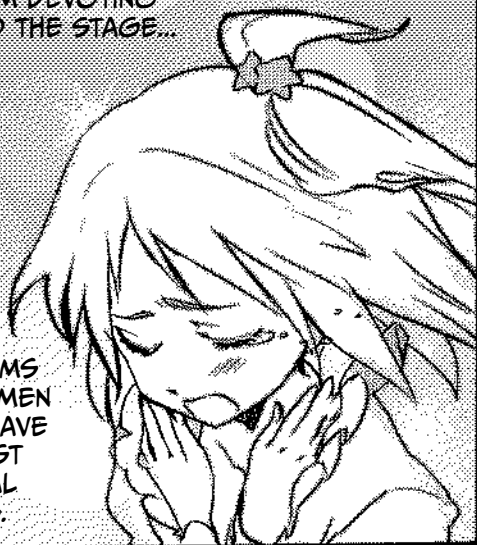
20 DAYS UNTIL  
THE FESTIVAL  
BEGINS!

WHAT ARE WE  
GOING TO DO?



I'VE TURNED DOWN ALL THE OFFERS TO BE ON SPORTS TEAMS. I'M DEVOTING MYSELF TO THE STAGE...

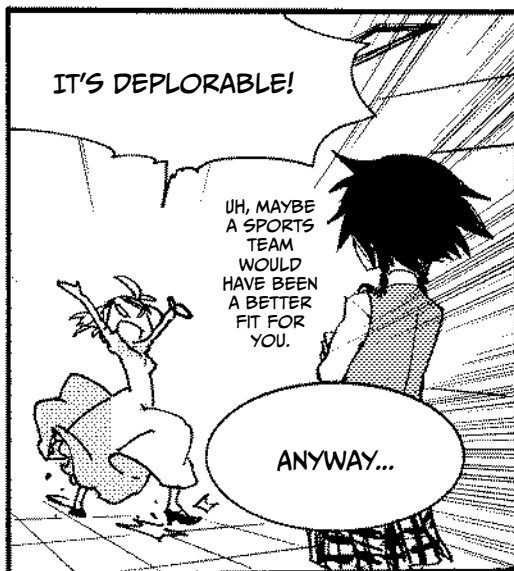
...BUT IT SEEMS THAT YOUNG MEN NOWADAYS HAVE NO INTEREST IN CULTURAL ACTIVITIES.



IT'S DEPLORABLE!

UH, MAYBE A SPORTS TEAM WOULD HAVE BEEN A BETTER FIT FOR YOU.

ANYWAY...



IF WE CAN'T PUT ON A PERFORMANCE AT THIS ARTS FESTIVAL....

20 DAYS!

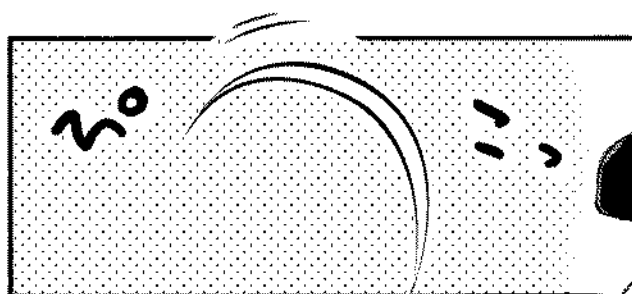
THE SCHOOL IS GOING TO SHUT DOWN THE DRAMA CLUB.

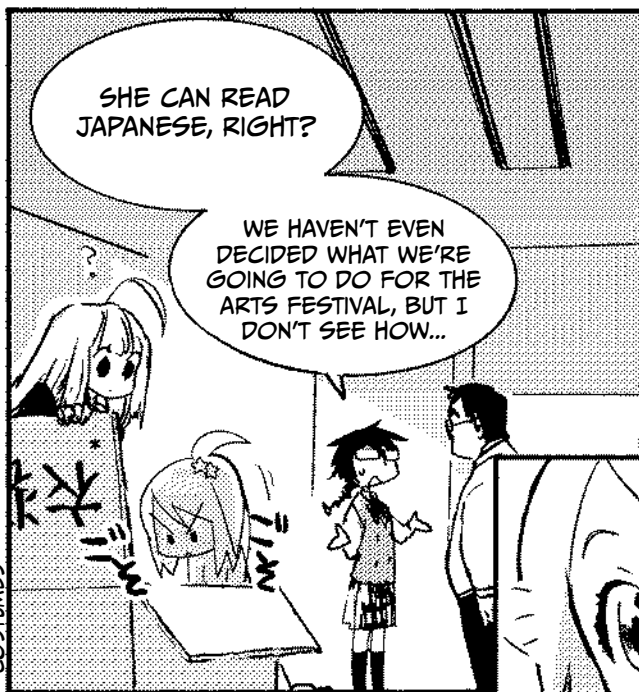
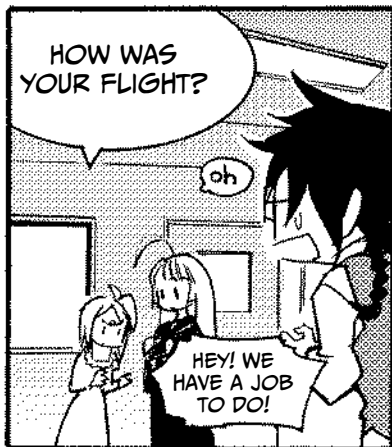


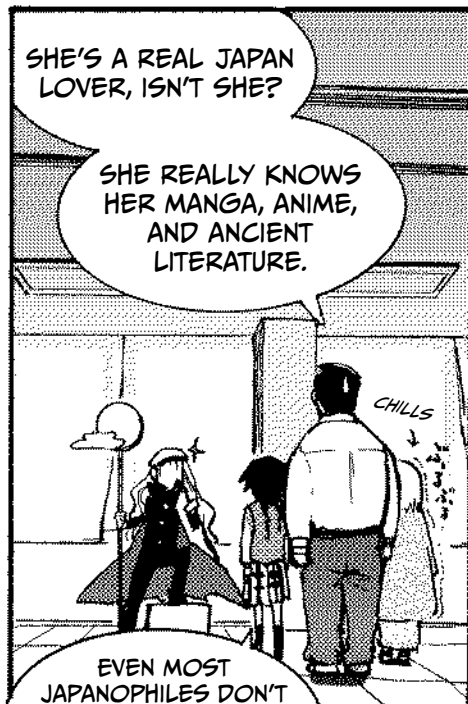
WHAT'S THAT?

CLATTER



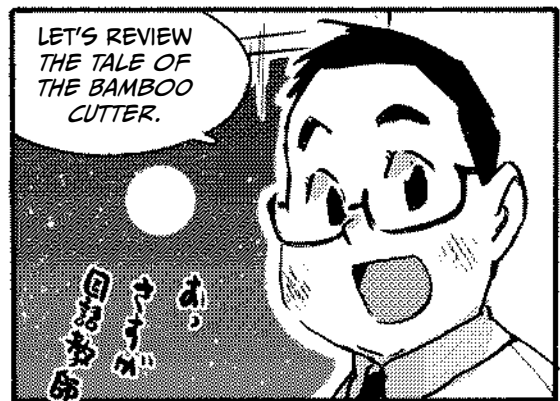
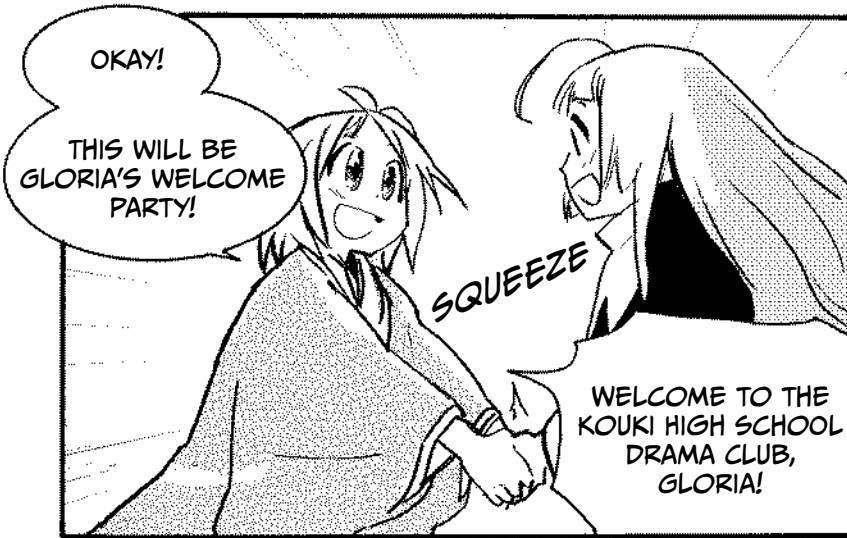
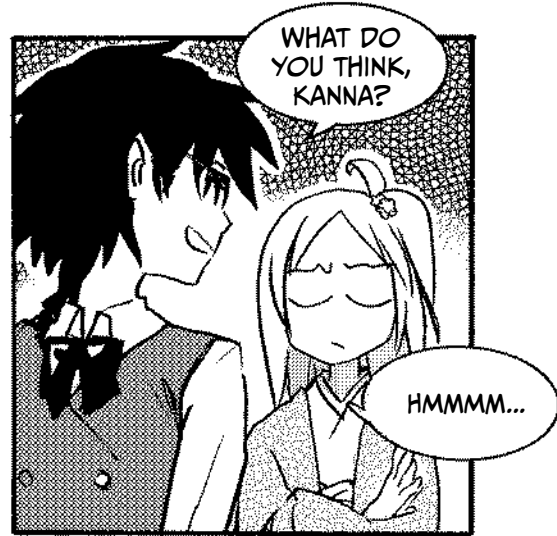
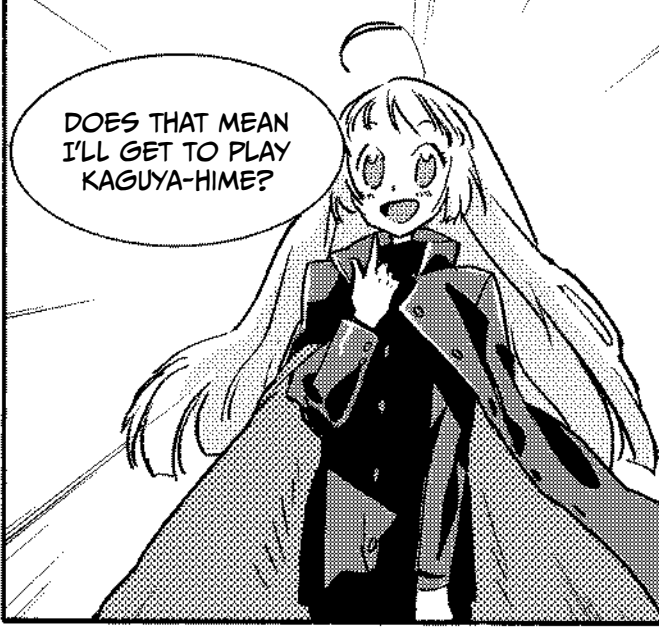










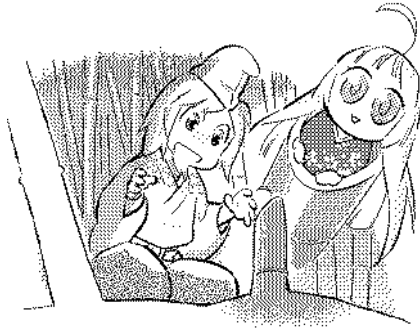


AS YOU MIGHT EXPECT, MR. ISHIZUKA IS THE JAPANESE LITERATURE TEACHER!

## THE STORY OF KAGUYA-HIME

Long, long ago, an elderly bamboo cutter was walking through a grove when he came upon a mysterious glowing stalk of bamboo. When he cut it open, he found a tiny girl inside—so tiny that she fit in the palm of his hand. Thinking that the gods had taken pity on him and his wife, an old childless couple, he decided to bring her home so that he and his wife could raise her as their own child.

From that day forward, whenever the old man cut down a stalk of bamboo, he found a piece of gold inside. Little by little, he became very wealthy. The girl grew up quickly, and in just three months she grew into a kind and loving daughter.



HOW'D SHE GROW UP SO FAST?

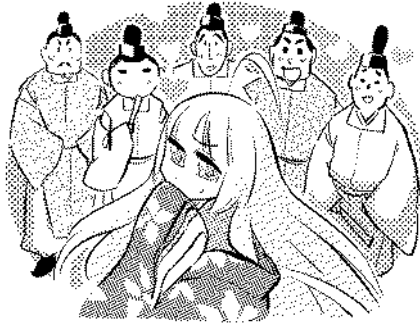
IT'S A FAIRY TALE, DUH...



The girl, who was named Kaguya-hime, was so exceptionally beautiful that word of her beauty reached even the faraway capital. Many suitors called on her, but she wasn't interested in any of them.

However, five of these men were unable to ignore her beauty, and they asked for her hand in marriage.

As the condition for accepting a marriage proposal, Kaguya-hime asked each of her suitors to bring back a rare treasure that was impossible to find. Naturally, no one succeeded.



WHAT WERE THE TREASURES?

OH, THINGS LIKE A SHINING MULTICOLORED JEWEL FROM A DRAGON'S NECK, YOU KNOW...



PRINCE OTOMO WAS ASKED TO FIND THE DRAGON'S JEWEL, BUT HE KNEW IF HE ENTRUSTED THE TASK TO HIS SAMURAI, ONE OF THEM WOULD STEAL IT. SO HE SET SAIL HIMSELF. BUT ALONG THE WAY, HE ENCOUNTERED A TERRIBLE STORM. THIS KIND OF ADVENTURE CERTAINLY MAKES AN INTERESTING STORY, BUT LET'S MOVE ALONG...



Kaguya-hime also caught the eye of the emperor—but he too was rejected. As the years passed, Kaguya-hime became more and more pensive whenever she gazed at the Moon, and as the autumnal full Moon approached, she would often burst into tears. The old bamboo cutter was very worried. When he asked her what was wrong, she replied, "I am not from this world! I come from the capital of the Moon, and I must return there when the Moon is full."

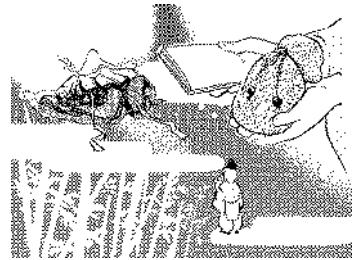


WHEN WOULD THE MOON BE FULL?

BY THE OLD CALENDAR, IT WAS THE 15TH NIGHT OF THE 8TH MONTH. NOWADAYS IT WOULD BE THE FULL MOON THAT OCCURS SOMETIME IN SEPTEMBER—THE HARVEST MOON.

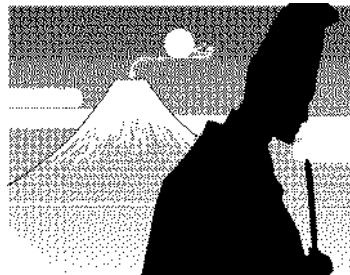


Hearing of this, the emperor tried to capture Kaguya-hime for himself before she could return to the Moon. He surrounded her house with soldiers, but then soldiers from the Moon came down and defeated them.



Before leaving for the Moon, Kaguya-hime gave the old bamboo cutter a letter and an elixir of immortality to give to the Emperor. Then the Moon's emissaries put the celestial maiden's feathered robe on her shoulders, and all of her memories of Earth disappeared. She returned to the Moon, pulled upward by an invisible force.

The Emperor read her letter but decided that he didn't want to live forever if he couldn't see her again. So he ordered his men to burn the elixir on top of the highest mountain in the country—the one that was closest to the Moon.



From then on, the mountain where the elixir was burned became known as Mt. Fuji, from the Japanese word for *immortality* (*fushi*).



NOW I SEE  
WHAT KIND OF  
STORY THIS IS!



IT'S A ROMANTIC  
SCIENCE FICTION  
STORY SET IN  
ANCIENT TIMES!!




JAPAN IS SO COOL!

YUCK, IT'S  
EMBARRASSING  
TO BE ADMIRING  
SO MUCH.

WHEN DID THAT  
HAPPEN?

WELL, IT'S  
NOT LIKE SHE  
ADMIRE YOU...

