

GLASS

STORIES COMICS

OPTICAL FIBER

3



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Glass Stories Comics

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EDITORIAL

HI, HOW ARE YOU?

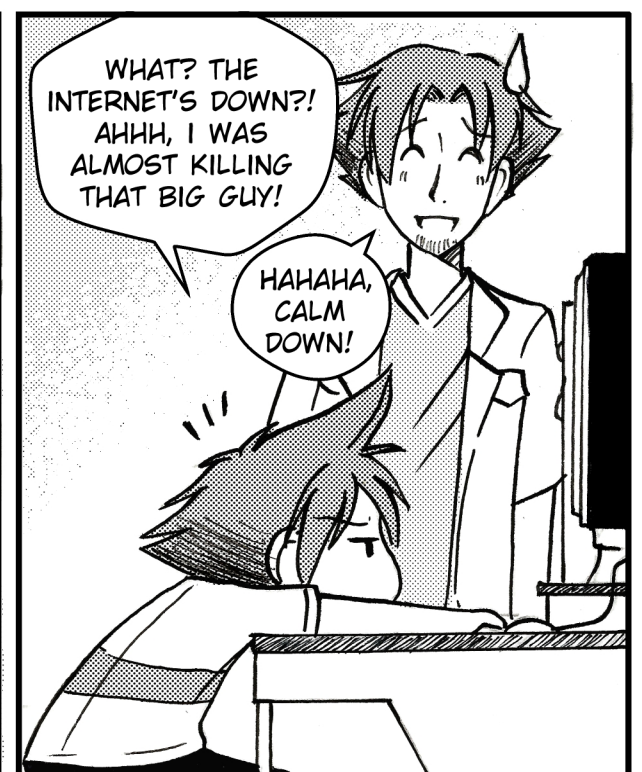
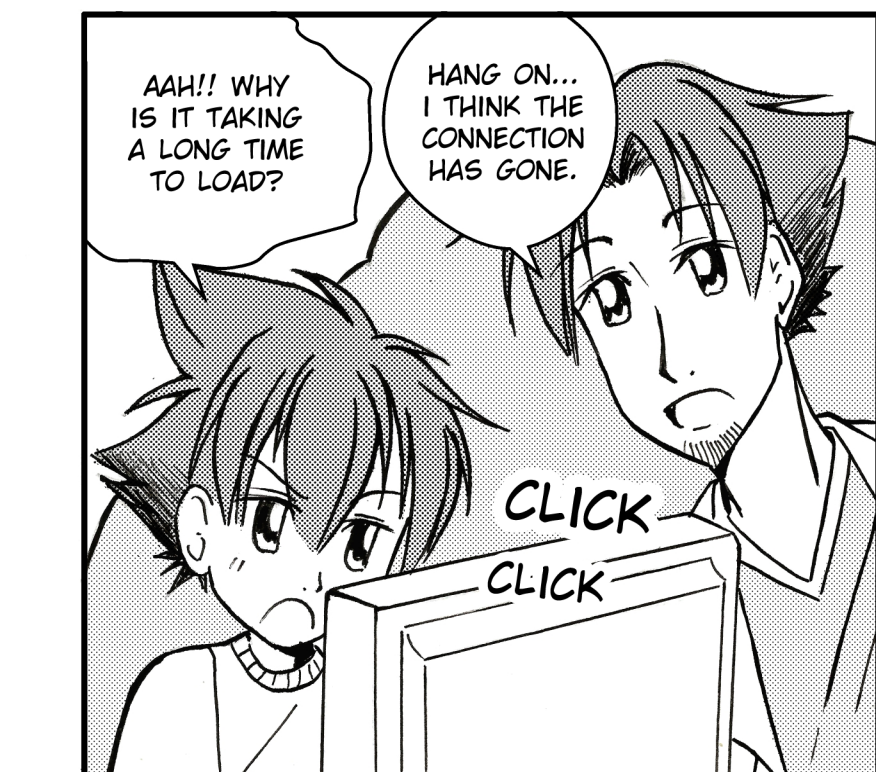
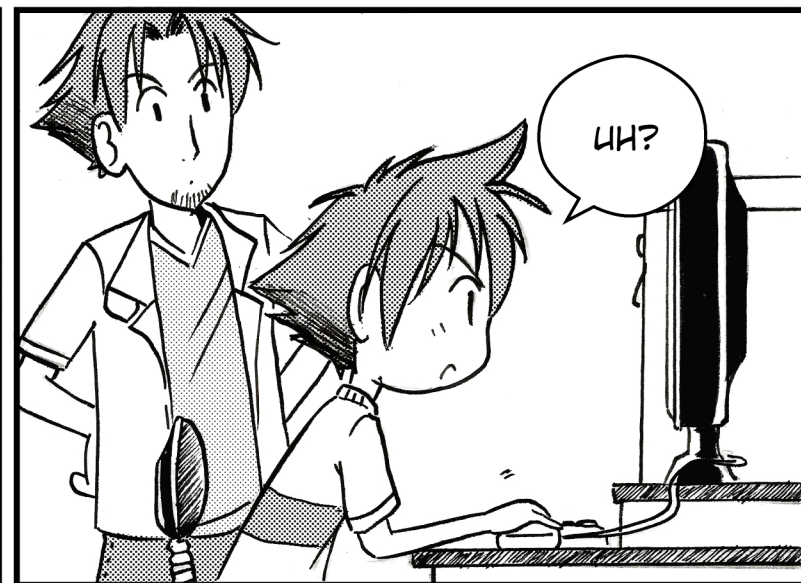
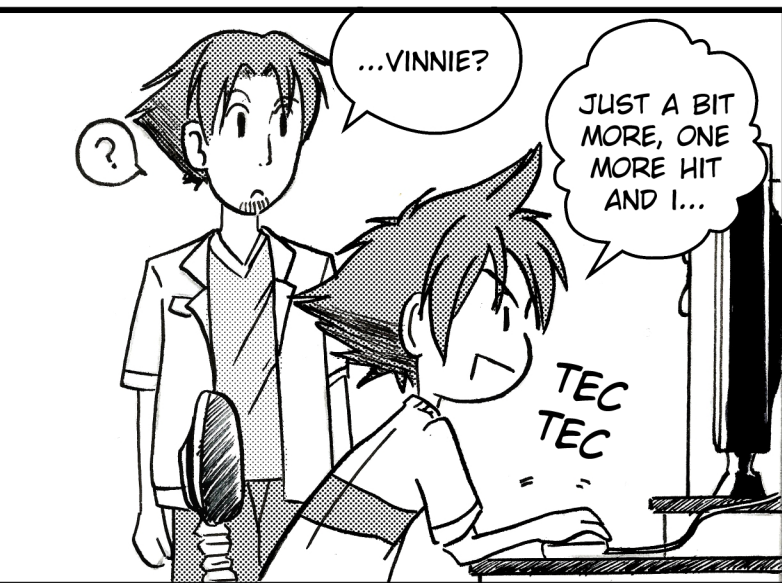
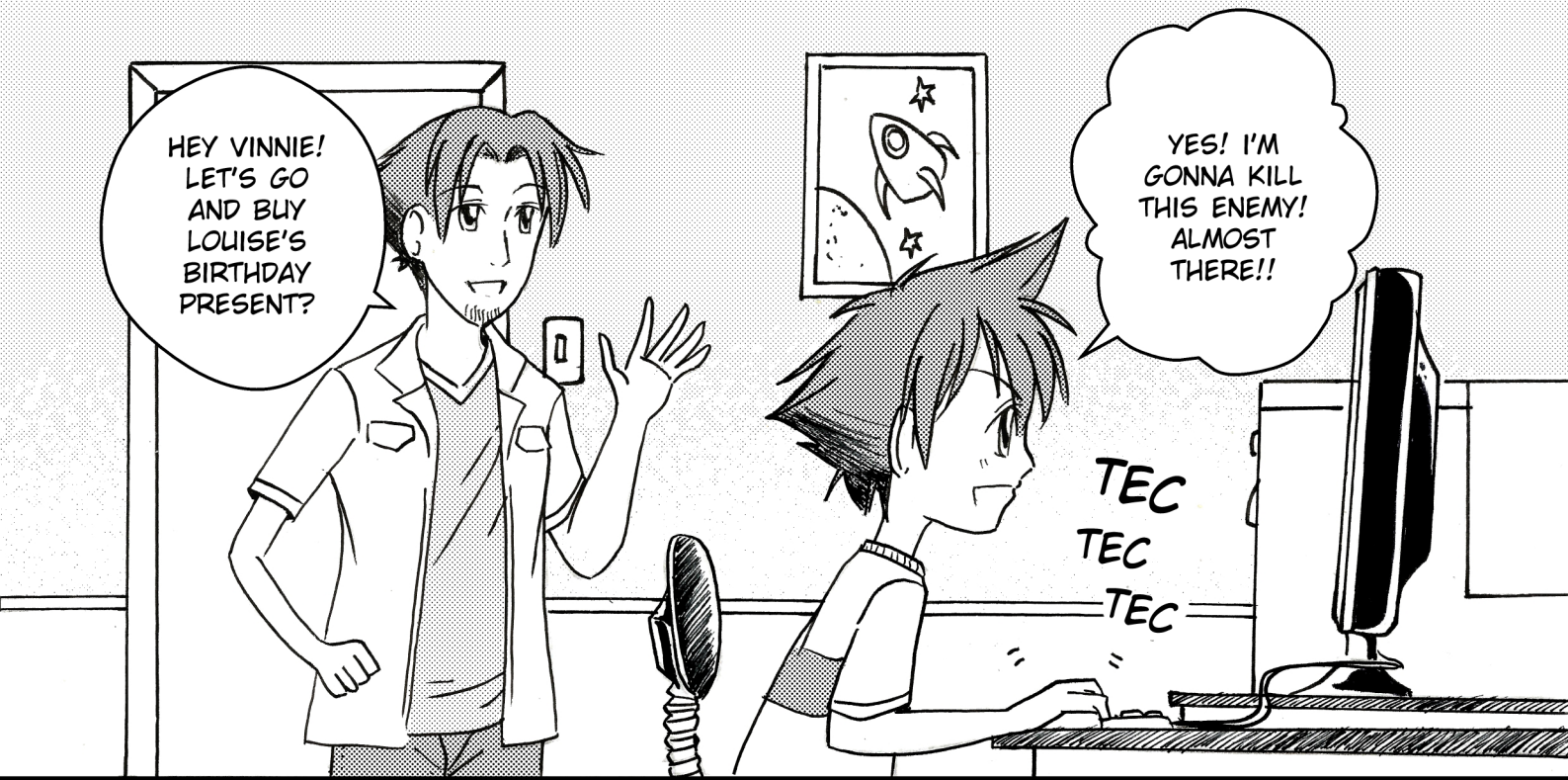
WE'RE BACK WITH THE THIRD ISSUE OF THE SERIES "GLASS STORIES"!

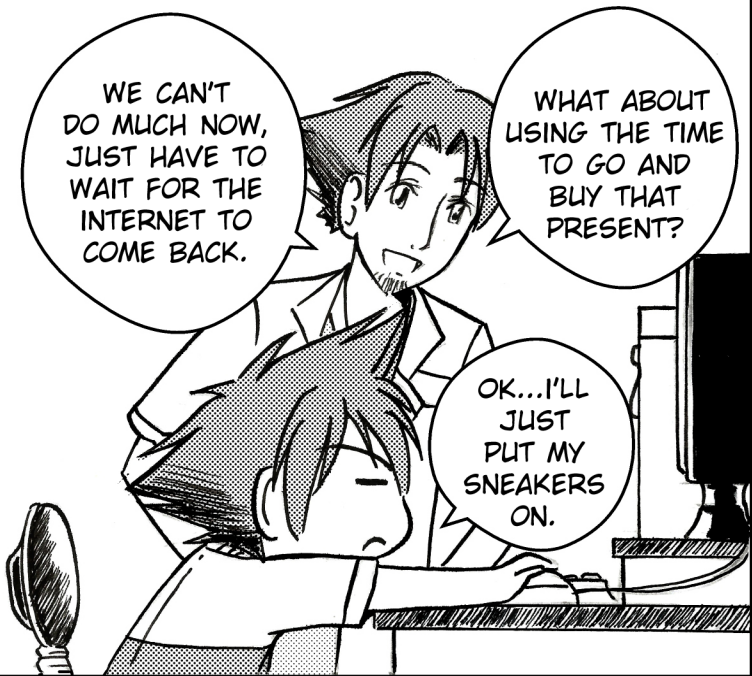
IN THIS THIRD ISSUE, VINNIE IS ON HIS COMPUTER PLAYING A GAME ON THE INTERNET WHEN SUDDENLY IT STOPS WORKING. WHAT SHOULD HE DO NOW?

MEANWHILE, MATTHEW DECIDES TO TELL HIM ABOUT OPTICAL FIBER, AND YOU WILL SEE THAT IT HAS A LOT TO DO WITH THE INTERNET THAT COMES TO OUR HOUSES!

BUT WHAT DOES OPTICAL FIBER HAVE TO DO WITH GLASS?

TO FIND OUT, JUST TURN THE PAGE AND START READING THE STORY!





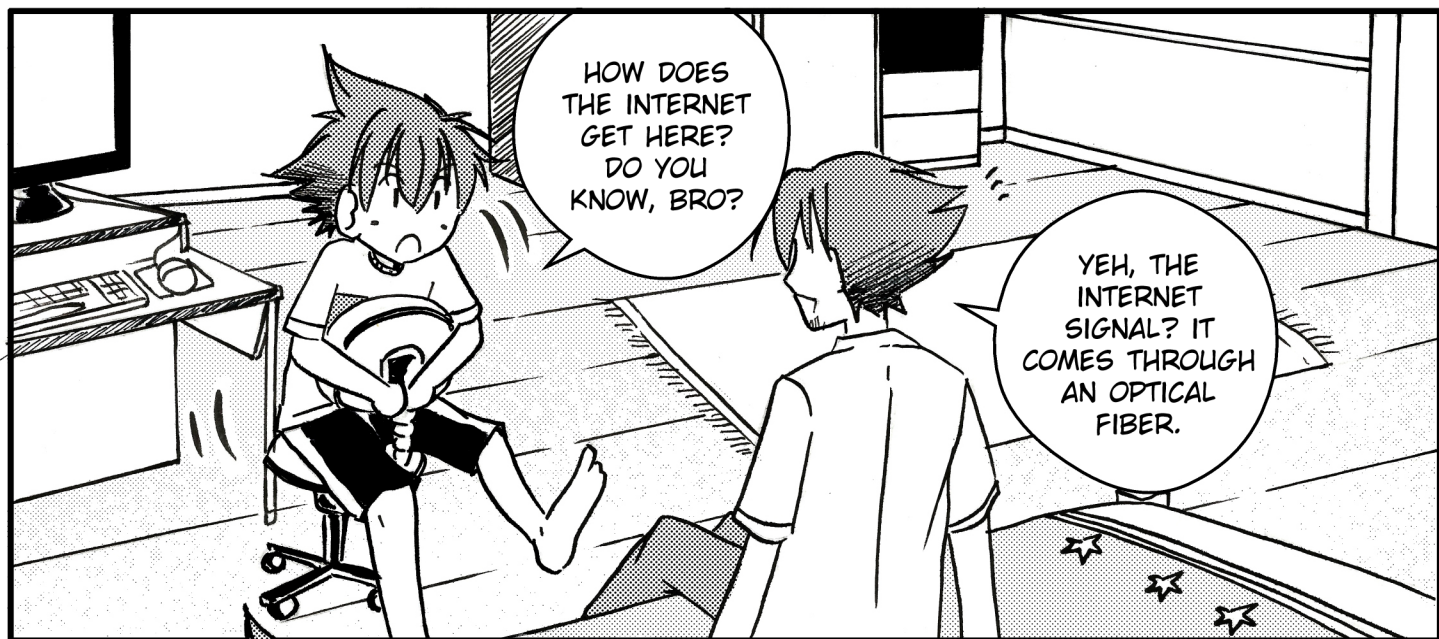
WE CAN'T DO MUCH NOW, JUST HAVE TO WAIT FOR THE INTERNET TO COME BACK.

WHAT ABOUT USING THE TIME TO GO AND BUY THAT PRESENT?

OK...I'LL JUST PUT MY SNEAKERS ON.

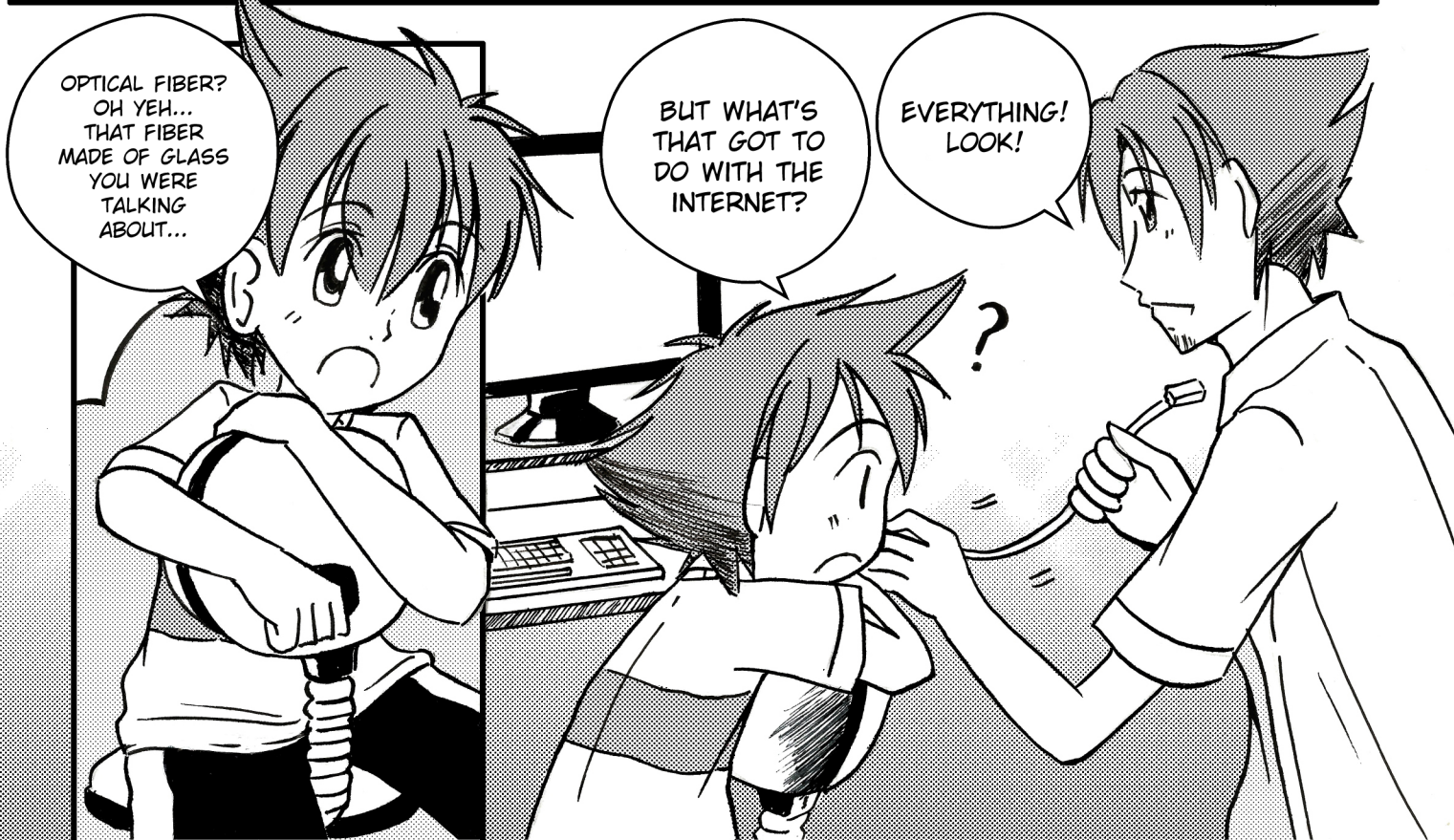


THE INTERNET CONNECTION COULD BE BETTER AND NOT GO DOWN ALL THE TIME...



HOW DOES THE INTERNET GET HERE? DO YOU KNOW, BRO?