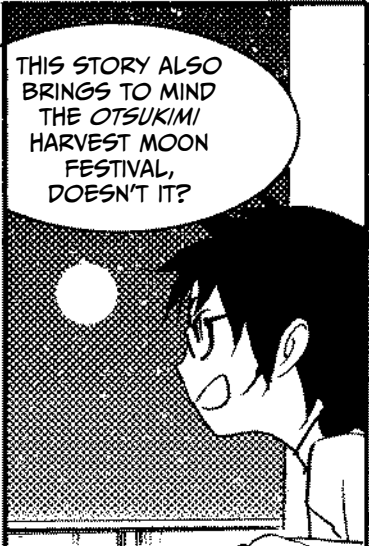


BUT KAGUYA-  
HIME IS ACTUALLY  
A SPACE ALIEN  
WHO CAME FROM  
THE MOON—IT IS  
SCIENCE FICTION.

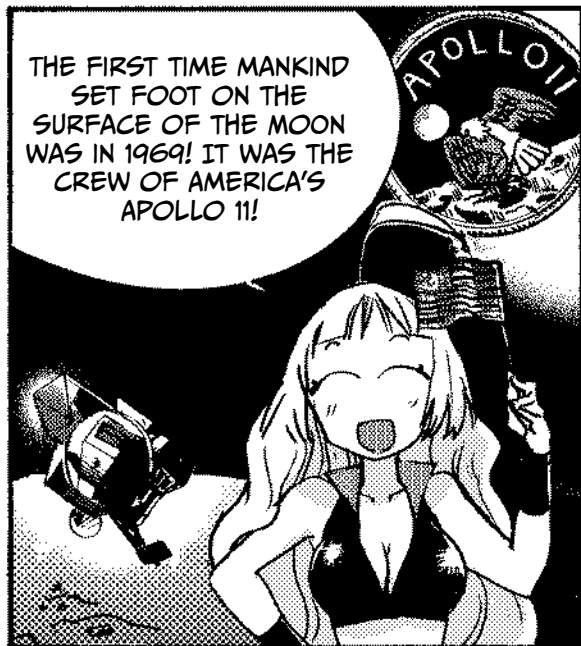
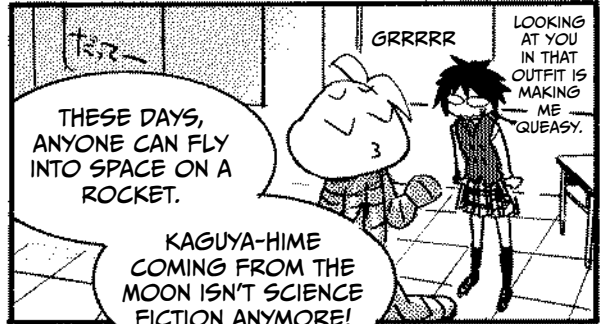
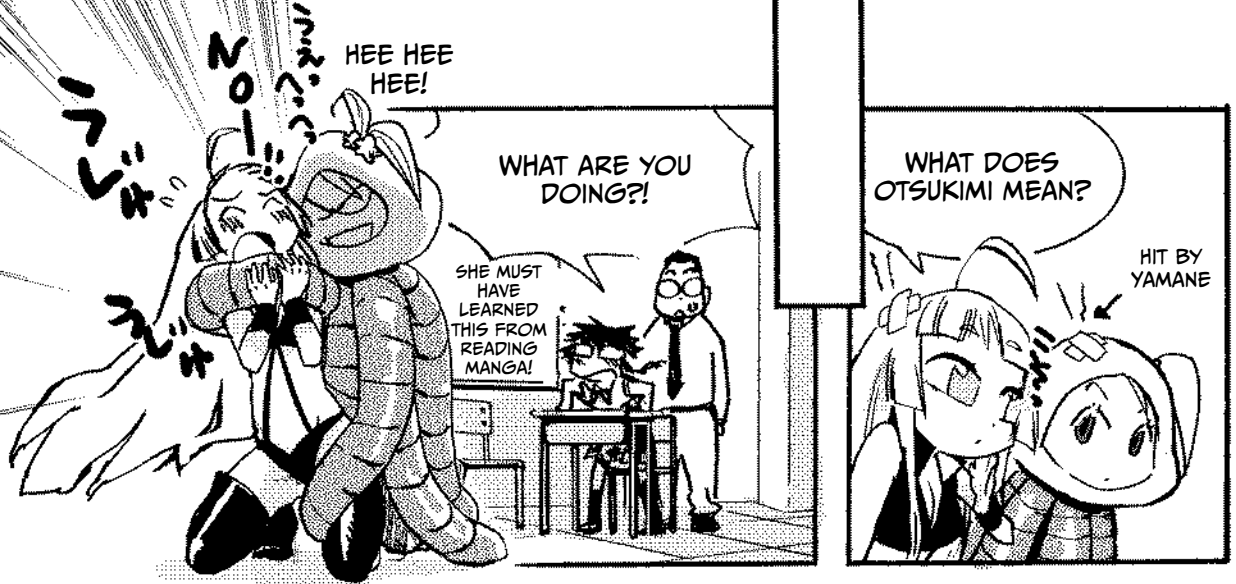


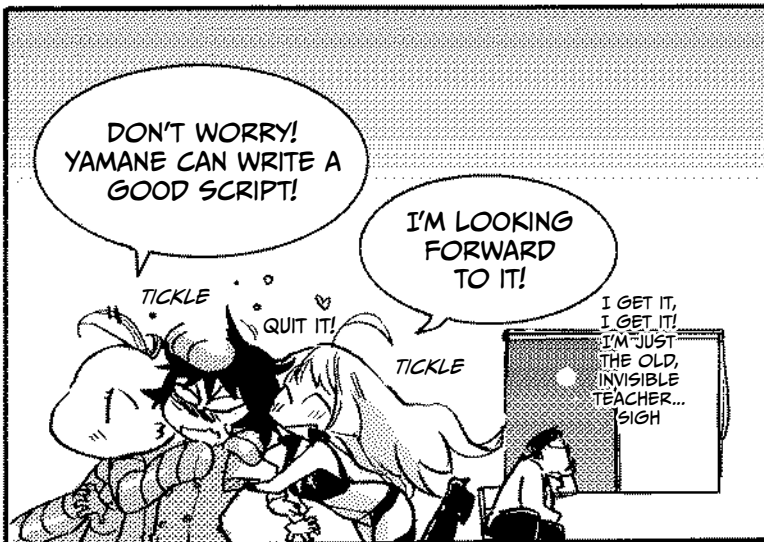
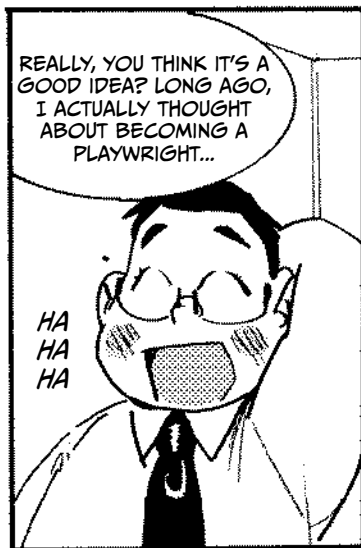
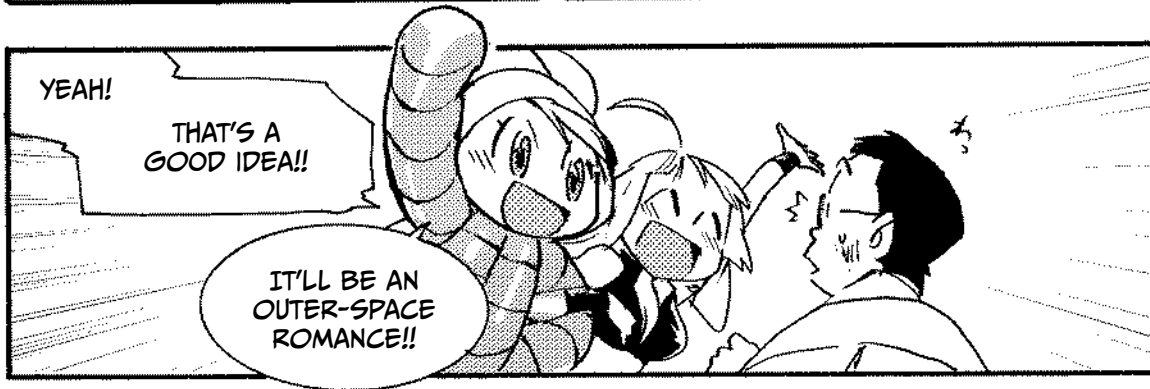
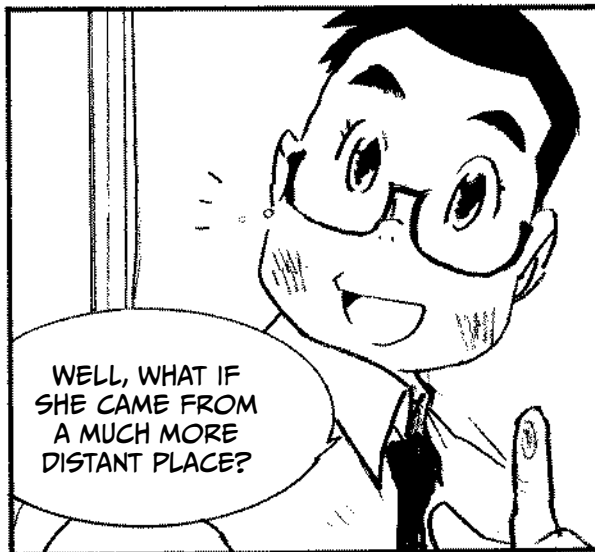
THERE ARE MANY  
SIMILAR STORIES  
FROM OTHER ASIAN  
COUNTRIES, BUT...

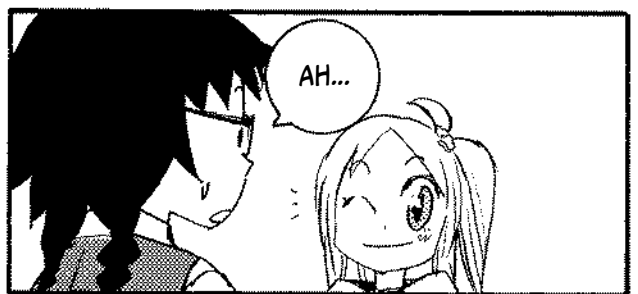
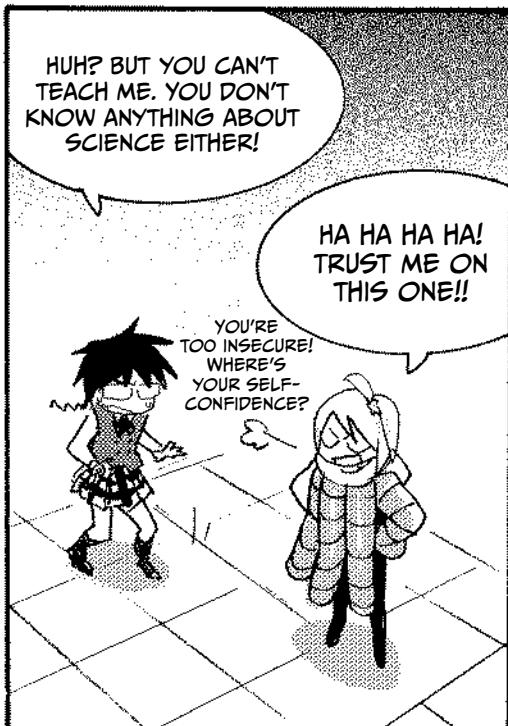
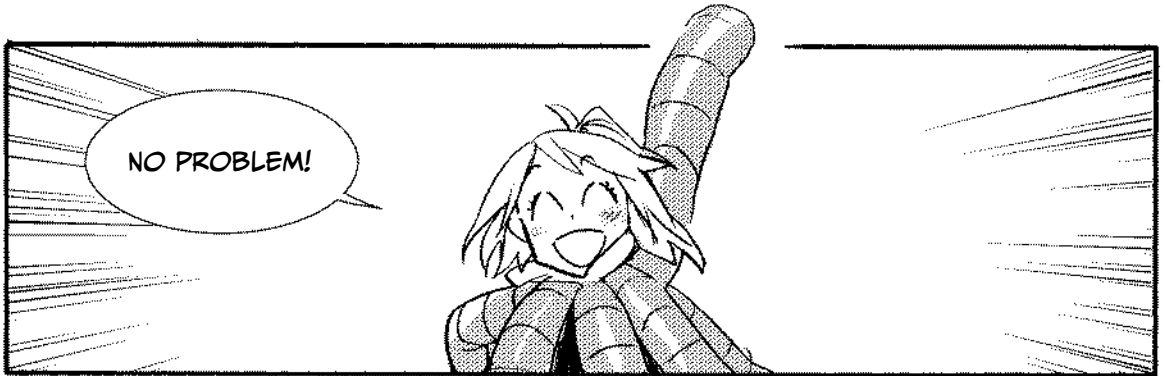
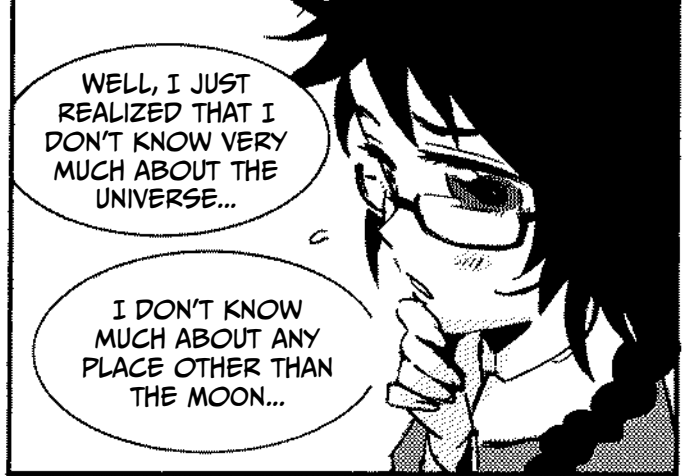
...ONE IN WHICH  
SOMEONE COMES  
TO EARTH FROM THE  
MOON IS UNIQUE TO  
JAPAN.



THIS STORY ALSO  
BRINGS TO MIND  
THE OTSUKIMI  
HARVEST MOON  
FESTIVAL,  
DOESN'T IT?



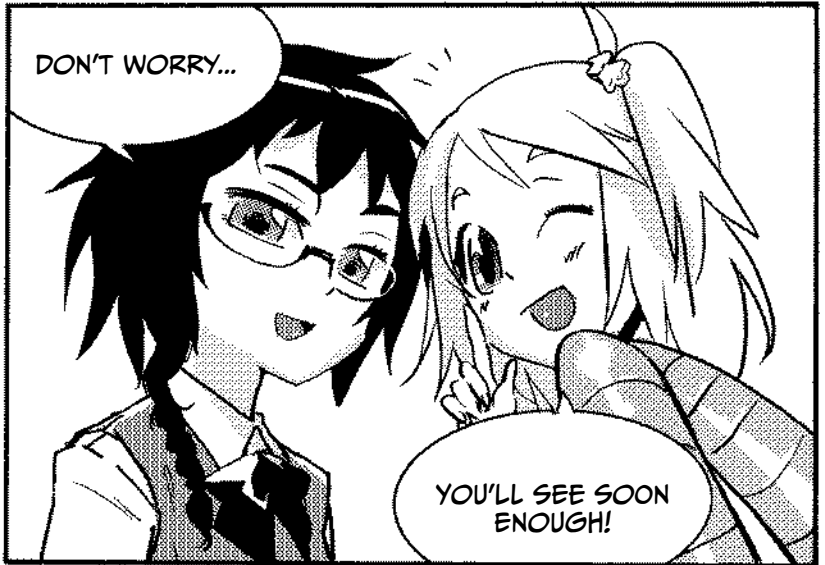




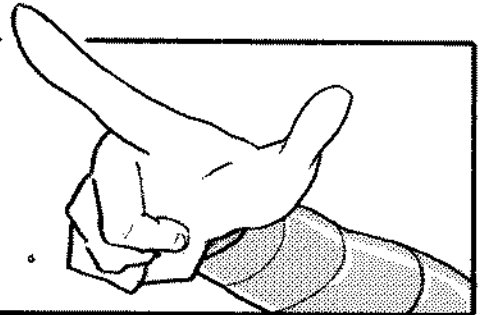
WHAT ARE YOU TALKING ABOUT? IT'S NOT FAIR IF ONLY YOU TWO UNDERSTAND!