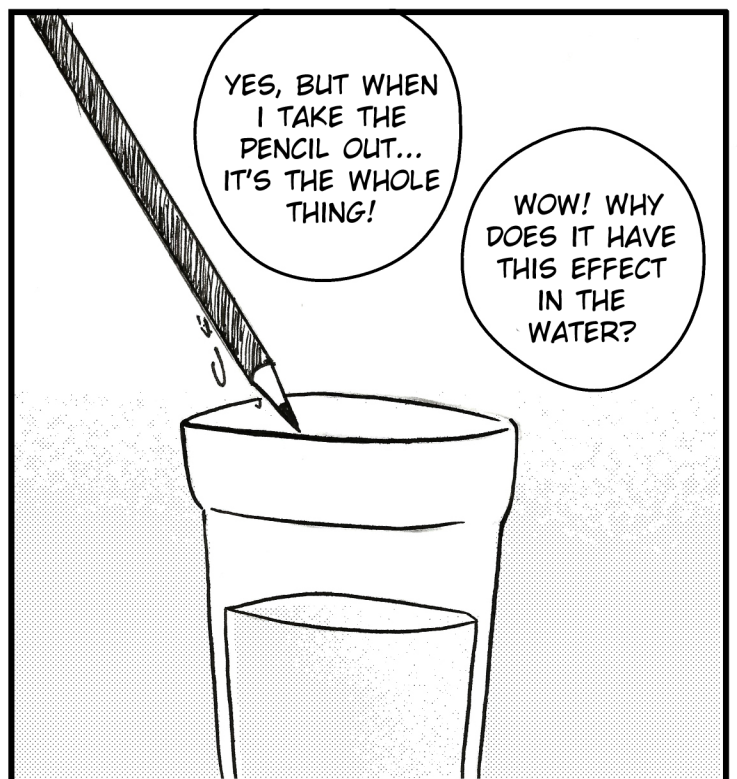
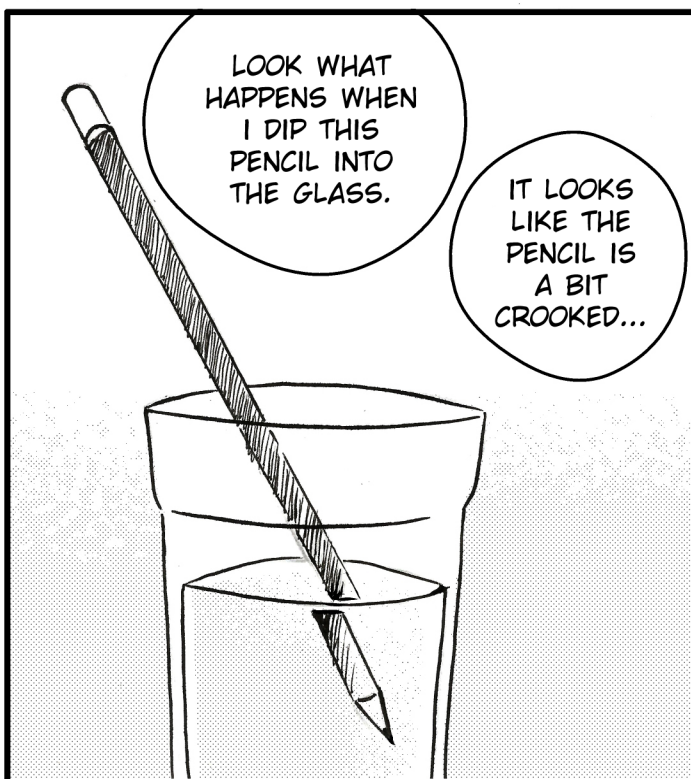
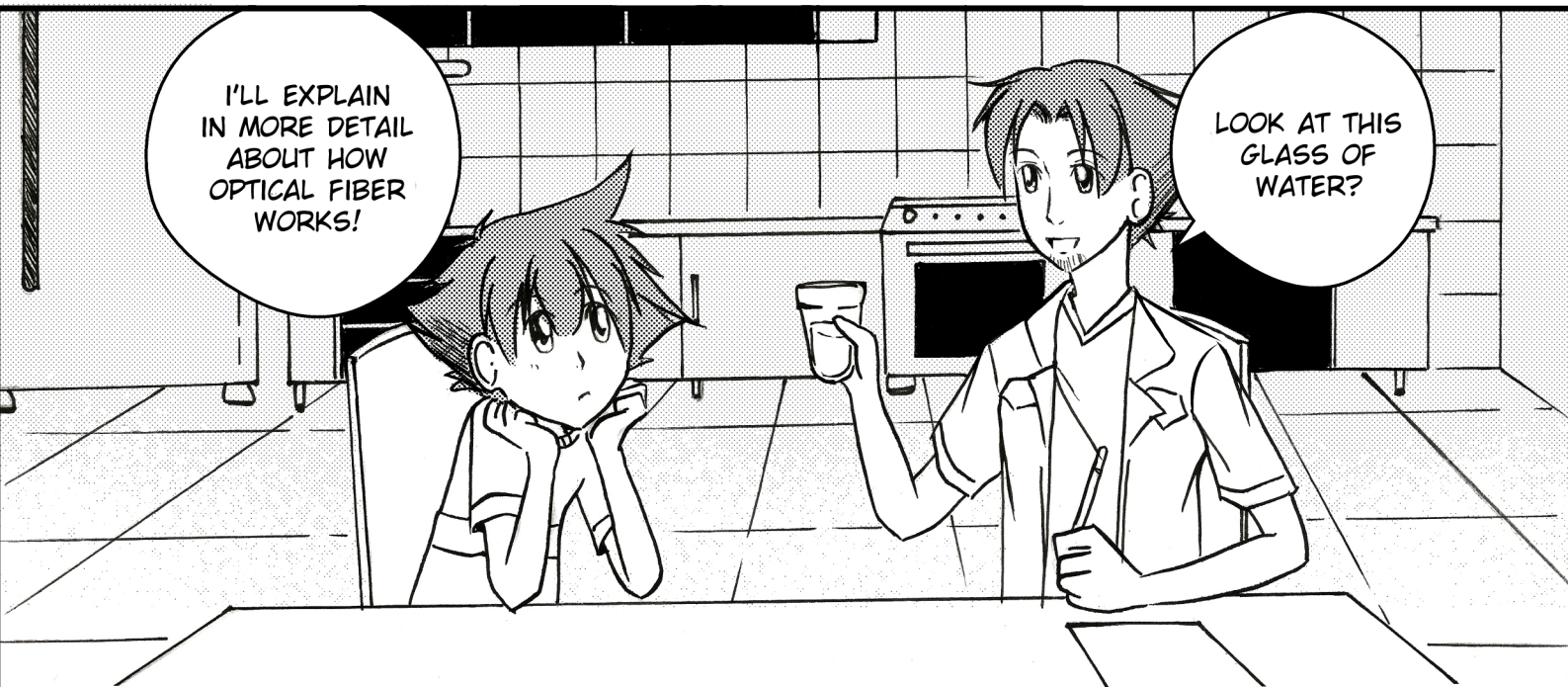
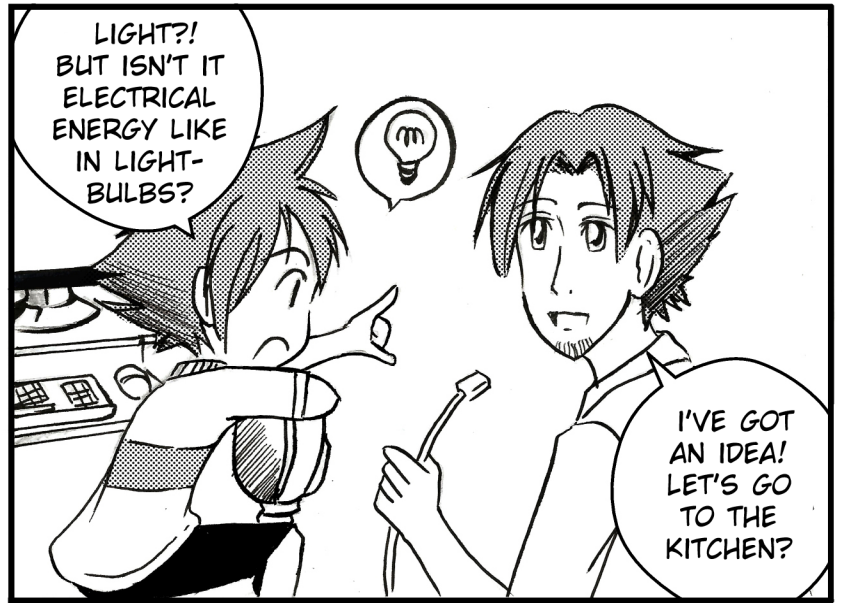
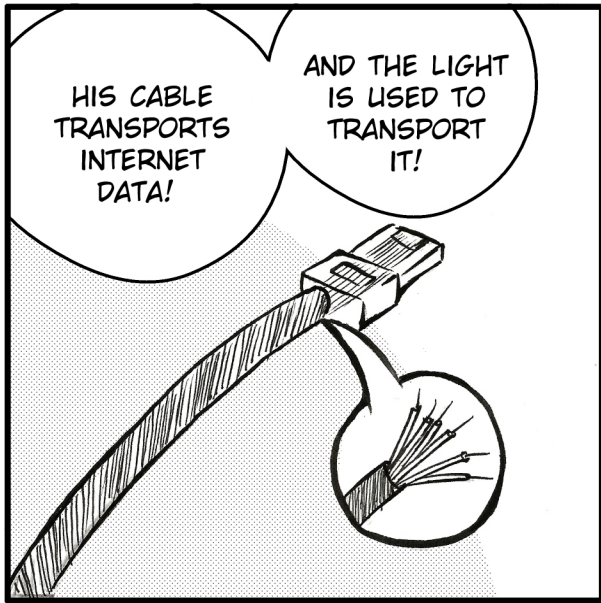
YEH, THE INTERNET SIGNAL? IT COMES THROUGH AN OPTICAL FIBER.



OPTICAL FIBER? OH YEH... THAT FIBER MADE OF GLASS YOU WERE TALKING ABOUT...

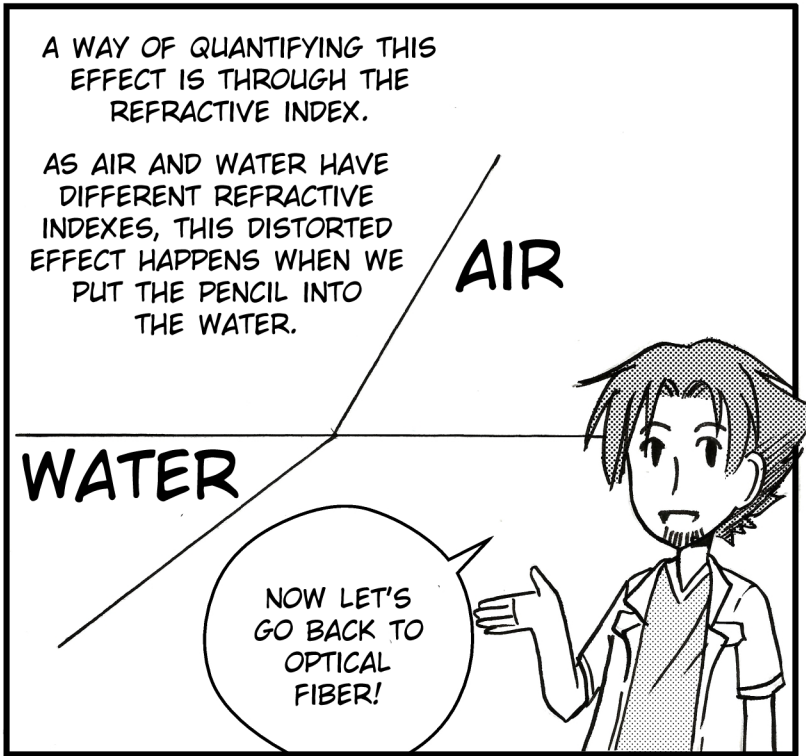
BUT WHAT'S THAT GOT TO DO WITH THE INTERNET?

EVERYTHING! LOOK!





WHAT HAPPENS HERE IS AN EFFECT CALLED REFRACTION, IN OTHER WORDS, IT IS THE WAY LIGHT TRAVELS THROUGH A CERTAIN MATERIAL.