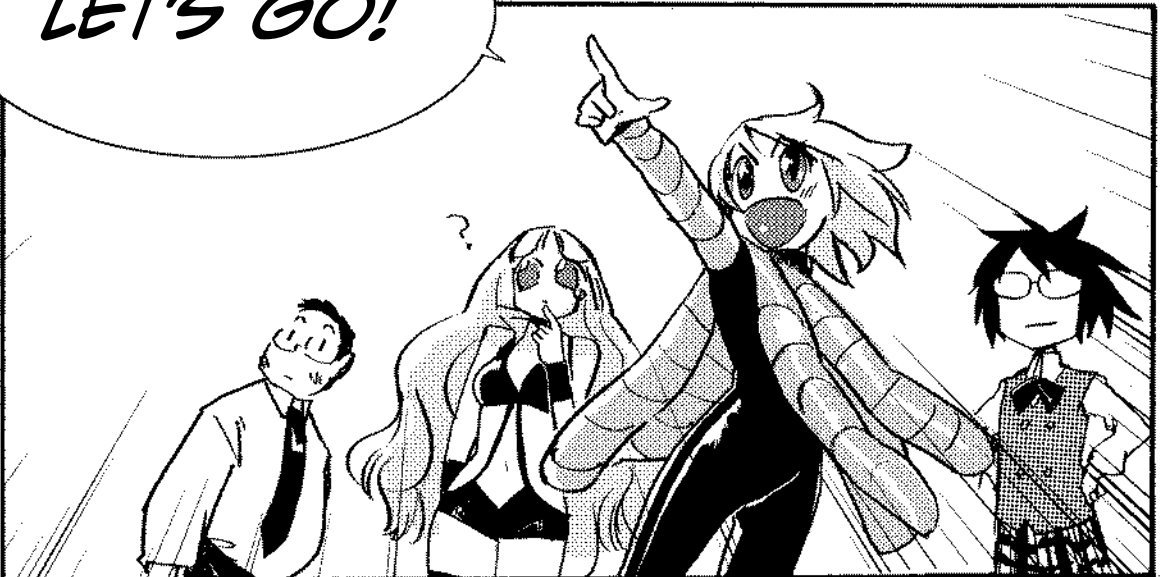
DON'T WORRY...



YOU'LL SEE SOON ENOUGH!



LET'S GO!







ON A JOURNEY  
THROUGH OUTER SPACE!



BUT FIRST I'M  
GOING HOME.

LET'S MEET LATER  
AT MY HOUSE!

*HUSTLE,  
HUSTLE*

## COSMIC MYTHS

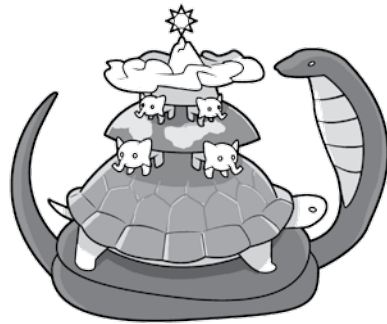
How did ancient Japanese people know that the Moon was a celestial body like Earth?

*The Tale of the Bamboo Cutter* is an ancient Japanese fairy tale known to almost everyone in Japan. *The Tale of Genji*, written approximately 1,000 years ago, mentioned that the first fairy tale ever told was about an old bamboo cutter. However, it is rather surprising that the ancient Japanese believed that there was a city on the Moon where people lived.

For a long time, mankind believed that the universe was a small amount of space that wrapped around the world in which they lived. Maps from ancient times showed celestial bodies such as the Sun, Moon, and stars as tiny entities affixed to the surface of a shell that surrounded Earth. But in a universe like that, Kaguya-hime's story doesn't make sense. The people who created her story had a different view of the universe, in which the Moon was another world where people lived. Let's look at some other views of the universe from ancient times.

### ANCIENT INDIA'S VIEW OF THE UNIVERSE

In ancient India, people believed in a turtle that rode on top of an enormous coiled snake and that elephants stood on the turtle's back to support a hemispherical Earth. The Sun was thought to appear and disappear as it revolved around the highest mountain, which stood at the center of the world. (This is Mt. Sumeru, which likely represented the Himalayas.) The Moon, which was the lamp belonging to the night watchman on this mountain, was thought to wax and wane depending on the direction the watchman was facing.



*Ancient India's view of the universe*

### ANCIENT EGYPT'S VIEW OF THE UNIVERSE

In ancient Egypt, people believed that Nut, goddess of the sky, was supported by Shu, god of the air. Nut was said to be a symbol of the Nile River, and daytime and nighttime occurred when the Sun god Ra went back and forth across the river by boat every day. The Moon and stars were thought to be suspended from Nut's body.



*Ancient Egypt's view of the universe*

## ANCIENT BABYLONIA'S VIEW OF THE UNIVERSE

The Babylonians thought that the Moon and stars were affixed to an enormous arched ceiling called the *celestial sphere*. The celestial sphere was supported by Mt. Ararat, and the Sun moved from east to west across its inner surface.



*Ancient Babylonia's view of the universe*

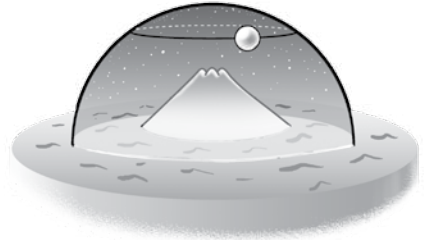
## IN CHINA, WHERE ASTRONOMY WAS ORIGINALLY DEVELOPED

In contrast to these imaginary universes, people in ancient China and Greece tried to develop models of the universe scientifically. It was in China that astronomy was first developed.

In China, several cosmologies were conceived approximately 2,000 to 2,400 years ago, based on observations of the heavens. Two such cosmologies were called Gai Tian and Hun Tian.

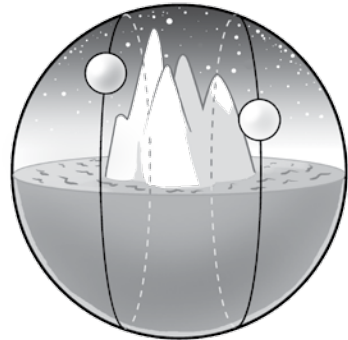
*Gai Tian* described a dome-shaped sky, like a cap, over a hemispherical Earth. This was surrounded by water (the ocean) and rotated once a day from east to west around the north pole. The Sun also traced a circle in the sky, and the size of that circle varied with the seasons.

*Hun Tian*, whose name means *the entire sky*, expanded upon the concept of Gai Tian to try to more accurately represent the movements of the celestial bodies. The celestial sphere enveloped everything like an eggshell rather than just capping it like a dome, and the variation in the constellations according to the seasons was explained by the notion that the north pole shifted, rather than always remaining directly overhead.



*Gai Tian:*

*A cosmology positing a hemispherical dome over Earth*



*Hun Tian:*

*A spherical cosmology*

# IN ANCIENT GREECE, WHERE THE SIZE OF EARTH WAS CALCULATED

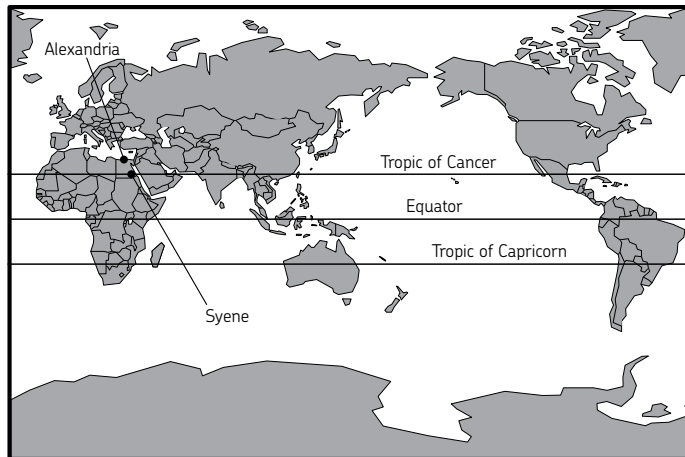
The ancient Greeks tried to explain the shape of the universe by using the logical thinking that permeates modern mathematics and physics. One of their greatest achievements was the discovery that Earth is a spherical body floating in space. The ancient Greeks were also the first to calculate the size of Earth.

Eratosthenes (who lived from about 276 BC to 195 BC) was a Greek scholar who was active in Egypt during the Hellenistic period. He calculated the size of Earth using the following method.

## ERATOSTHENES' CALCULATION METHOD

Eratosthenes discovered an account that said that a rod standing vertically at midday on the summer solstice in Syene (in the southern part of Egypt) did not cast a shadow. It seemed that this phenomenon could only occur south of the Tropic of Cancer, when the Sun appeared at the zenith (directly overhead).

The astonished scholar wondered what would happen in Alexandria, in the northern part of Egypt, and he immediately performed the experiment under the same conditions. The result was that the shadow of the rod remained visible. Eratosthenes concluded from this evidence that Earth is a sphere, a theory that was being discussed among some scholars at the time.



*The Tropics and the Equator*

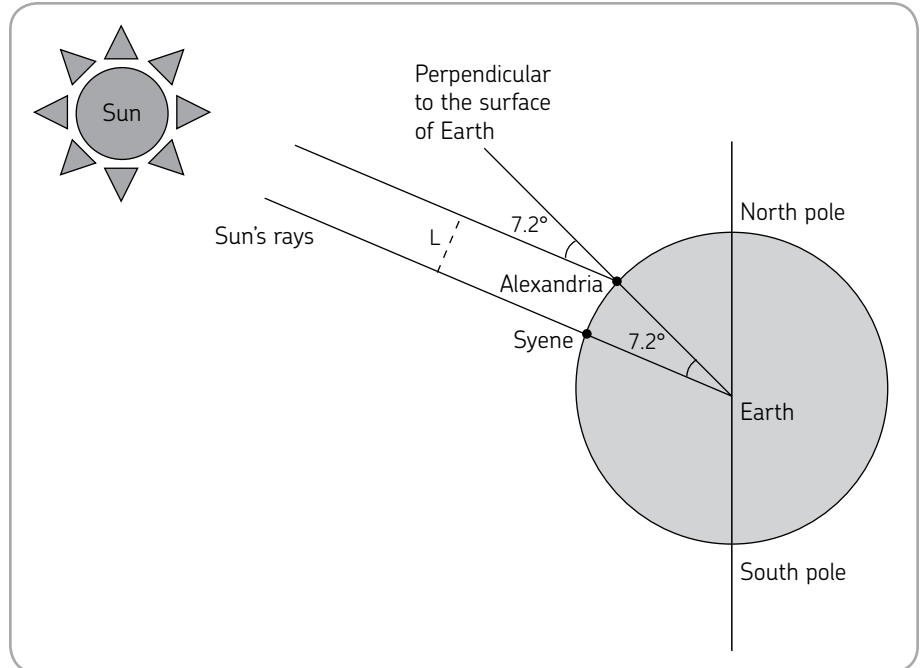
Eratosthenes also used his observations to try to measure the size of Earth. First, he measured the length of the rod's shadow. He calculated that in Alexandria at the same time on the same day, the Sun's rays arrived from a direction that was offset from the vertical by 7.2 degrees.

Next, he had a man walk from Alexandria to Syene and determined from the man's stride that the distance was 5,000 stadia (an ancient unit of measurement), or

approximately 925 km (575 miles). Then he used the following formula to determine the circumference of Earth.

$$575 \text{ miles (925 km)} \times \frac{360^\circ}{7.2^\circ} = 28,750 \text{ miles (46,250 km)}$$

Although we now know that the circumference of Earth is 40,000 km (24,855 miles), Eratosthenes' calculation is remarkably close.



*Eratosthenes' calculation method*

Another version of the story says that Eratosthenes got his idea by seeing the Sun's rays reach the bottom of a well rather than observing the shadow cast by a rod. Nevertheless, it is generally accepted that he calculated Earth's circumference as being approximately 25,000 miles, which is roughly accurate.

## IF EARTH IS ROUND, THE MOON MUST BE ROUND TOO

It is quite reasonable to suppose that scholars like Eratosthenes were not the only ones to realize that Earth was round. Certain phenomena—such as the fact that you cannot see beyond the horizon, or that the top of the sail always appears first when a ship is approaching—were obvious to people whose lives were closely related to the sea, and these occurrences are inconceivable on a flat surface.

Ancient Greece, where Eratosthenes lived, was a maritime nation bordered by the Ionian and Aegean Seas and located not far from the Mediterranean Sea. For that reason alone, many seafaring Greeks may have sensed that the world might be round.

On the other hand, when people with good eyesight observe light striking the Moon they should easily see that its surface is spherical rather than flat. For example, if you look at an enlarged photograph, there are clearly gradations at the outer edge and the waxing or waning border line. This wouldn't happen if the Moon were flat.

Now, let's return to the story of Kaguya-hime.

Japan is an island country, surrounded by the sea. This means that even in ancient times, some Japanese people probably recognized the existence of the curved horizon and from that concluded that Earth was round.

For example, when European missionaries traveled to Japan in the 16th century, they tried to introduce their scientific knowledge to the feudal lords they found there. One item they presented as a display of their knowledge was a globe. However, contrary to the expectations of the Europeans, most Japanese people did not show surprise at the suggestion that the world was a sphere.

The fact that Japanese people have gazed at and felt affection for the Moon since ancient times is also apparent from folklore, such as the story of the Moon Rabbit. And although Otsukimi (moon-viewing) festivals seem to have originated in China, the custom of appreciating the Moon is said to have existed in Japan since the *Jōmon* period (approximately 14,000 BC to 400 BC). Most likely, it would have been recognized then that the Moon was a sphere.

If Earth—like the Moon—is round and floats in space, then the idea that people should live on both Earth and the Moon is a natural conclusion. Therefore, it's not surprising that this idea appears in the tale of Kaguya-hime.



*The round Earth*



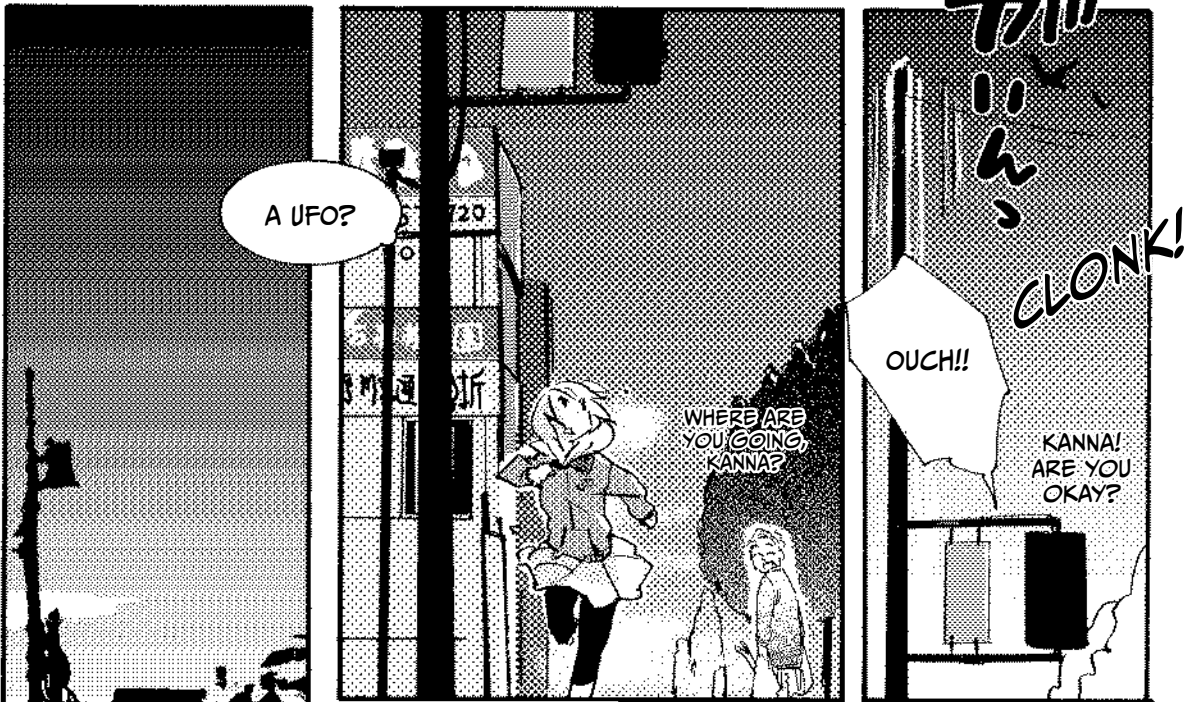
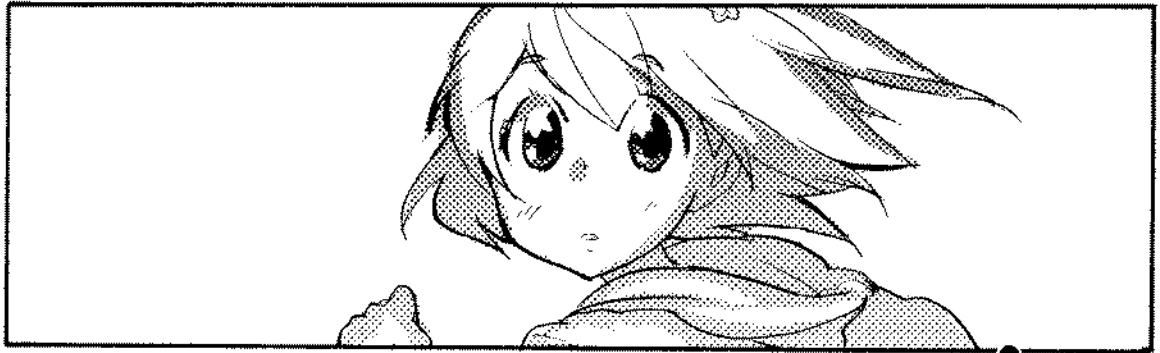
*The Moon has been appreciated by the Japanese since ancient times.*