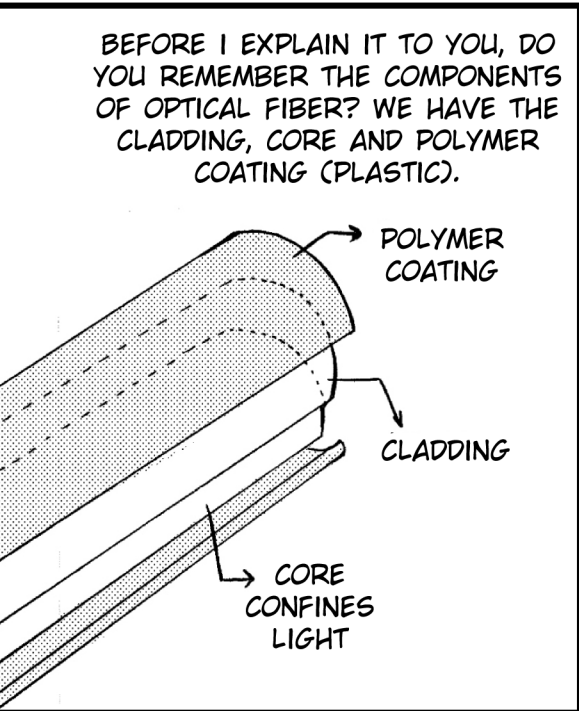
A WAY OF QUANTIFYING THIS EFFECT IS THROUGH THE REFRACTIVE INDEX.

AS AIR AND WATER HAVE DIFFERENT REFRACTIVE INDEXES, THIS DISTORTED EFFECT HAPPENS WHEN WE PUT THE PENCIL INTO THE WATER.

AIR

WATER

NOW LET'S GO BACK TO OPTICAL FIBER!



BEFORE I EXPLAIN IT TO YOU, DO YOU REMEMBER THE COMPONENTS OF OPTICAL FIBER? WE HAVE THE CLADDING, CORE AND POLYMER COATING (PLASTIC).

POLYMER COATING

CLADDING

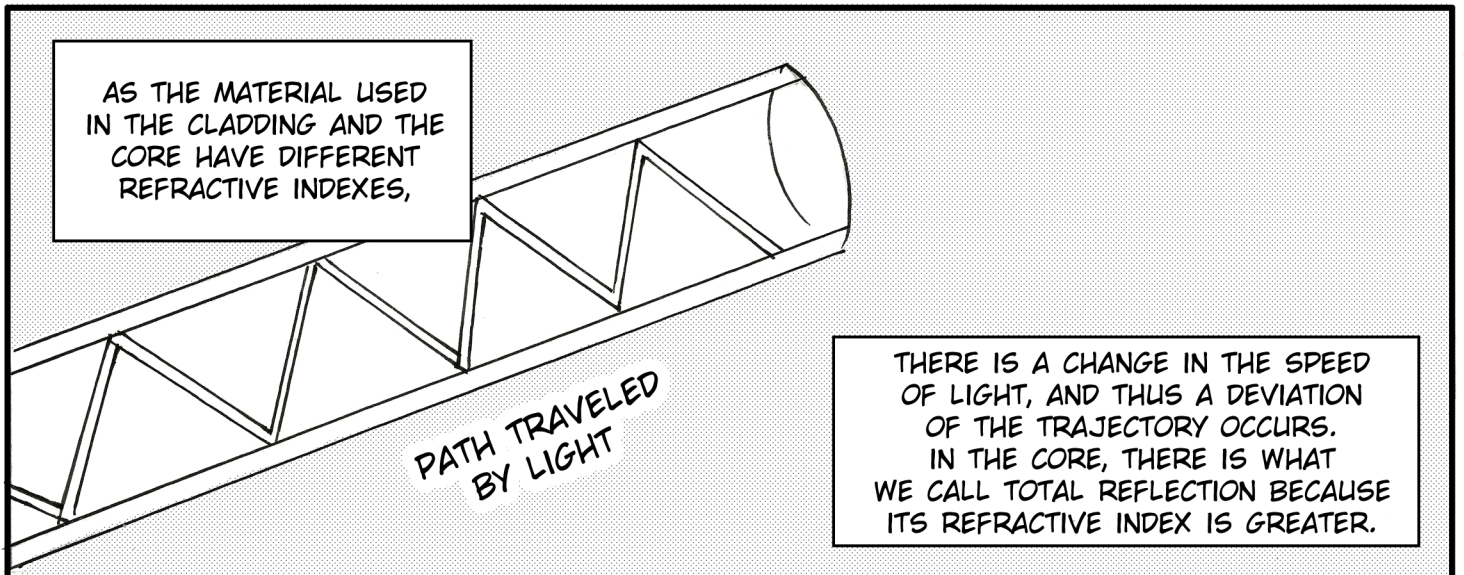
CORE CONFINES LIGHT



YES!



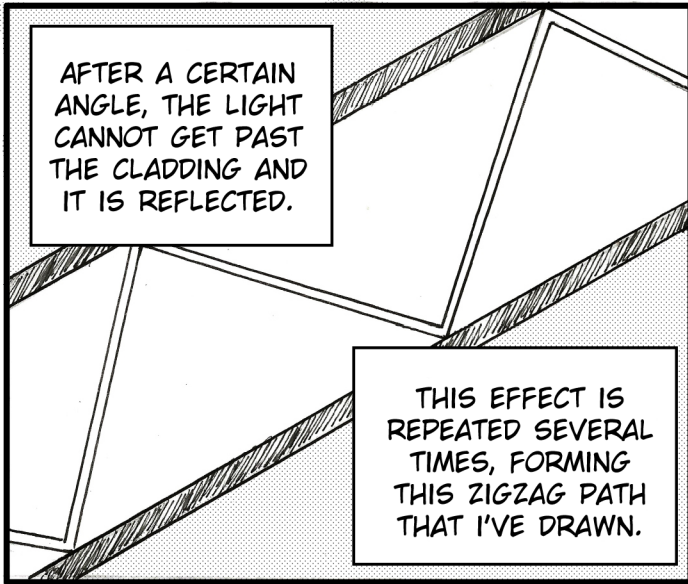
THE LIGHT WILL GO DOWN THIS PATH THAT I'M GONNA DRAW NOW.



AS THE MATERIAL USED IN THE CLADDING AND THE CORE HAVE DIFFERENT REFRACTIVE INDEXES,

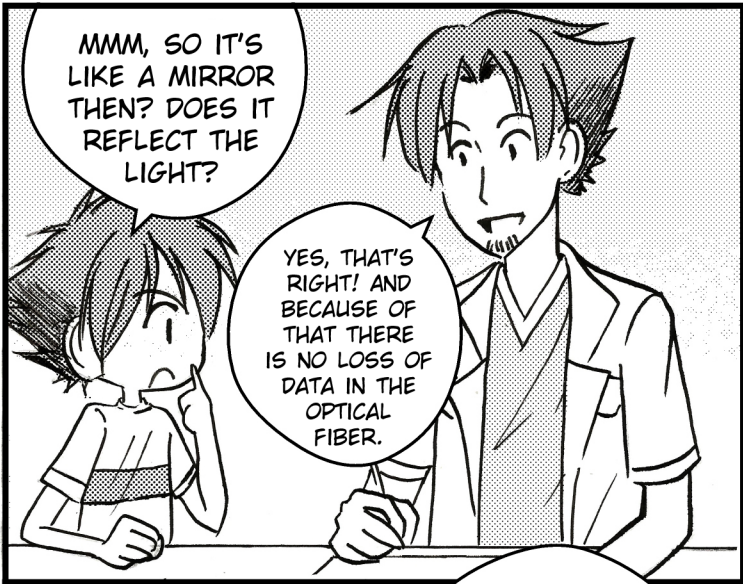
PATH TRAVELED BY LIGHT

THERE IS A CHANGE IN THE SPEED OF LIGHT, AND THUS A DEVIATION OF THE TRAJECTORY OCCURS. IN THE CORE, THERE IS WHAT WE CALL TOTAL REFLECTION BECAUSE ITS REFRACTIVE INDEX IS GREATER.



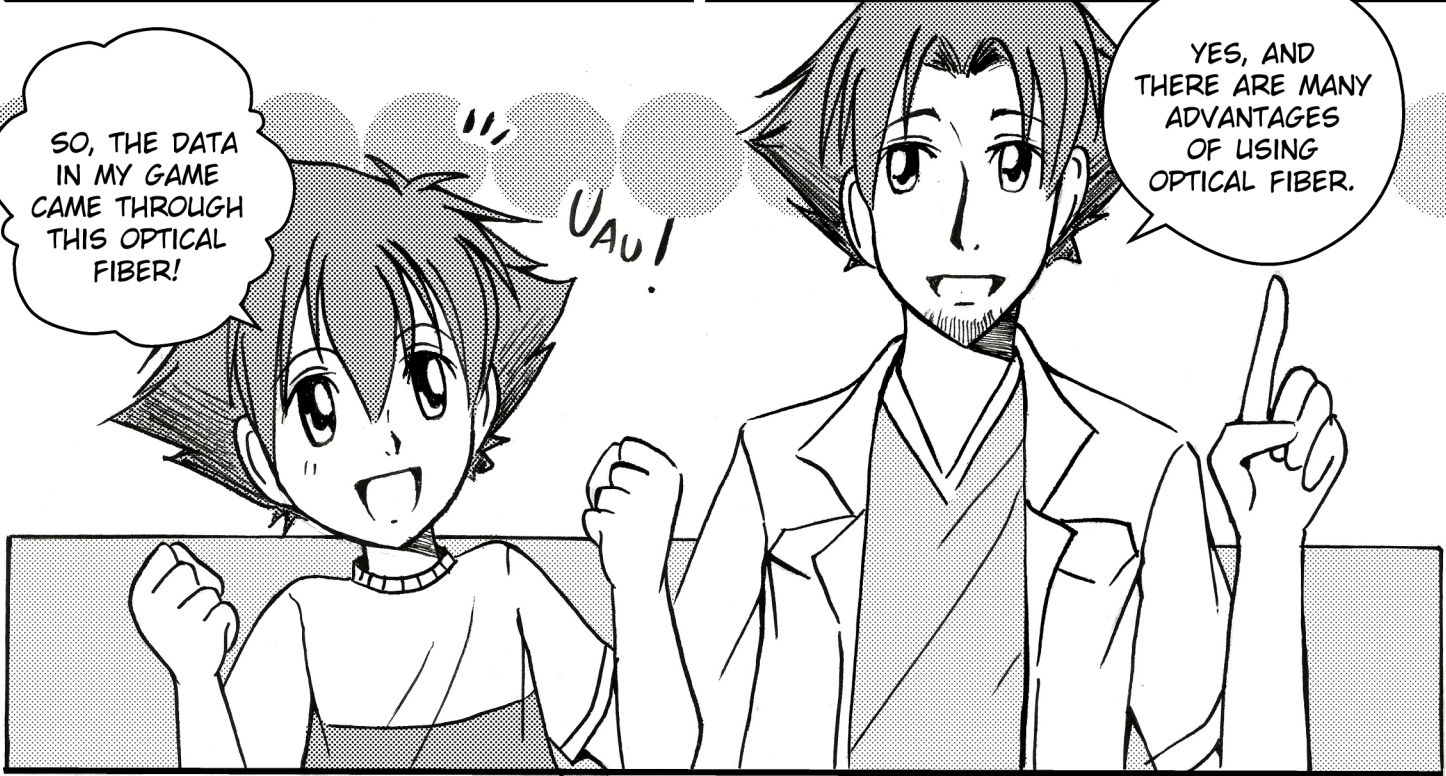
AFTER A CERTAIN ANGLE, THE LIGHT CANNOT GET PAST THE CLADDING AND IT IS REFLECTED.