**1**

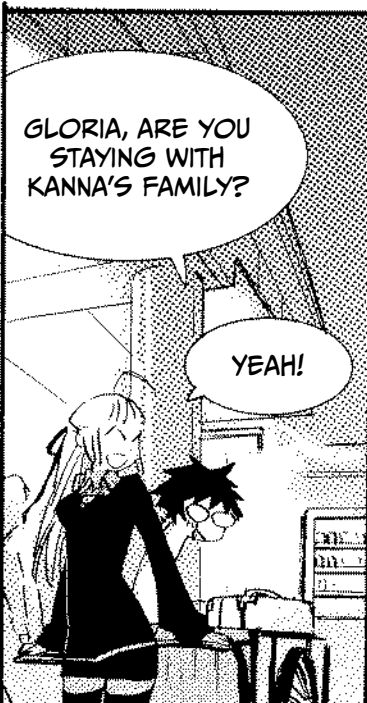
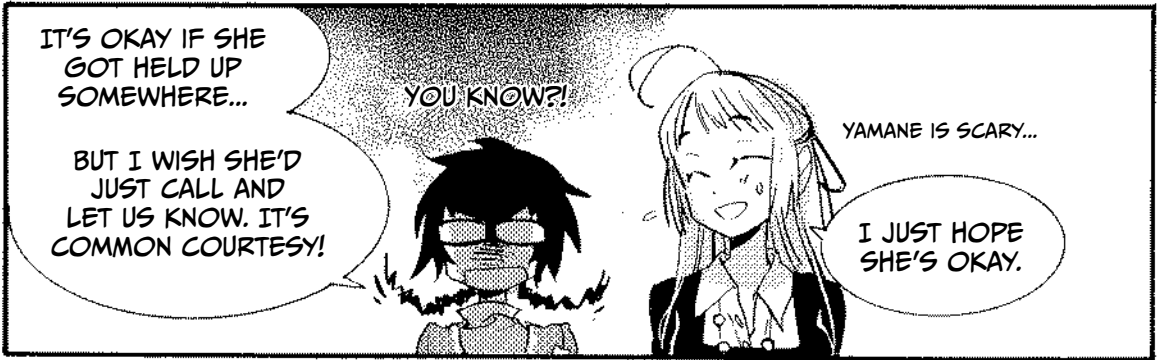
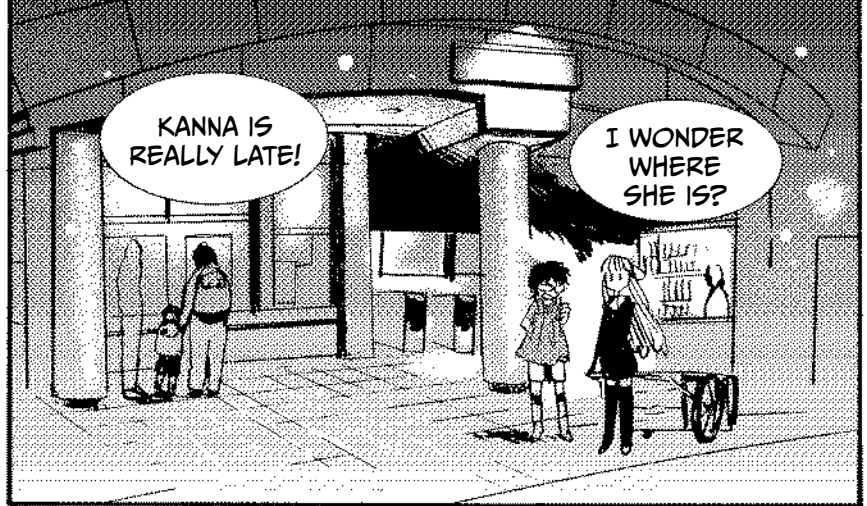
**IS EARTH THE CENTER  
OF THE UNIVERSE?**

A MYSTERIOUS LIGHT APPEARED IN THE SKY

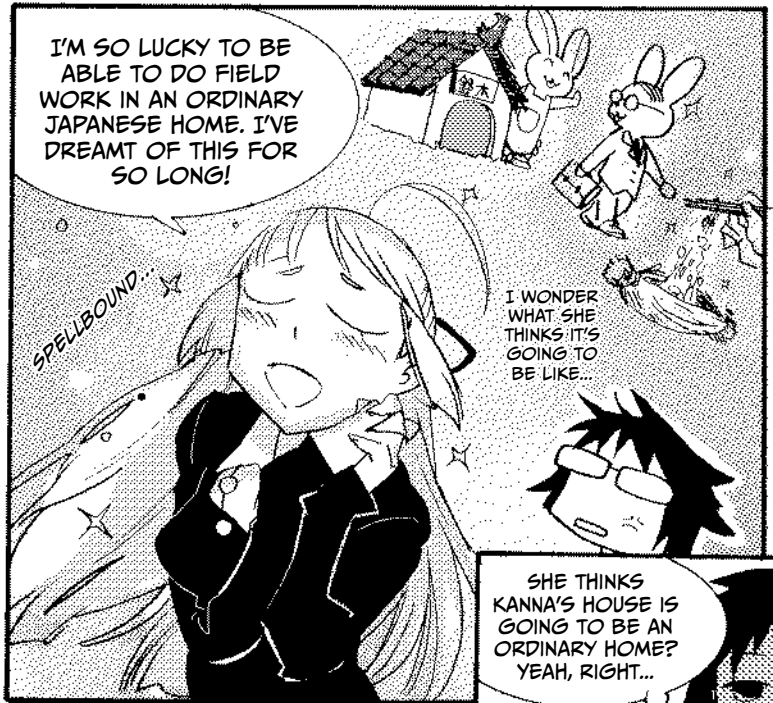


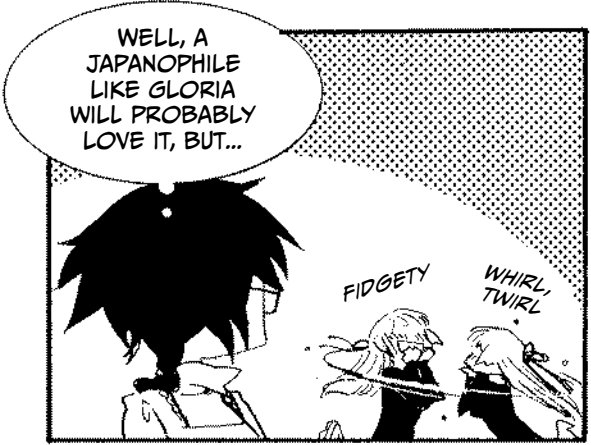
PIT PAT, PIT PAT





SHE'S CARRYING HER LUGGAGE IN A RICKSHAW?!





WELL, A JAPANOPHILE LIKE GLORIA WILL PROBABLY LOVE IT, BUT...

FIDGETY WHIRL TWIRL



THAT REMINDS ME. WHAT EXACTLY WERE YOU TWO TALKING ABOUT EARLIER?

YOU'LL SEE SOON ENOUGH!



YOU'LL FIND OUT WHEN WE GET TO HER HOUSE.

OH, SHE'S HERE!



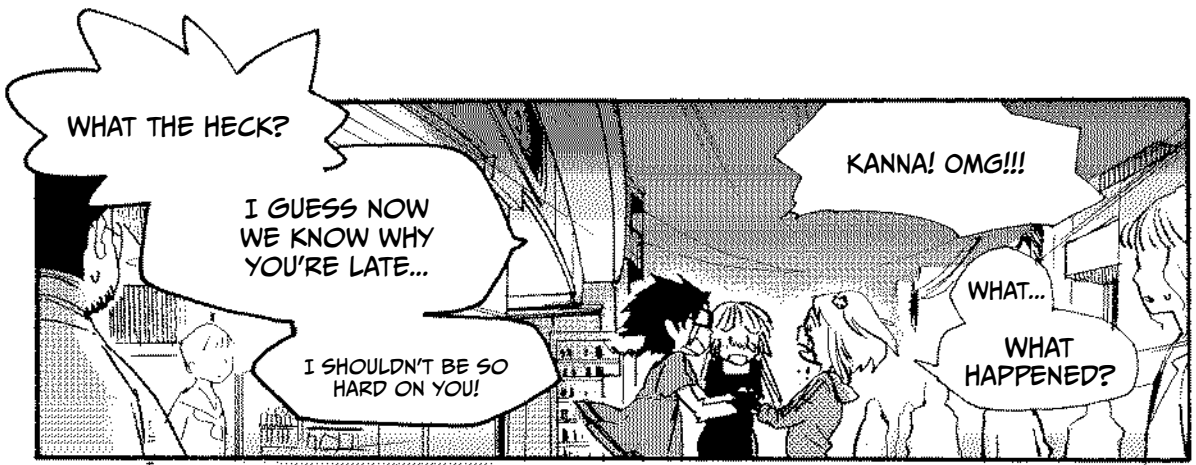
HEY!

KANNA! DO YOU HAVE ANY IDEA WHAT TIME IT IS?



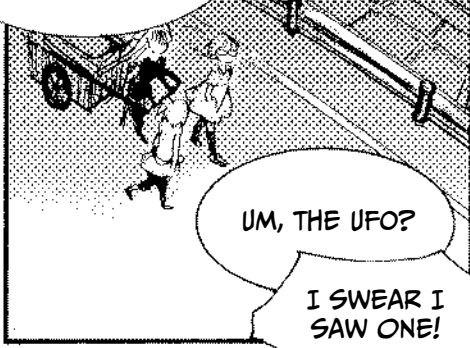
YOU WAITED FOR ME!

**YIKES!**



## CLOSE ENCOUNTERS

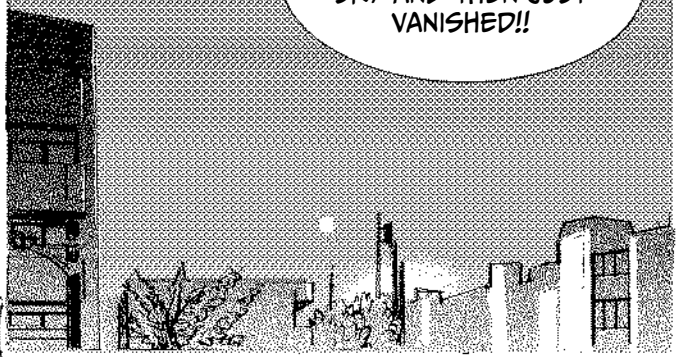
I GOT DISTRACTED BY THE UFO AND RAN INTO A POLE...



UM, THE UFO?

I SWEAR I SAW ONE!

A LITTLE WHILE AGO, BEFORE IT GOT DARK...

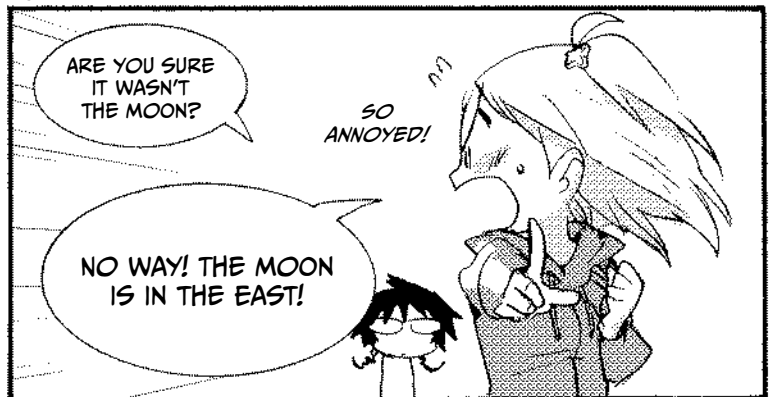


...IT APPEARED LOW IN THE WESTERN SKY AND THEN JUST VANISHED!!



BTW...

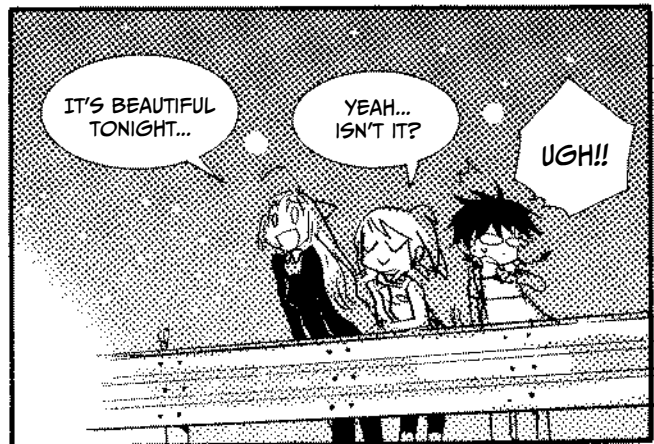
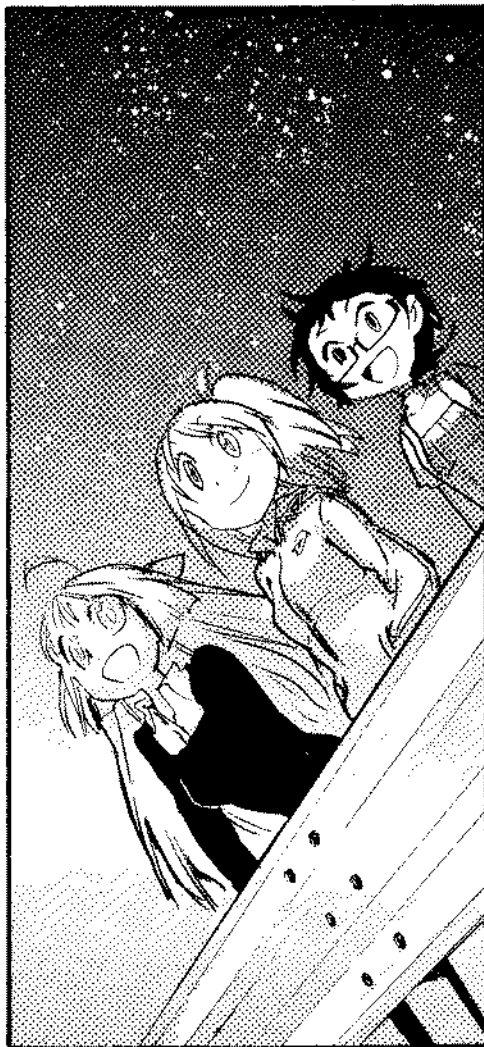
UFO STANDS FOR UNIDENTIFIED FLYING OBJECT.