THIS EFFECT IS REPEATED SEVERAL TIMES, FORMING THIS ZIGZAG PATH THAT I'VE DRAWN.



MMM, SO IT'S LIKE A MIRROR THEN? DOES IT REFLECT THE LIGHT?

YES, THAT'S RIGHT! AND BECAUSE OF THAT THERE IS NO LOSS OF DATA IN THE OPTICAL FIBER.



SO, THE DATA IN MY GAME CAME THROUGH THIS OPTICAL FIBER!

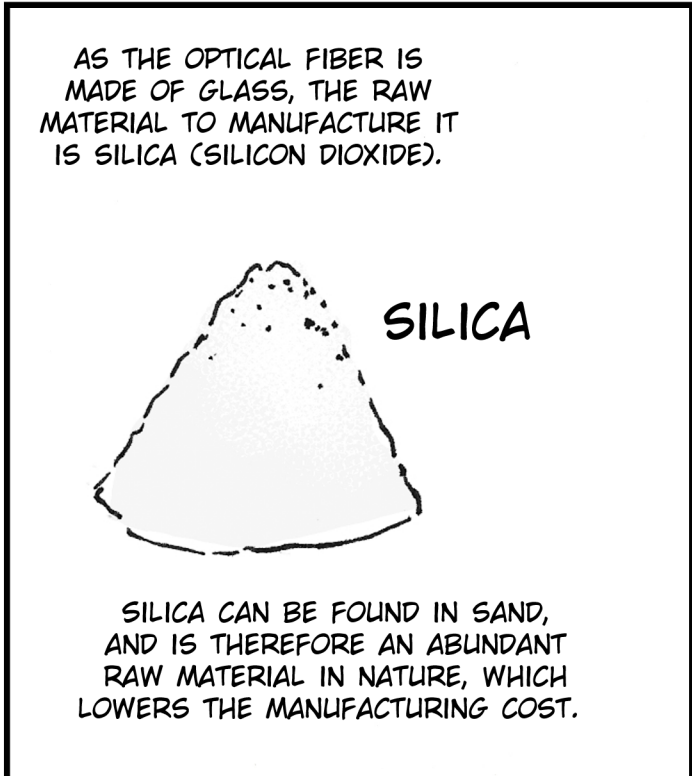
Uau!

YES, AND THERE ARE MANY ADVANTAGES OF USING OPTICAL FIBER.



REALLY? WHAT ARE THEY?

FIRST, THE MATERIAL FROM WHICH THE FIBER IS MADE.

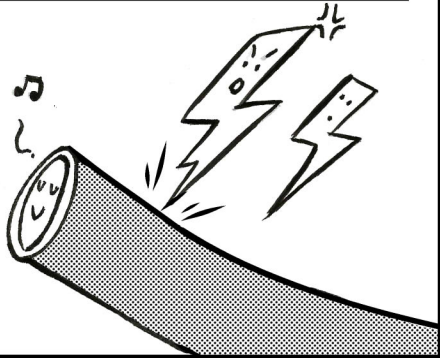


AS THE OPTICAL FIBER IS MADE OF GLASS, THE RAW MATERIAL TO MANUFACTURE IT IS SILICA (SILICON DIOXIDE).

SILICA

SILICA CAN BE FOUND IN SAND, AND IS THEREFORE AN ABUNDANT RAW MATERIAL IN NATURE, WHICH LOWERS THE MANUFACTURING COST.

ANOTHER ADVANTAGE IS THAT THERE IS NO ELECTRICAL INTERFERENCE BECAUSE SILICA IS AN INSULATOR (IT DOESN'T CONDUCT ELECTRICITY) AND SO THERE IS NO SIGNAL DISTORTION DUE TO SOME ELECTRICAL NOISE.



HOWEVER, THEY ARE FRAGILE AND MUST BE HANDLED WITH CARE.

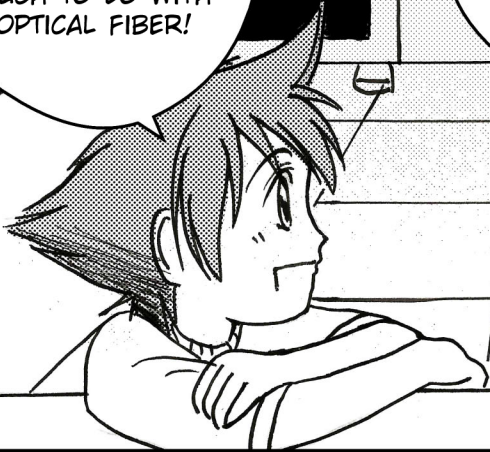
FRAGILE



COOL, BRO!
I DIDN'T KNOW THAT THE DATA FROM MY GAME HAD SO MUCH TO DO WITH OPTICAL FIBER!

BY THE WAY, DO YOU KNOW HOW THE INTERNET DATA, WHICH COME FROM OTHER CONTINENTS, GETS TO OUR HOUSES?

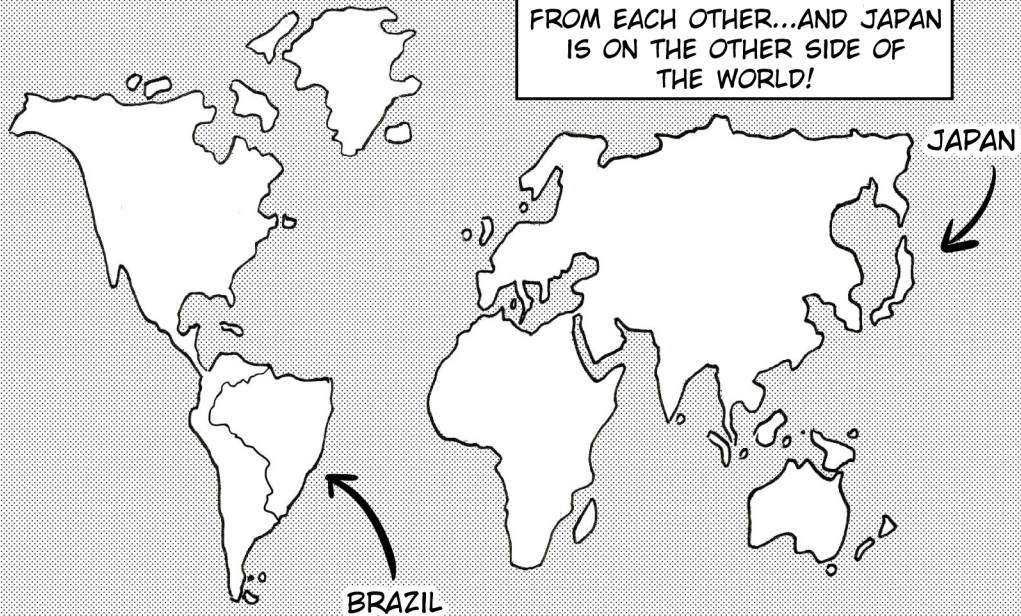
FOR EXAMPLE, FROM JAPAN?



UM...NEVER THOUGHT OF THAT, BRO.

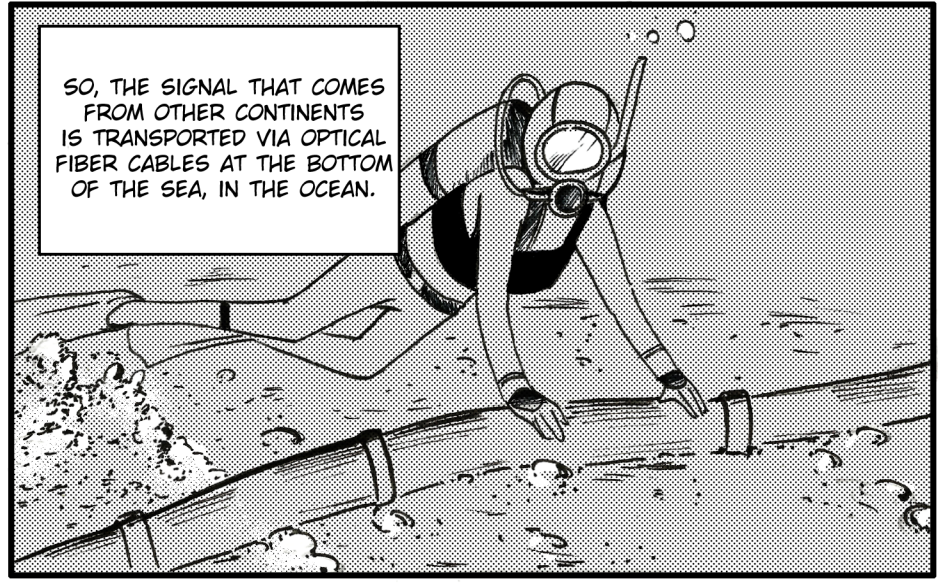


NOW YOU SAID IT THOUGH, CONTINENTS ARE SO SEPARATE FROM EACH OTHER...AND JAPAN IS ON THE OTHER SIDE OF THE WORLD!

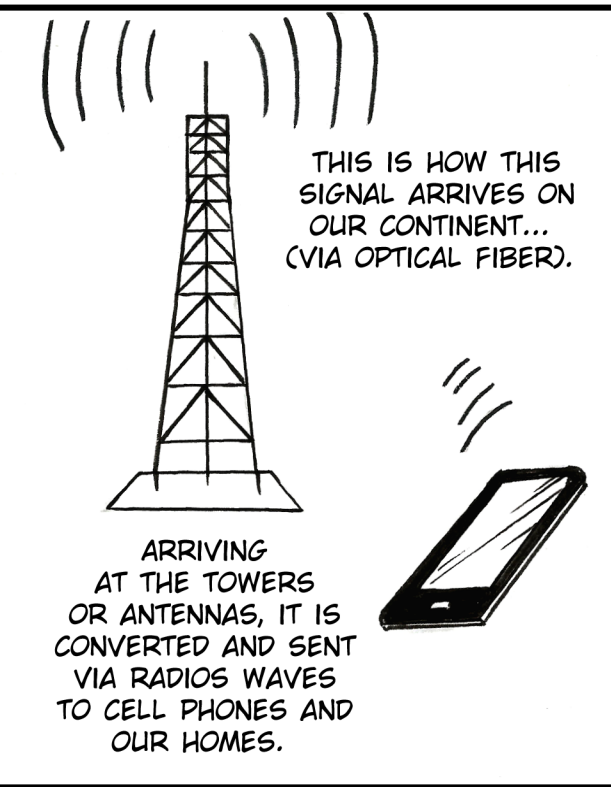




YEH, RIGHT!
IF THERE'S
SOMETHING THAT
CONNECTS
ALL THESE
CONTINENTS,
IT'S THE
SEA.