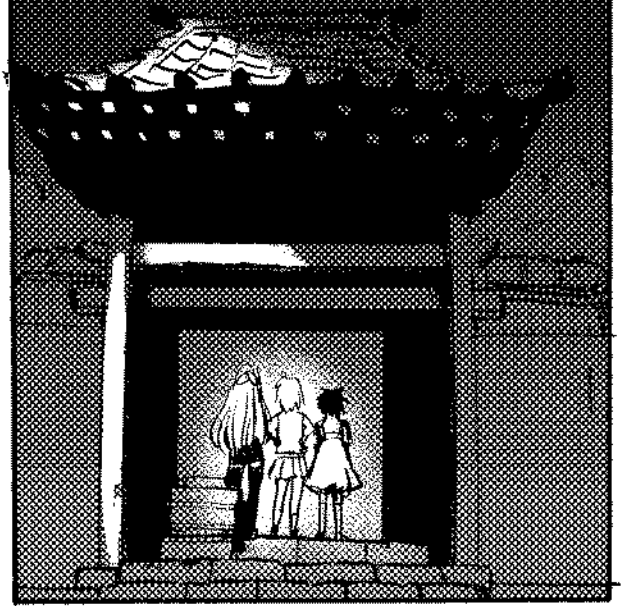
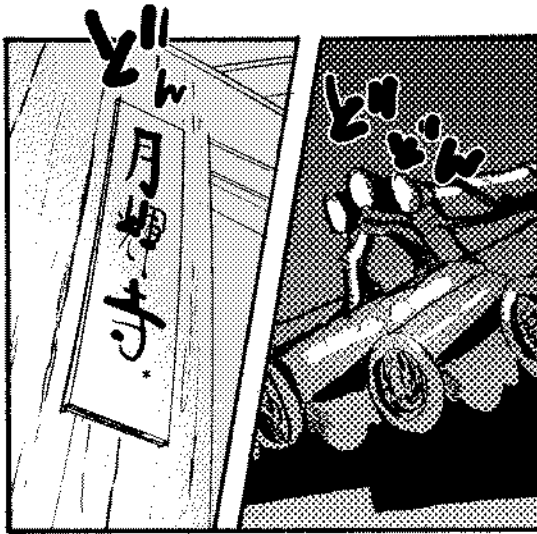


ARE YOU SURE IT WASN'T THE MOON?

SO ANNOYED!

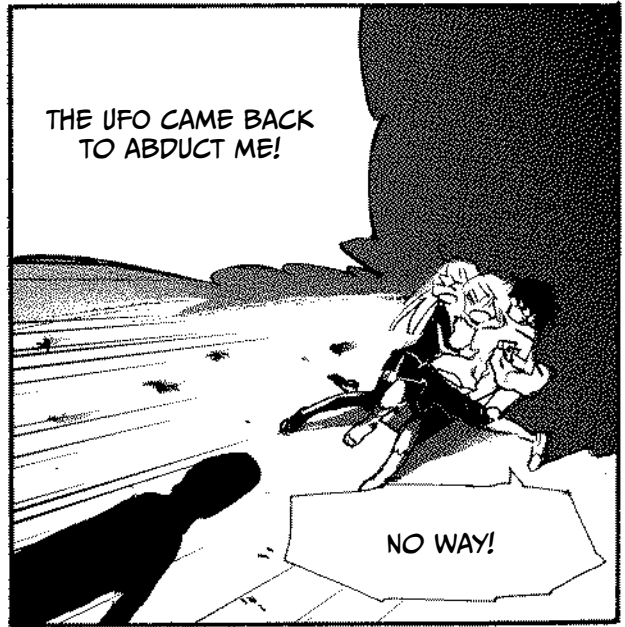
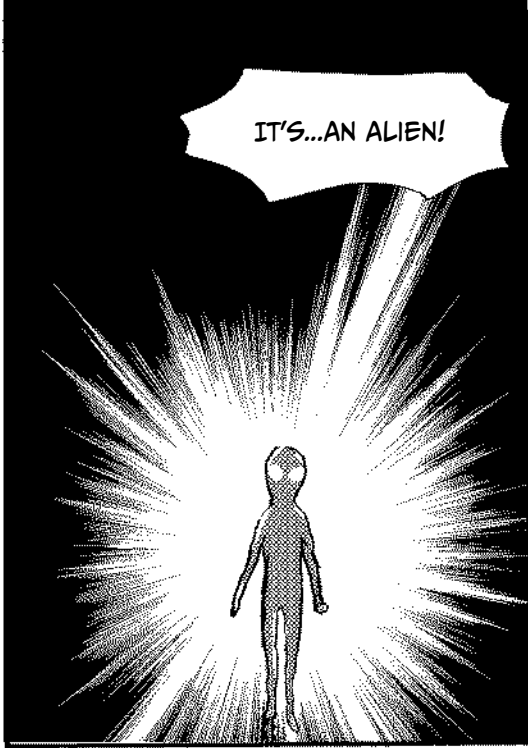
NO WAY! THE MOON IS IN THE EAST!

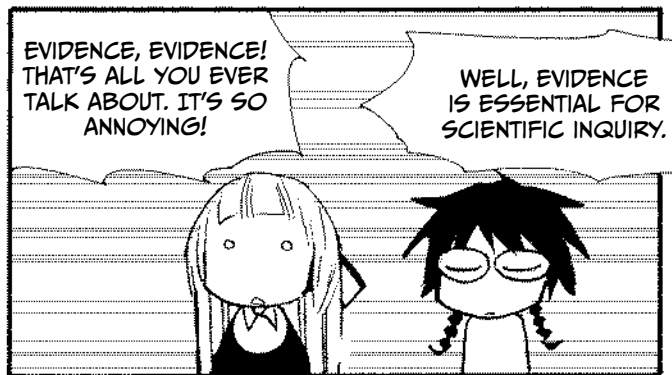
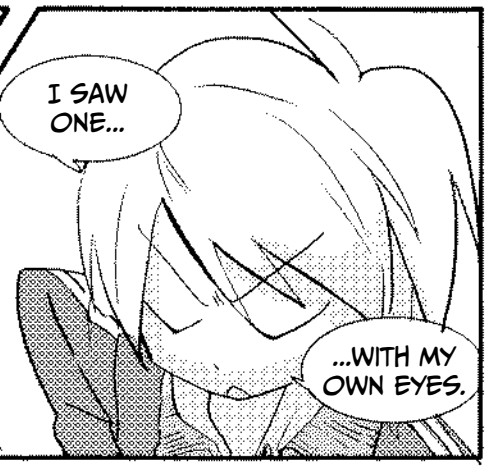
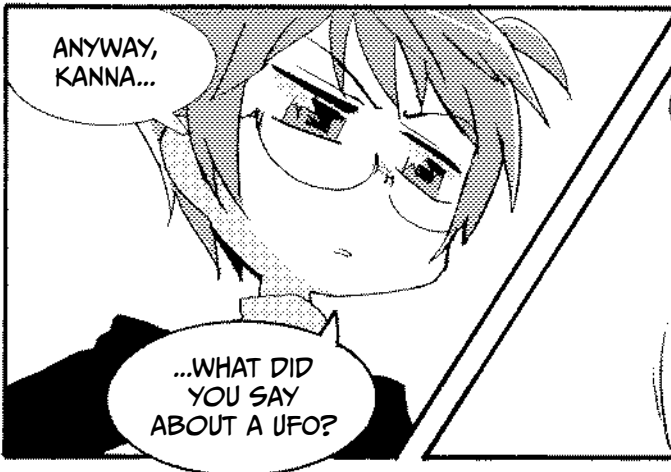
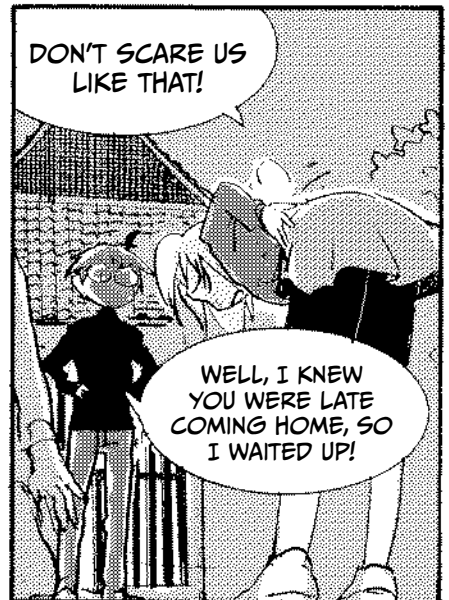
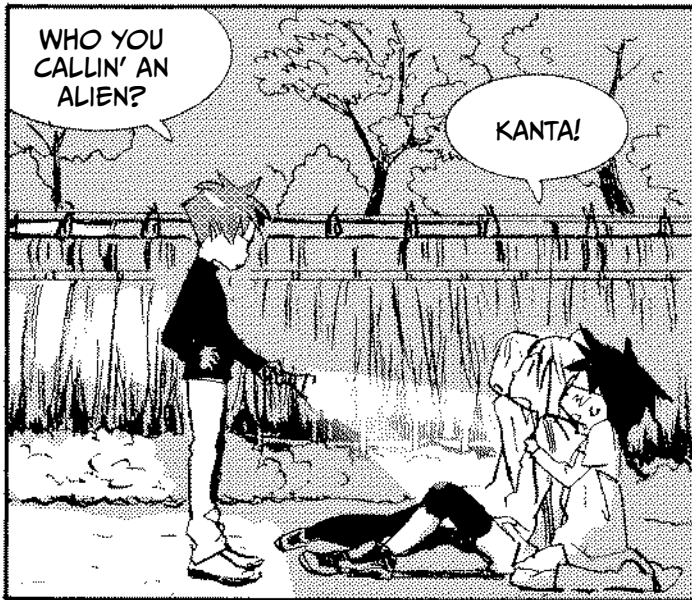


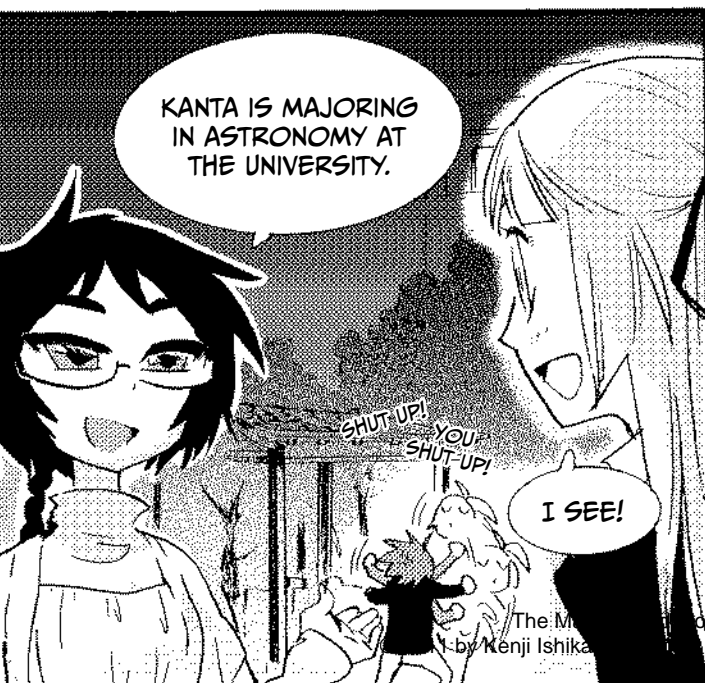
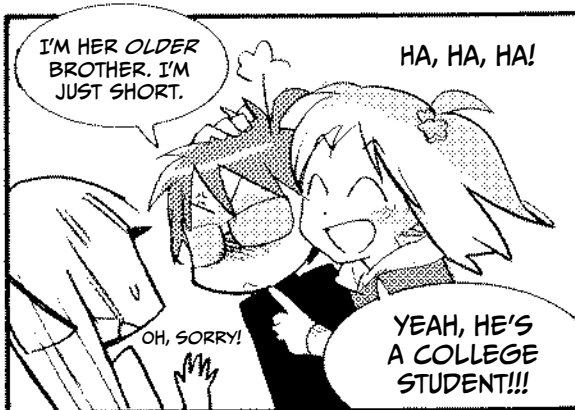
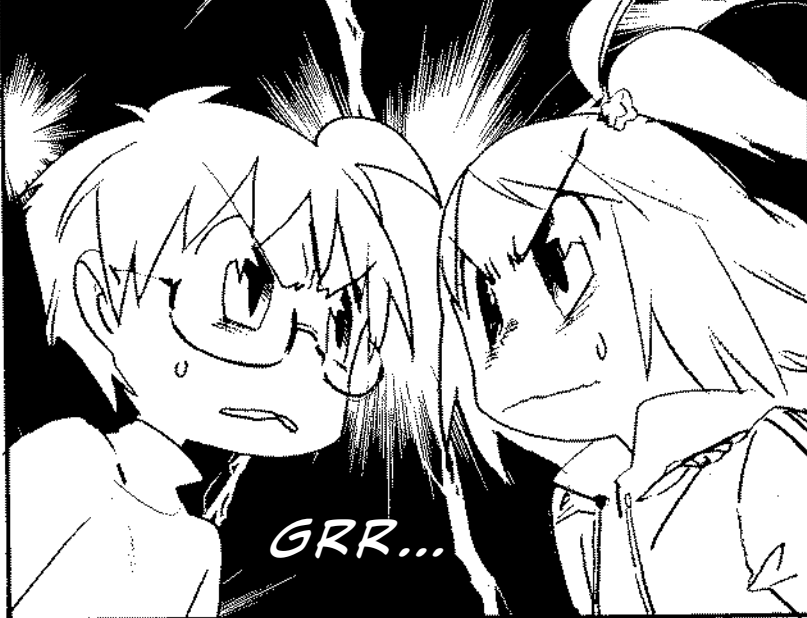


\* GEKKOJI: TEMPLE OF THE MOONLIGHT

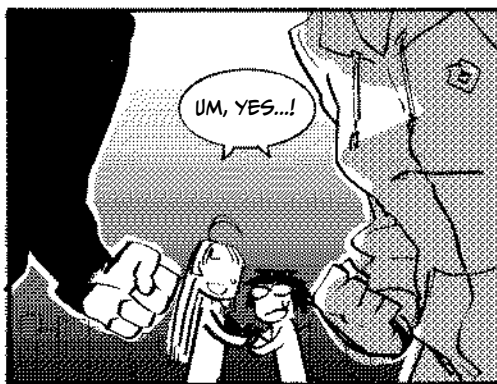
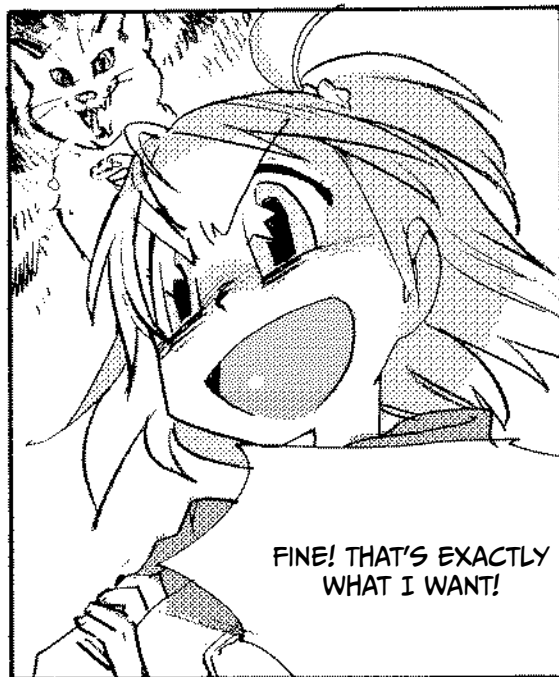
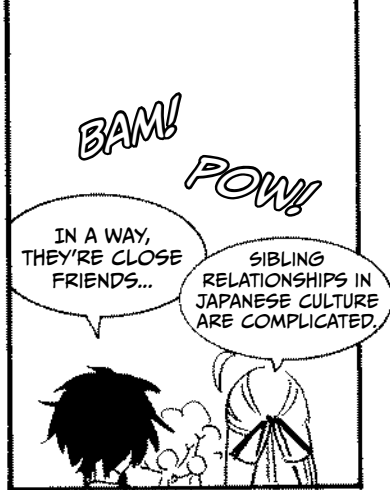
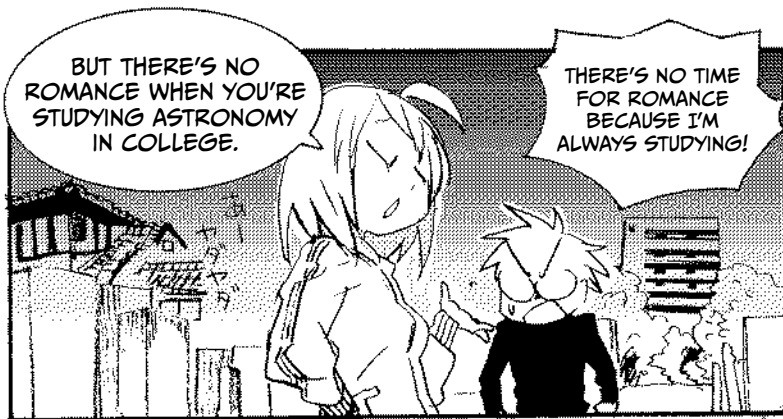