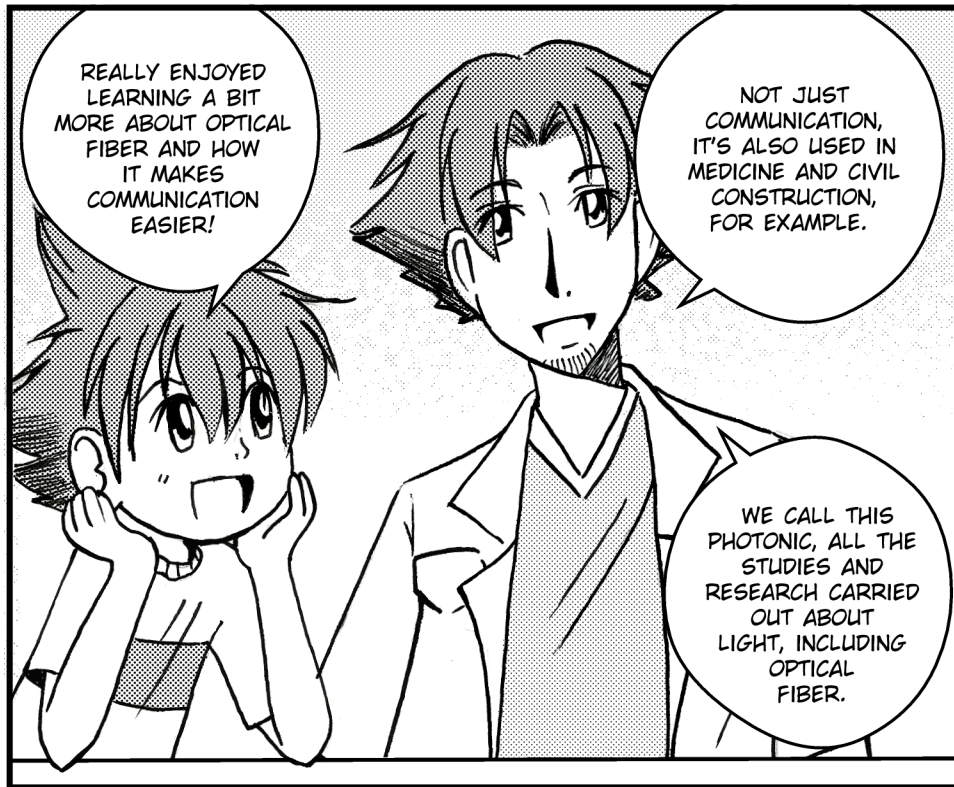


SO, THE SIGNAL THAT COMES
FROM OTHER CONTINENTS
IS TRANSPORTED VIA OPTICAL
FIBER CABLES AT THE BOTTOM
OF THE SEA, IN THE OCEAN.



THIS IS HOW THIS
SIGNAL ARRIVES ON
OUR CONTINENT...
(VIA OPTICAL FIBER).

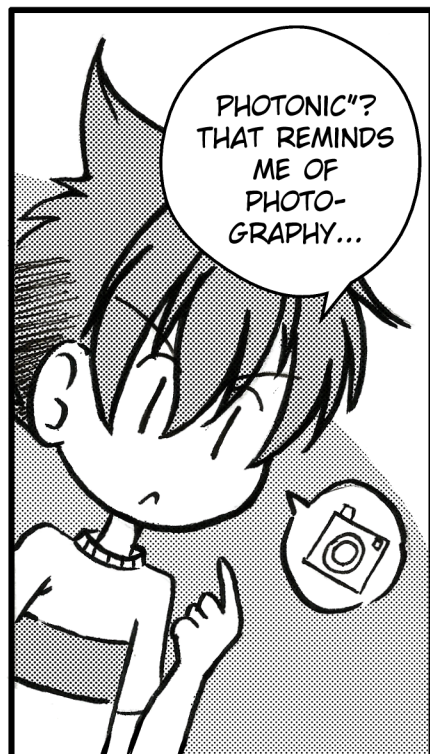
ARRIVING
AT THE TOWERS
OR ANTENNAS, IT IS
CONVERTED AND SENT
VIA RADIOS WAVES
TO CELL PHONES AND
OUR HOMES.



REALLY ENJOYED
LEARNING A BIT
MORE ABOUT OPTICAL
FIBER AND HOW
IT MAKES
COMMUNICATION
EASIER!

NOT JUST
COMMUNICATION,
IT'S ALSO USED IN
MEDICINE AND CIVIL
CONSTRUCTION,
FOR EXAMPLE.

WE CALL THIS
PHOTONIC, ALL THE
STUDIES AND
RESEARCH CARRIED
OUT ABOUT
LIGHT, INCLUDING
OPTICAL
FIBER.

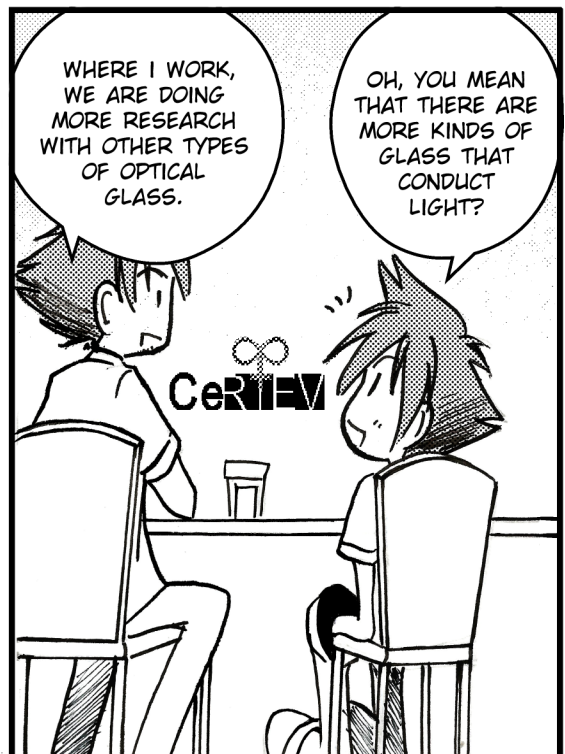


PHOTONIC"?
THAT REMINDS
ME OF
PHOTO-
GRAPHY...

THE WORDS ARE KIND
OF SIMILAR, AS THE
TERM "PHOTO" COMES
FROM "PHOTOS" OR
"PHOS", WHICH MEANS
"LIGHT" IN GREEK.

photos
or = light
phos

SO, PHOTONIC WOULD
BE A SCIENCE THAT
STUDIES LIGHT.



WHERE I WORK,
WE ARE DOING
MORE RESEARCH
WITH OTHER TYPES
OF OPTICAL
GLASS.

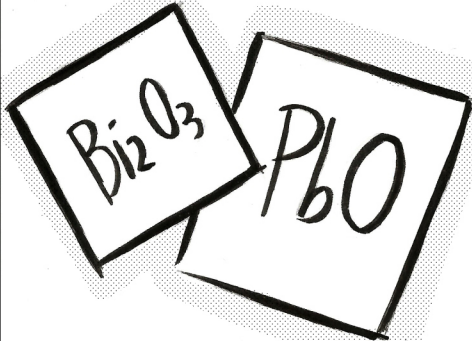
OH, YOU MEAN
THAT THERE ARE
MORE KINDS OF
GLASS THAT
CONDUCT
LIGHT?



YES, WE HAVE GLASS MADE FROM HEAVY METAL OXIDES SUCH AS BISMUTH OXIDE (Bi_2O_3) AND LEAD OXIDE (PbO), WHICH CAN BE USED TO MANUFACTURE LASERS, FOR EXAMPLE.

WE ALSO HAVE FLUORIDE GLASS, WHICH IS FORMED BY COMBINING VARIOUS DIFFERENT ELEMENTS.

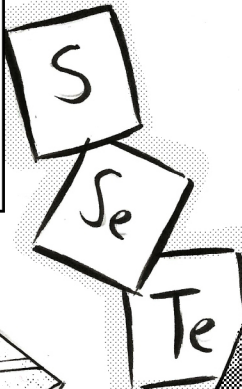
DID YOU KNOW THAT BESIDES SILICA, WE CAN ALSO USE IT AS A RAW MATERIAL FOR FLUORIDE GLASS OPTICAL FIBERS FORMED BY RARE-EARTH IONS?*



*LANTHANIDE ELEMENTS LIKE SCANDIUM AND YTTRIUM

AND FINALLY, WE HAVE CHALCOGENIDE GLASSES, WHICH ARE MADE FROM SULFUR (S), SELENIUM (Se) OR TELLURIUM (Te), WHICH ARE ELEMENTS OF GROUP VI OF THE PERIODIC TABLE.

THEY ARE ALSO KNOWN AS CHALCOGENS AND ARE USED IN MEDICAL AND MILITARY DEVICES.