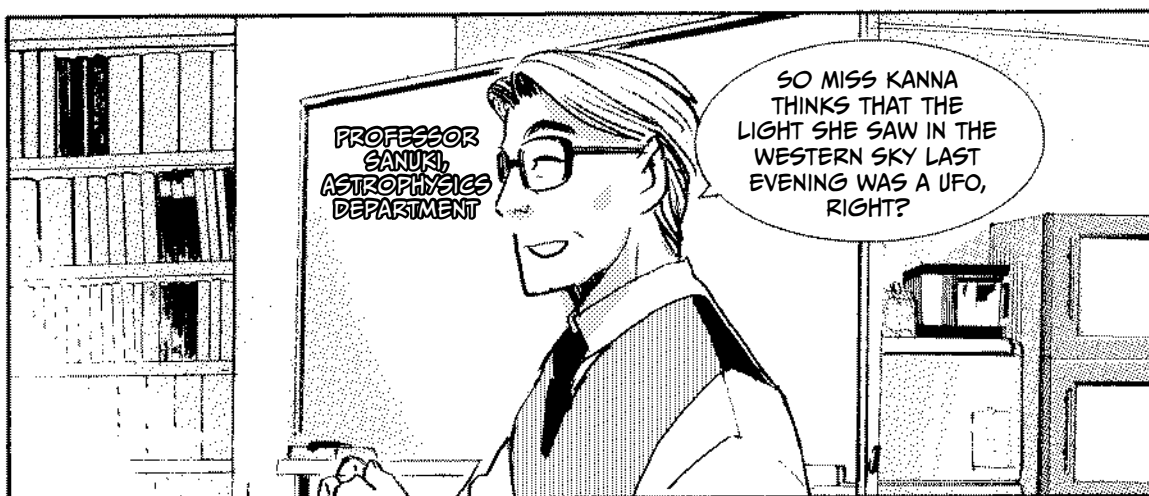
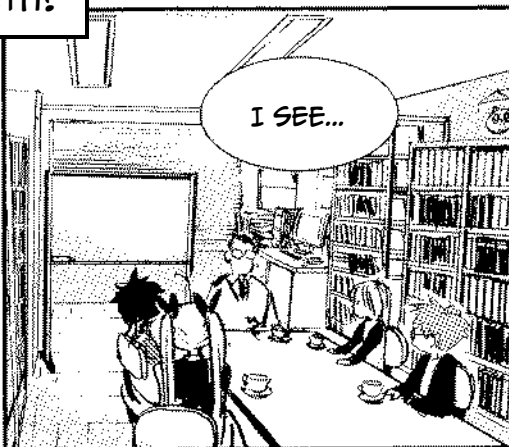








DOES THE SUN REVOLVE AROUND EARTH?

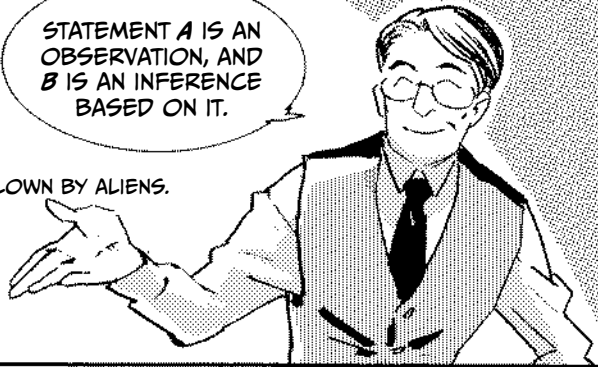


A: A SHINING LIGHT WAS VISIBLE AT A LOW POSITION IN THE WESTERN SKY AT APPROXIMATELY 5:30 IN THE EVENING.



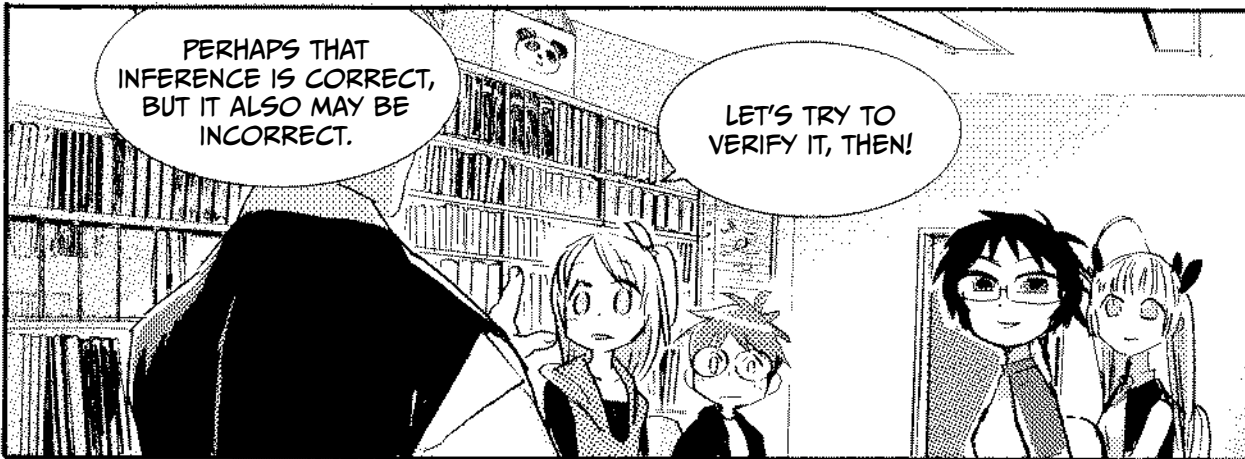
STATEMENT A IS AN OBSERVATION, AND B IS AN INFERENCE BASED ON IT.

B: THAT SHINING LIGHT IS A UFO BEING FLOWN BY ALIENS.



PERHAPS THAT INFERENCE IS CORRECT, BUT IT ALSO MAY BE INCORRECT.

LET'S TRY TO VERIFY IT, THEN!

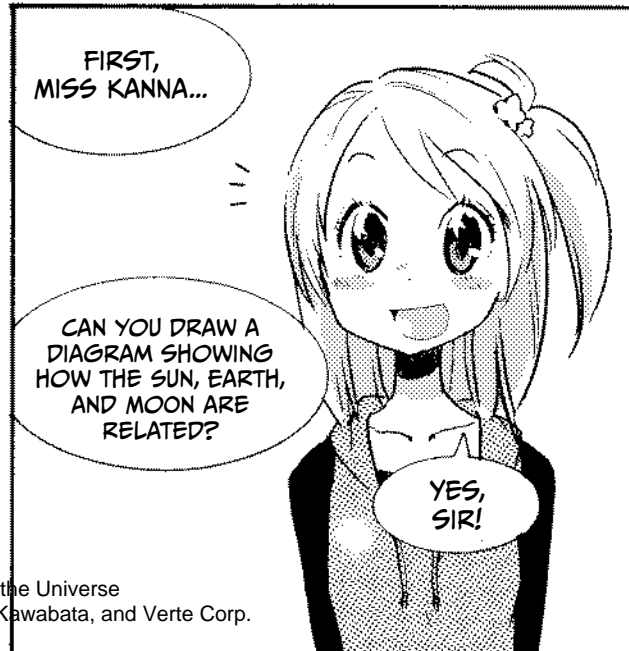


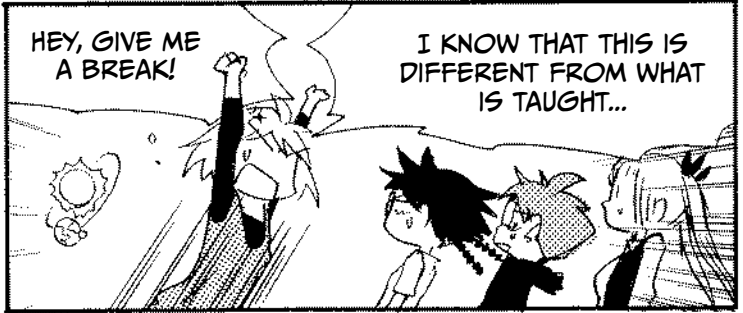
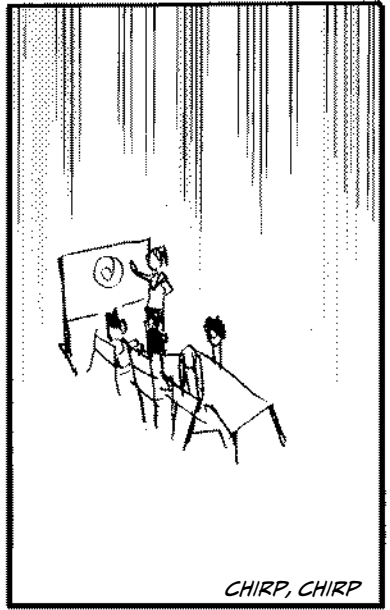
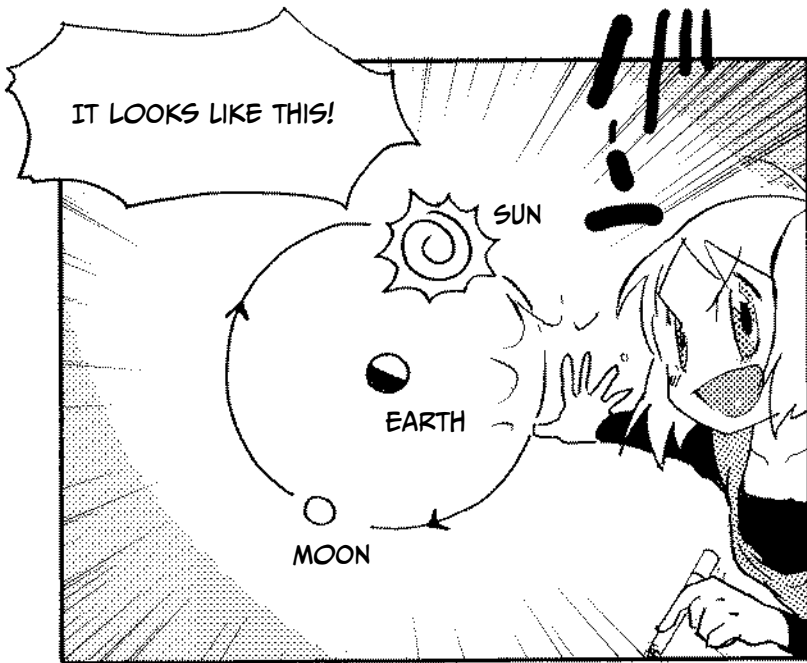
HE'S REALLY SWEET TO HELP US LIKE THIS.

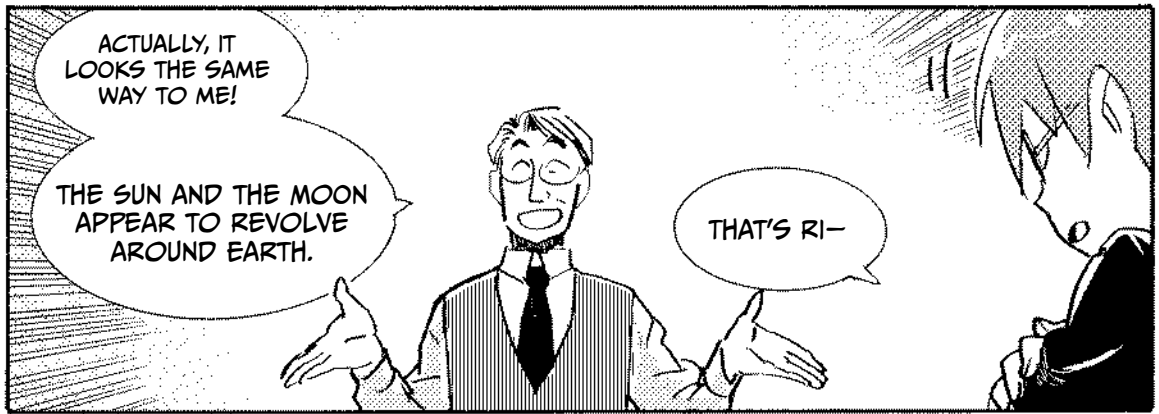
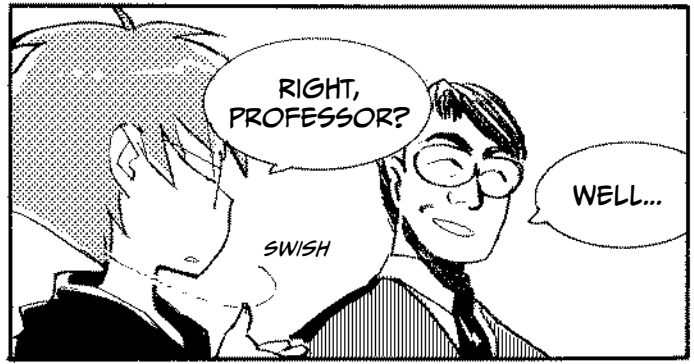
FIRST, MISS KANNA...

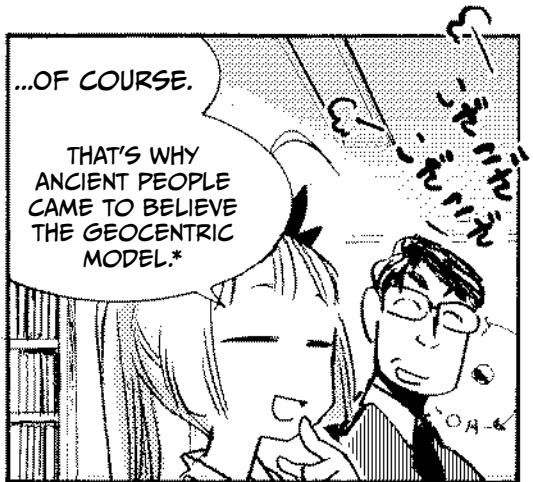
CAN YOU DRAW A DIAGRAM SHOWING HOW THE SUN, EARTH, AND MOON ARE RELATED?

YES, SIR!