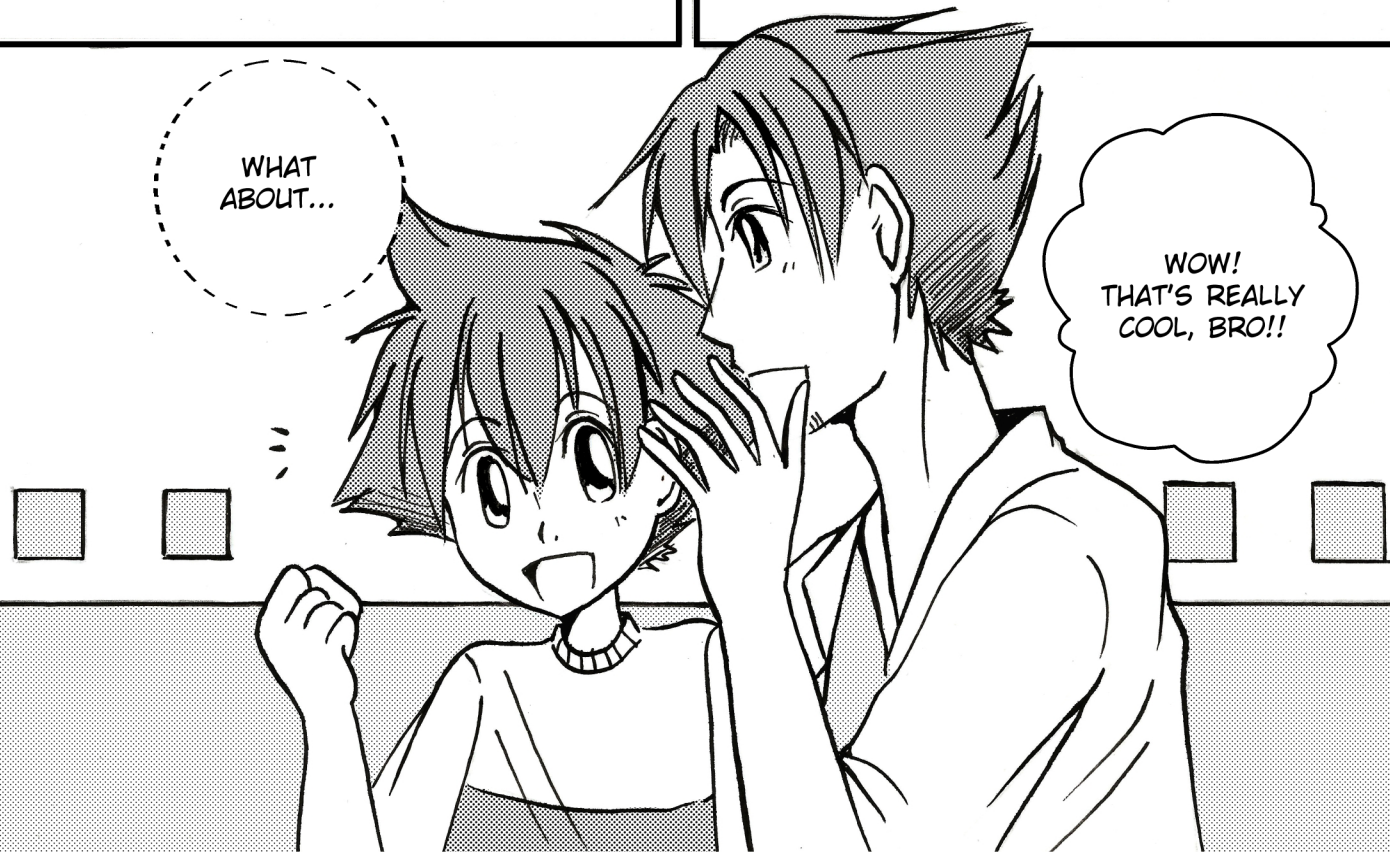
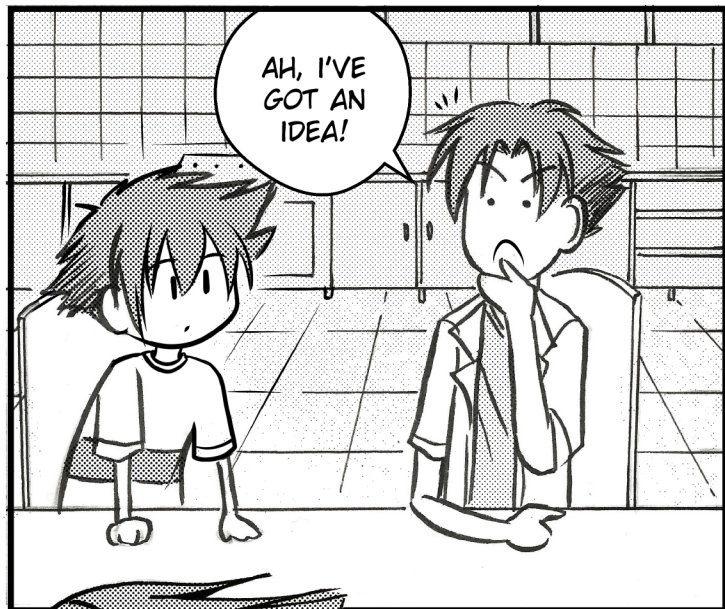
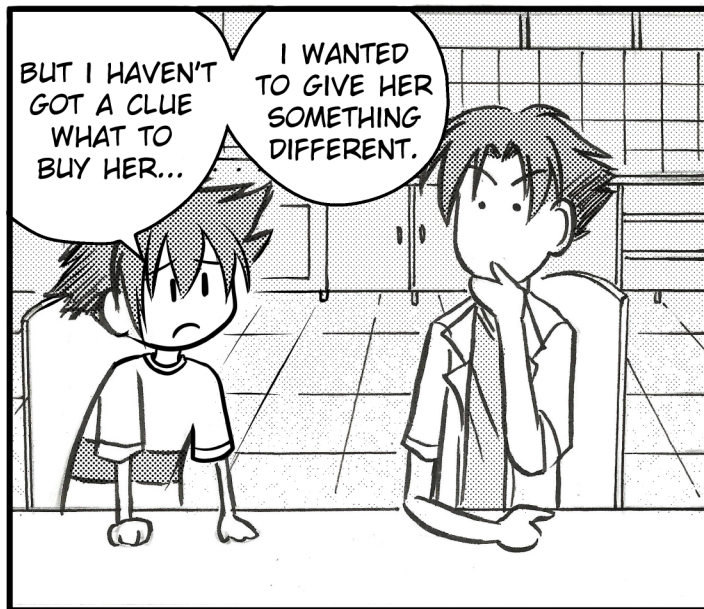
GEE! SO, THERE'S STILL A LOT OF THINGS TO RESEARCH ABOUT GLASS, ISN'T THERE?

YEP! IT'S A VERY BROAD RESEARCH AREA.

OUR WORK AS SCIENTISTS AND RESEARCHERS NEVER ENDS,

AS THERE'S ALWAYS SOMETHING NEW TO EXPLORE IN SCIENCE.

UH... DIDN'T WE HAVE TO DO SOMETHING?

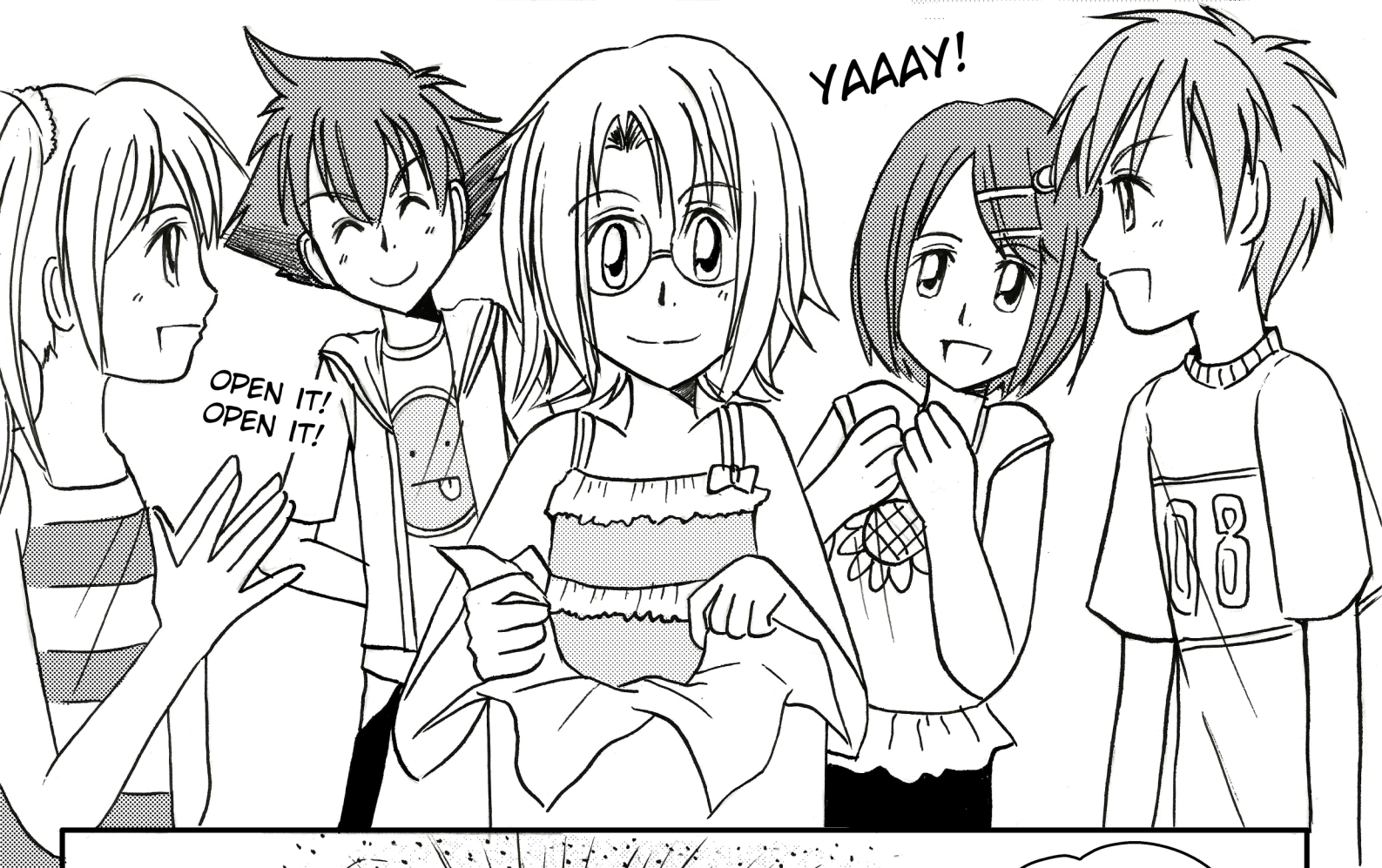


LOUISE'S BIRTHDAY

HAPPY BIRTHDAY!!

HI VINNIE!
JUST YOU WERE
MISSING!