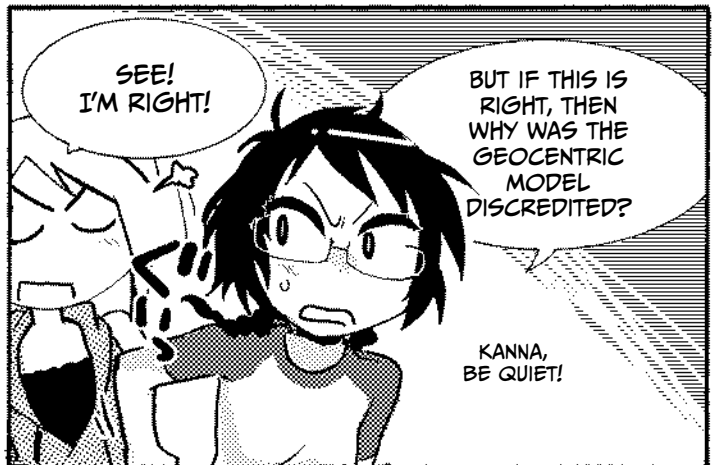
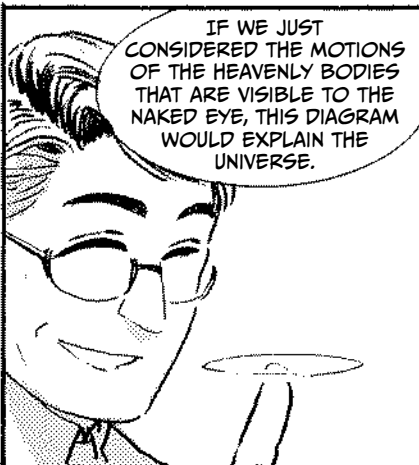
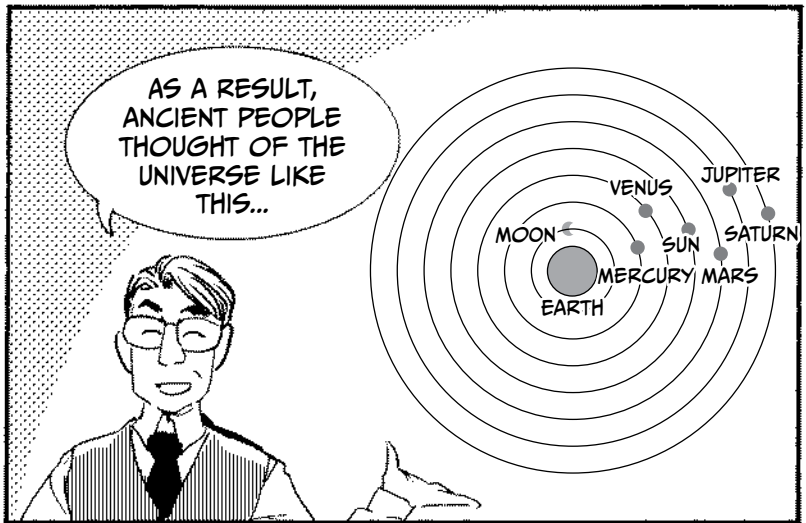
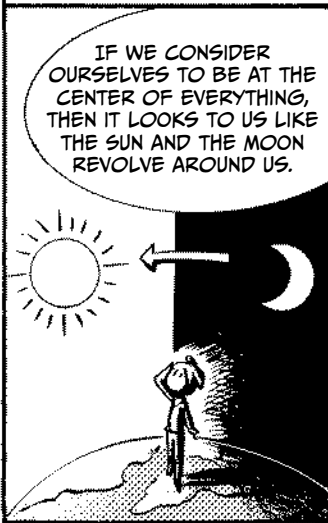


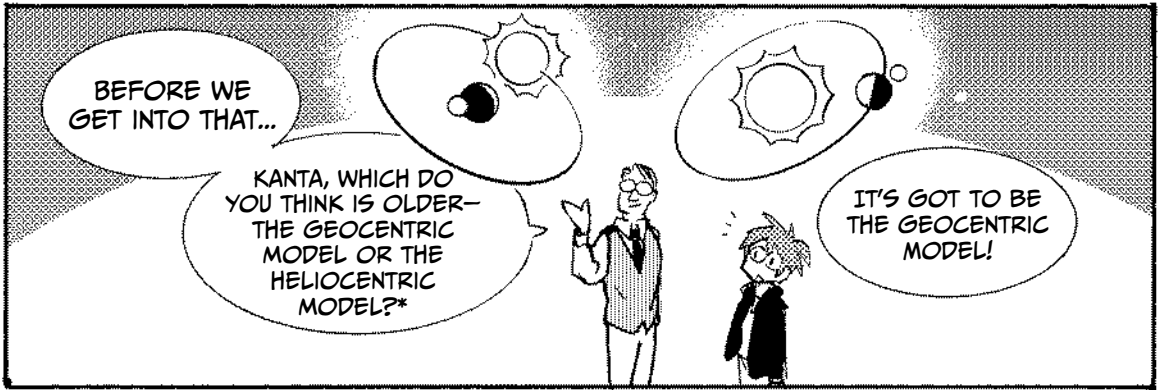






\* A MODEL OF OUR PLANETARY SYSTEM WITH EARTH AT ITS CENTER, LIKE THE ONE KANNA DREW, IS CALLED *GEOCENTRIC*.



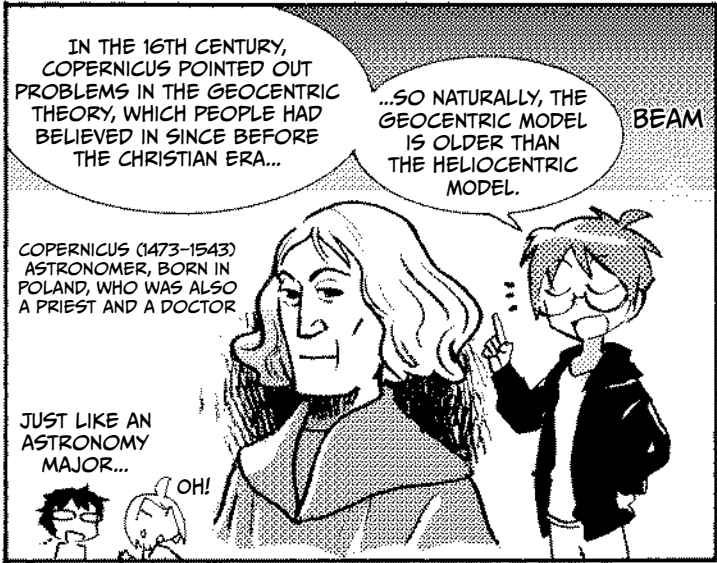


BEFORE WE GET INTO THAT...

KANTA, WHICH DO YOU THINK IS OLDER—THE GEOCENTRIC MODEL OR THE HELIOCENTRIC MODEL?\*

IT'S GOT TO BE THE GEOCENTRIC MODEL!

\* A HELIOCENTRIC MODEL OF OUR PLANETARY SYSTEM HAS THE SUN AT ITS CENTER.



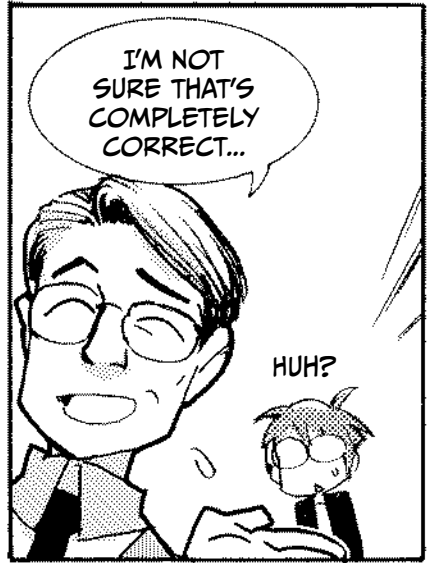
IN THE 16TH CENTURY, COPERNICUS POINTED OUT PROBLEMS IN THE GEOCENTRIC THEORY, WHICH PEOPLE HAD BELIEVED IN SINCE BEFORE THE CHRISTIAN ERA...

...SO NATURALLY, THE GEOCENTRIC MODEL IS OLDER THAN THE HELIOCENTRIC MODEL.

BEAM

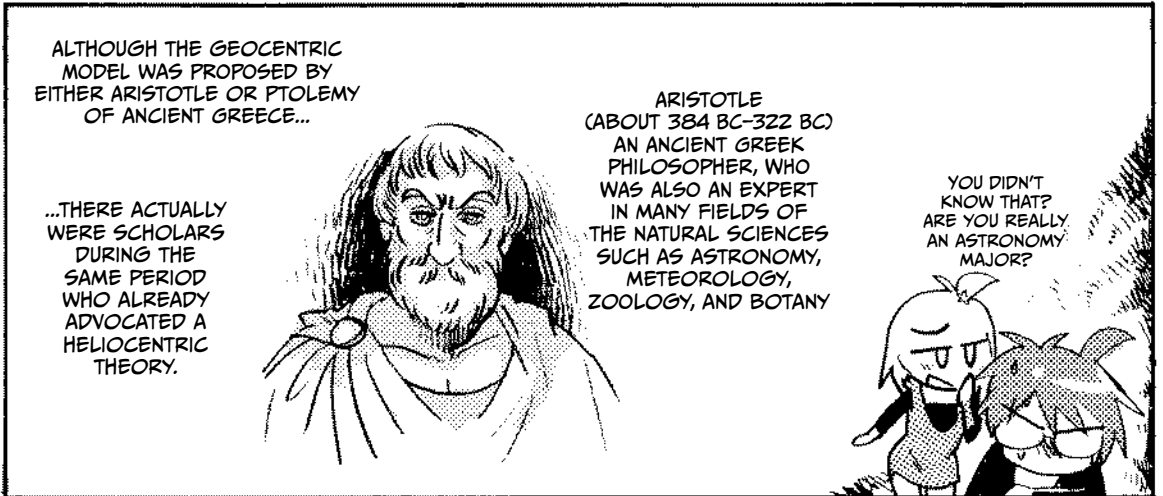
COPERNICUS (1473-1543) ASTRONOMER, BORN IN POLAND, WHO WAS ALSO A PRIEST AND A DOCTOR

JUST LIKE AN ASTRONOMY MAJOR... OH!



I'M NOT SURE THAT'S COMPLETELY CORRECT...

HUH?



ALTHOUGH THE GEOCENTRIC MODEL WAS PROPOSED BY EITHER ARISTOTLE OR PTOLEMY OF ANCIENT GREECE...

...THERE ACTUALLY WERE SCHOLARS DURING THE SAME PERIOD WHO ALREADY ADVOCATED A HELIOCENTRIC THEORY.

ARISTOTLE (ABOUT 384 BC-322 BC) AN ANCIENT GREEK PHILOSOPHER, WHO WAS ALSO AN EXPERT IN MANY FIELDS OF THE NATURAL SCIENCES SUCH AS ASTRONOMY, METEOROLOGY, ZOOLOGY, AND BOTANY

YOU DIDN'T KNOW THAT? ARE YOU REALLY AN ASTRONOMY MAJOR?

# A HELIOCENTRIC MODEL WAS PROPOSED 2,300 YEARS AGO

THE GREEK SCHOLAR ARISTARCHUS, WHO WAS BORN IN THE THIRD CENTURY BC (THE ERA AFTER ARISTOTLE), FIRST TRIED TO EXPLAIN THE UNIVERSE WITH A GEOCENTRIC THEORY.

HOWEVER, AS HE CONTINUED TO MAKE OBSERVATIONS, THIS THEORY SEEMED TO HAVE ONE PROBLEM...



ARISTARCHUS (ABOUT 310-230 BC)  
ANCIENT GREEK ASTRONOMER AND  
MATHEMATICIAN



HE NOTICED THAT THE WAXING AND WANING OF THE MOON OCCURRED BECAUSE OF THE ANGLE OF THE LIGHT FROM THE SUN.



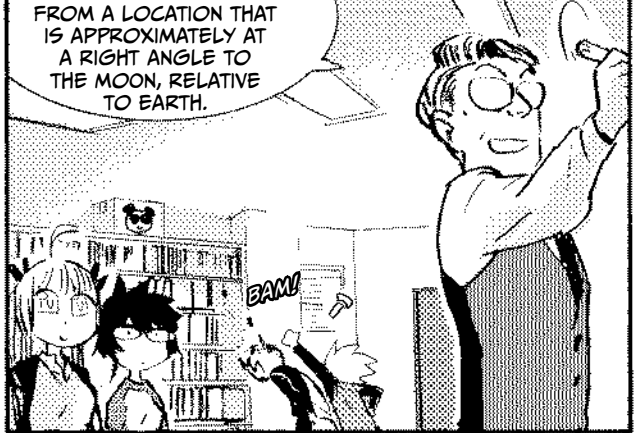
WHAT DO YOU MEAN?

LIKE THIS!!!

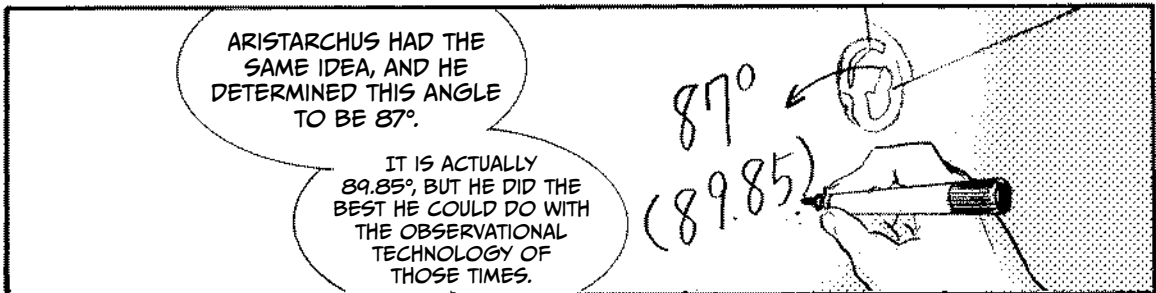
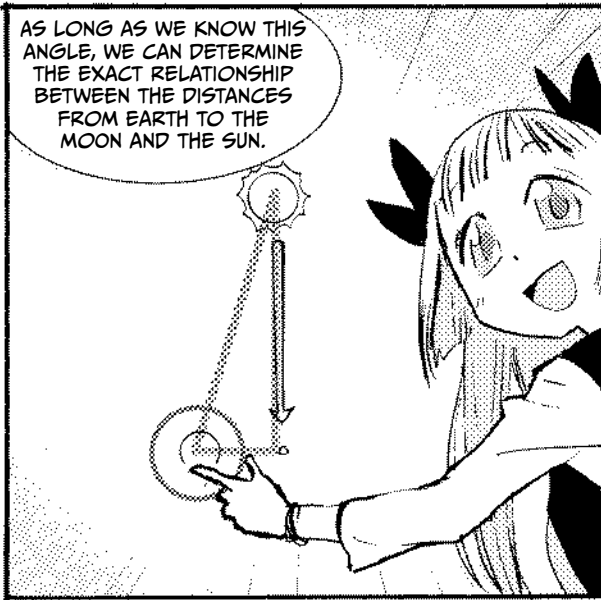
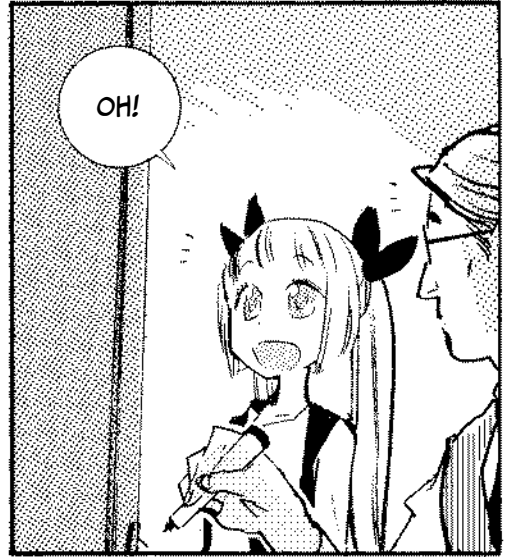
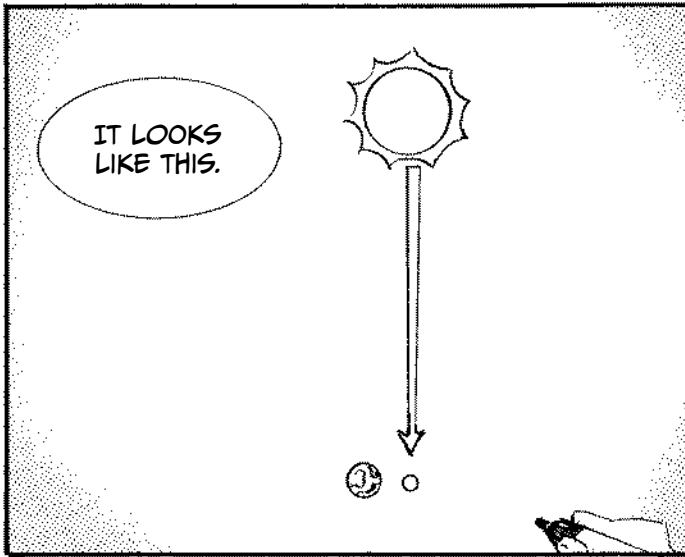
STOP IT!

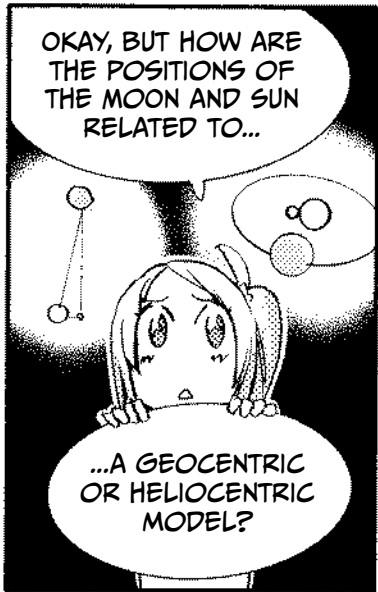


FOR EXAMPLE, WHEN THERE IS A HALF MOON, THE SUN IS SHINING FROM A LOCATION THAT IS APPROXIMATELY AT A RIGHT ANGLE TO THE MOON, RELATIVE TO EARTH.









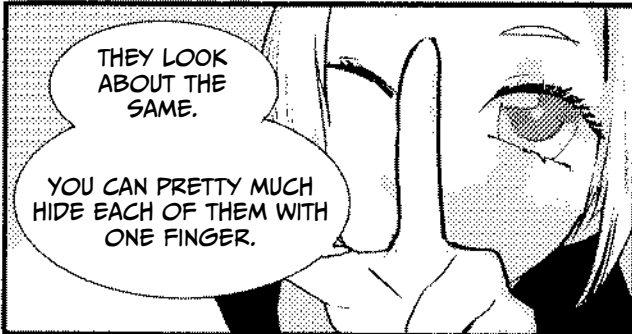
OKAY, BUT HOW ARE THE POSITIONS OF THE MOON AND SUN RELATED TO...

...A GEOCENTRIC OR HELIOCENTRIC MODEL?



LET'S TAKE IT ONE STEP AT A TIME...

HOW DIFFERENT IN SIZE DO THE SUN AND MOON APPEAR TO BE?



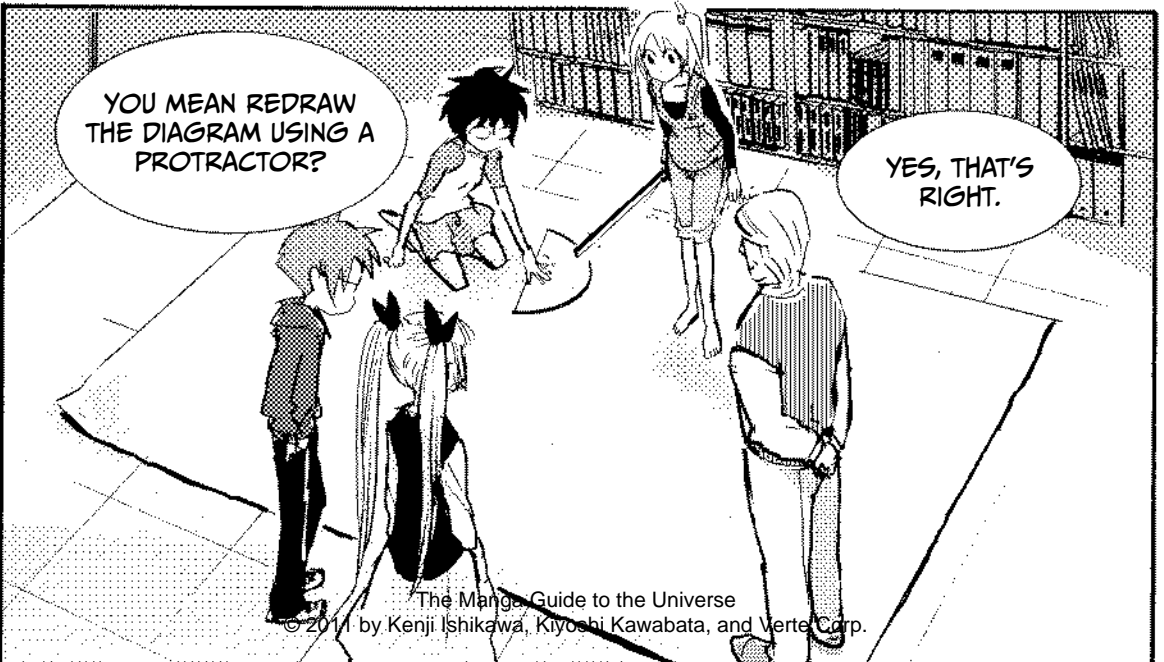
THEY LOOK ABOUT THE SAME.

YOU CAN PRETTY MUCH HIDE EACH OF THEM WITH ONE FINGER.



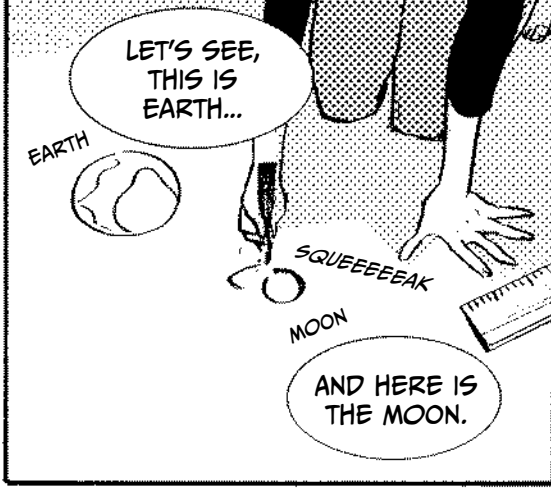
THAT'S RIGHT. THEY BOTH APPEAR TO BE APPROXIMATELY THE SAME SIZE, FROM OUR PERSPECTIVE.

BASED ON THIS FACT, LETS MAKE OUR DIAGRAM A BIT MORE ACCURATE.



YOU MEAN REDRAW THE DIAGRAM USING A PROTRACTOR?

YES, THAT'S RIGHT.



LET'S SEE, THIS IS EARTH...

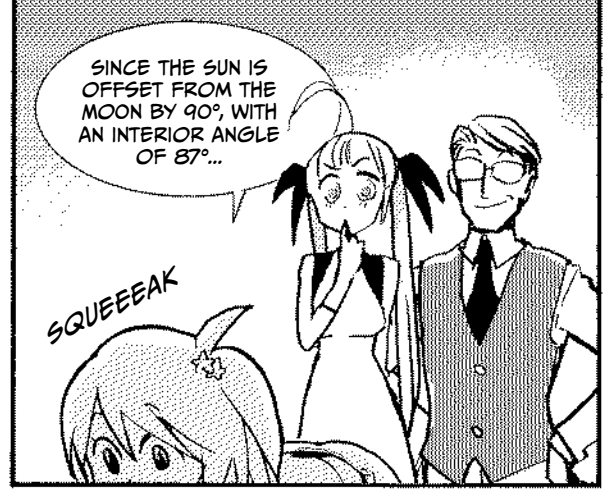
EARTH



SQUEEEEEK

MOON

AND HERE IS THE MOON.

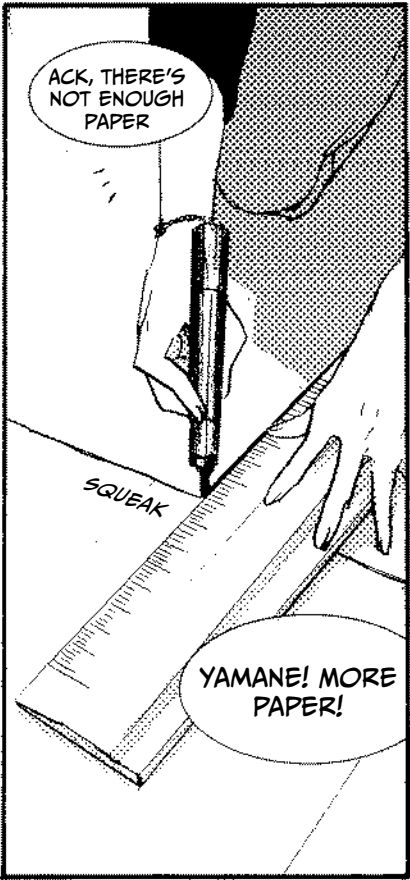


SINCE THE SUN IS OFFSET FROM THE MOON BY 90°, WITH AN INTERIOR ANGLE OF 87°...

SQUEEEEEK



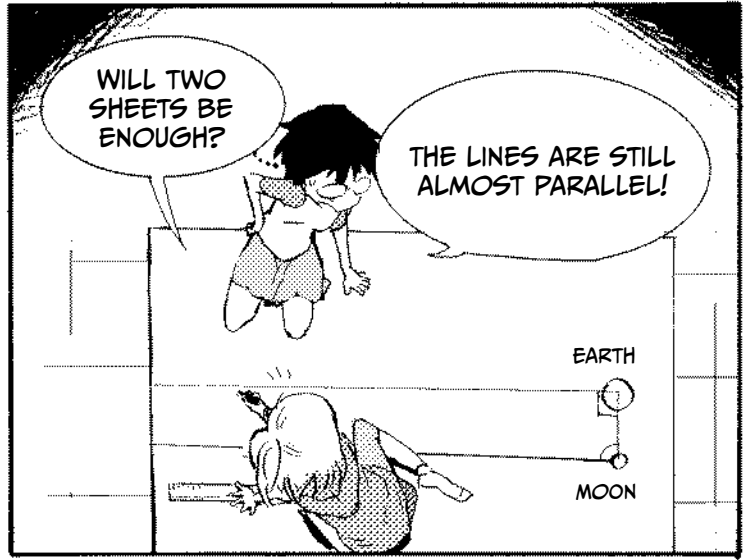
HUH?



ACK, THERE'S NOT ENOUGH PAPER

SQUEAK

YAMANE! MORE PAPER!



WILL TWO SHEETS BE ENOUGH?

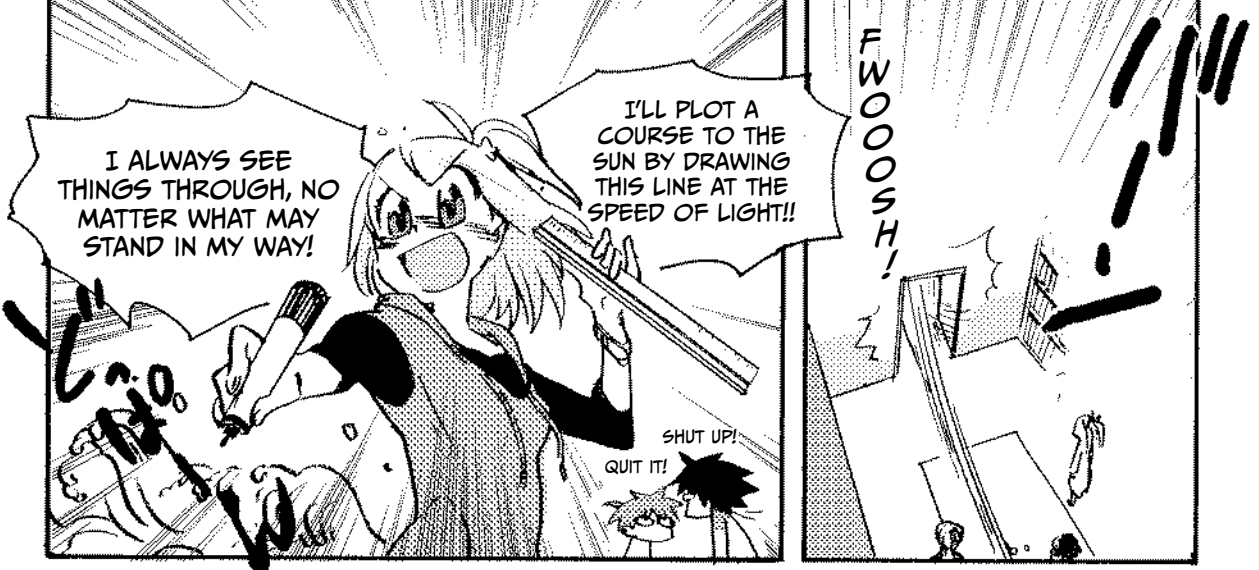
THE LINES ARE STILL ALMOST PARALLEL!

EARTH

MOON



WHAT'S THE MATTER?

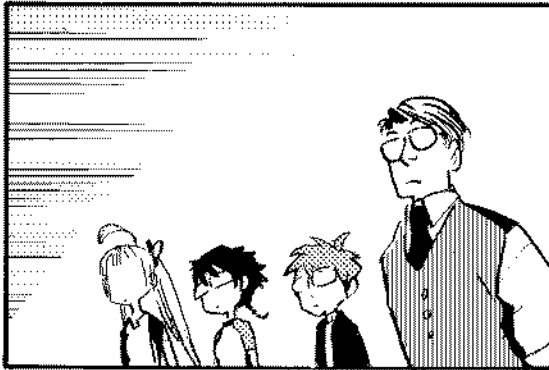


I ALWAYS SEE THINGS THROUGH, NO MATTER WHAT MAY STAND IN MY WAY!

I'LL PLOT A COURSE TO THE SUN BY DRAWING THIS LINE AT THE SPEED OF LIGHT!!

FWOOSH!

SHUT UP!  
QUIT IT!



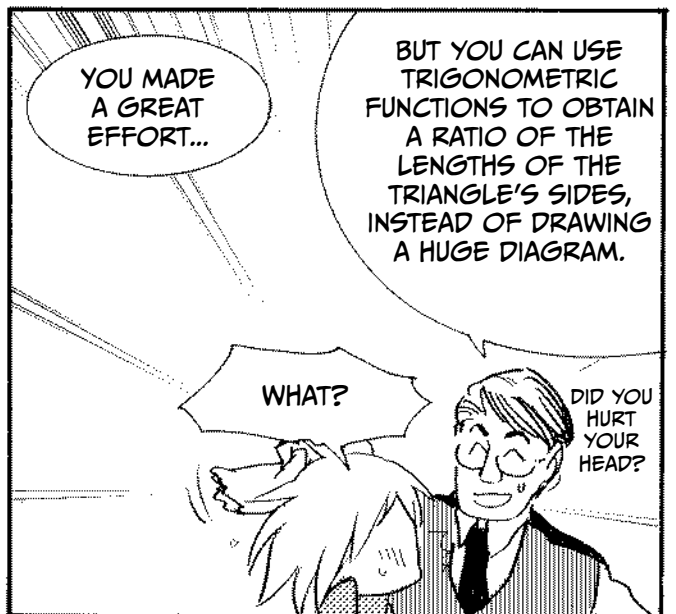
BUMP  
BUMP  
BUMP  
CRASH!



REPORTING IN, SIR!

I ENCOUNTERED A STAIRCASE ALONG THE WAY, SO I DIDN'T MAKE IT ALL THE WAY TO THE SUN. MISSION ABORTED, SIR.

WELL, NOW YOU SHOULD CLEAN UP THE MARKER YOU DREW EVERYWHERE.

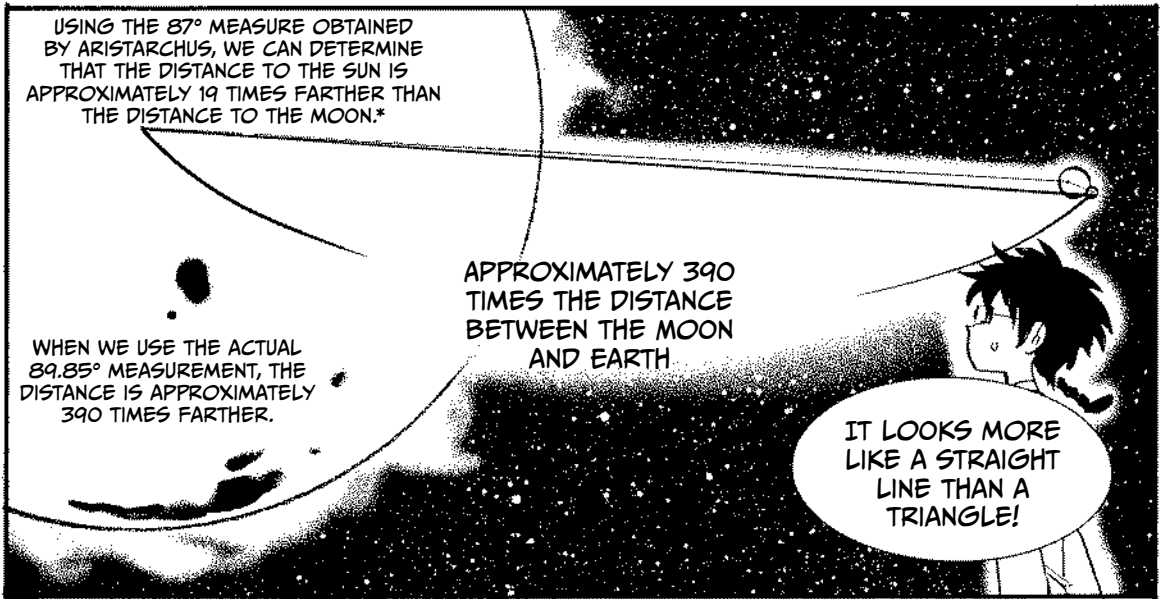


YOU MADE A GREAT EFFORT...

BUT YOU CAN USE TRIGONOMETRIC FUNCTIONS TO OBTAIN A RATIO OF THE LENGTHS OF THE TRIANGLE'S SIDES, INSTEAD OF DRAWING A HUGE DIAGRAM.

WHAT?

DID YOU HURT YOUR HEAD?



\* THE TANGENT FUNCTION DESCRIBES THE RATIO OF OPPOSITE-TO-ADJACENT SIDES OF A RIGHT TRIANGLE ( $\tan 87^\circ = 19$ ).