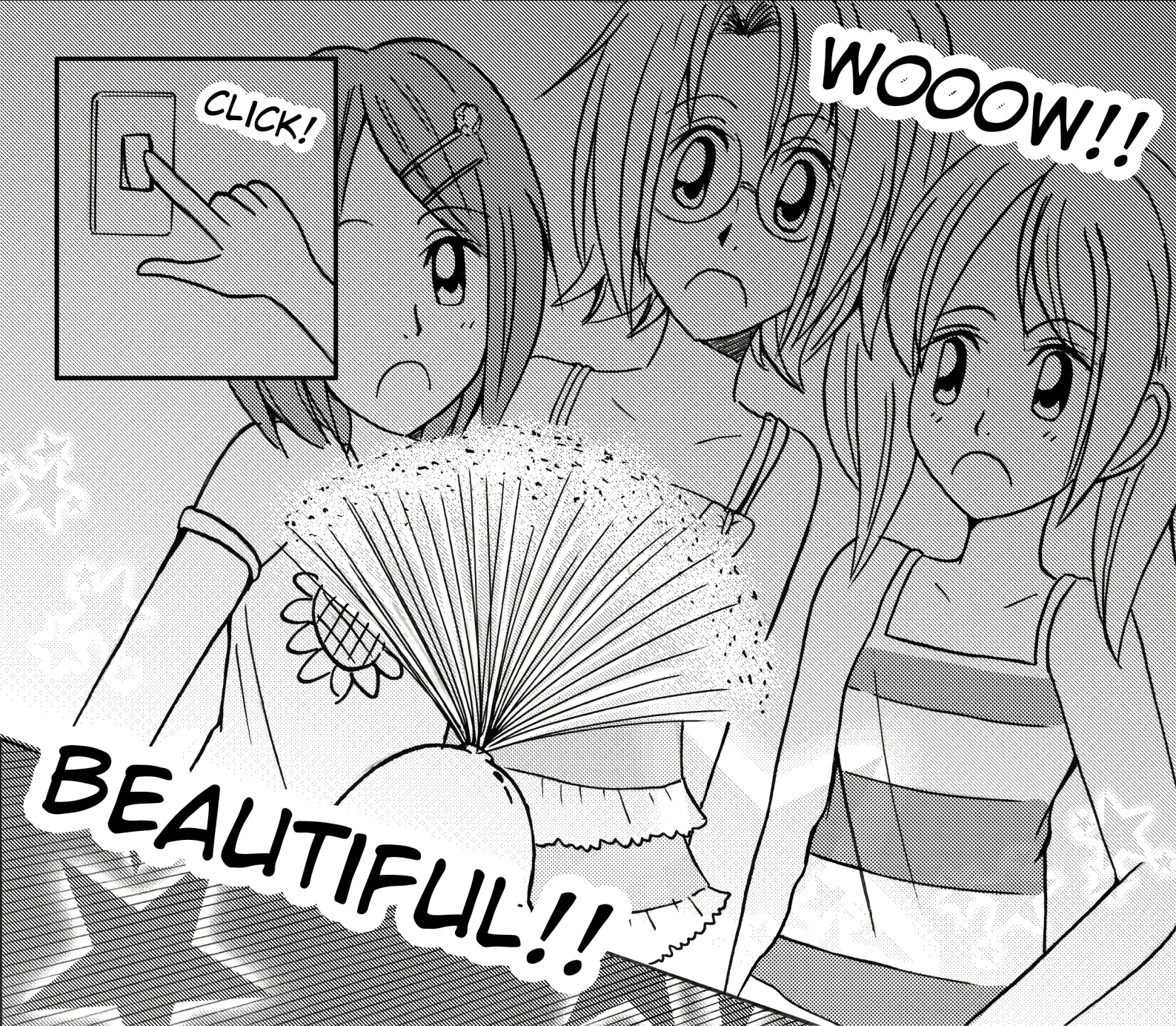
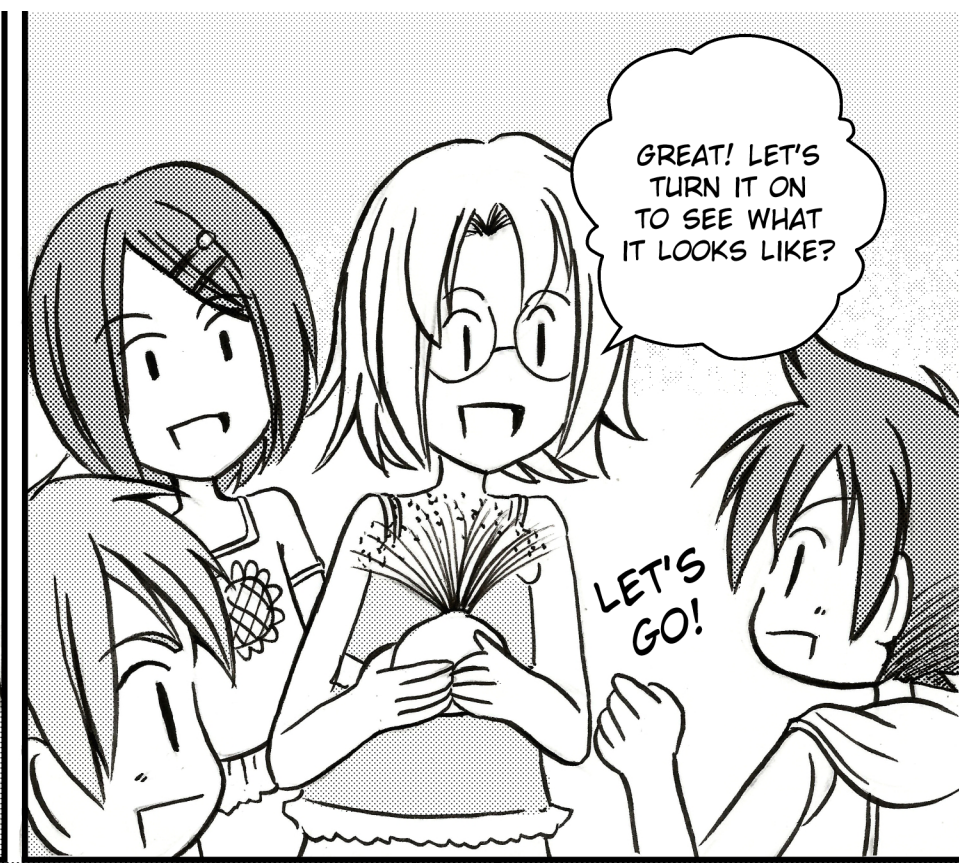
THANKS FOR
THE PRESENT!
LET ME
OPEN IT...

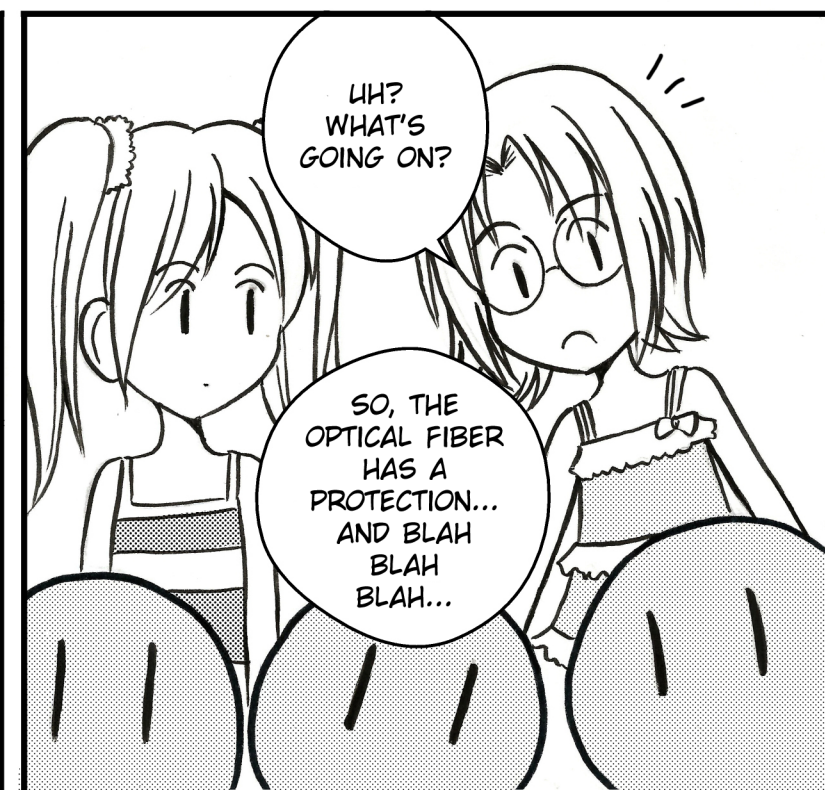
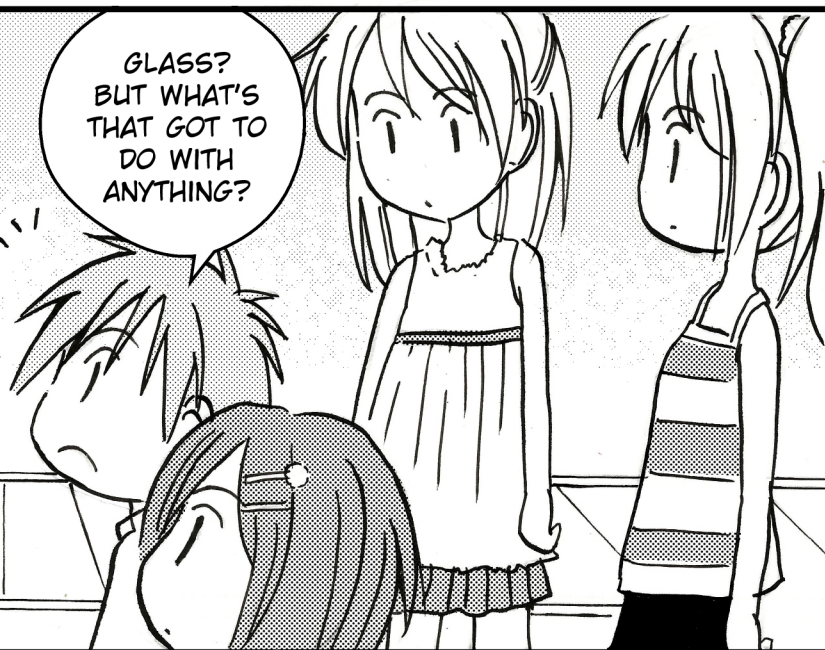
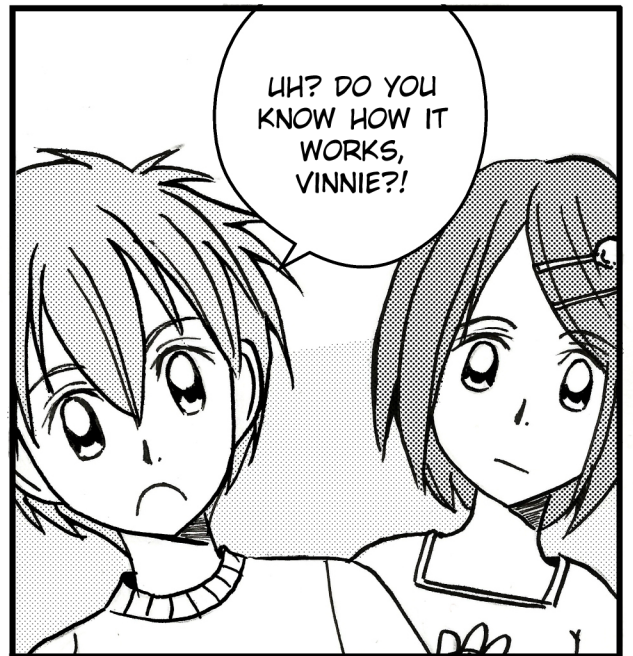
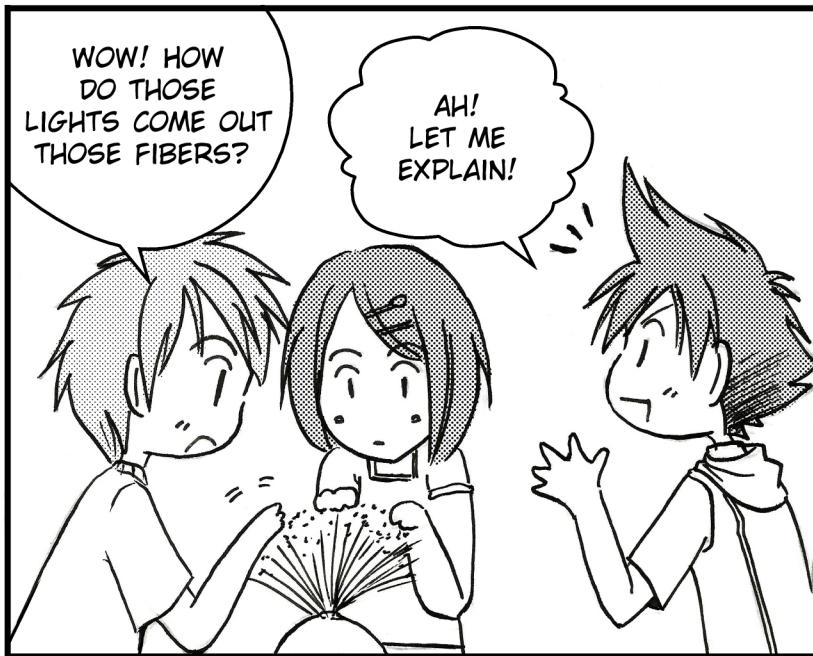


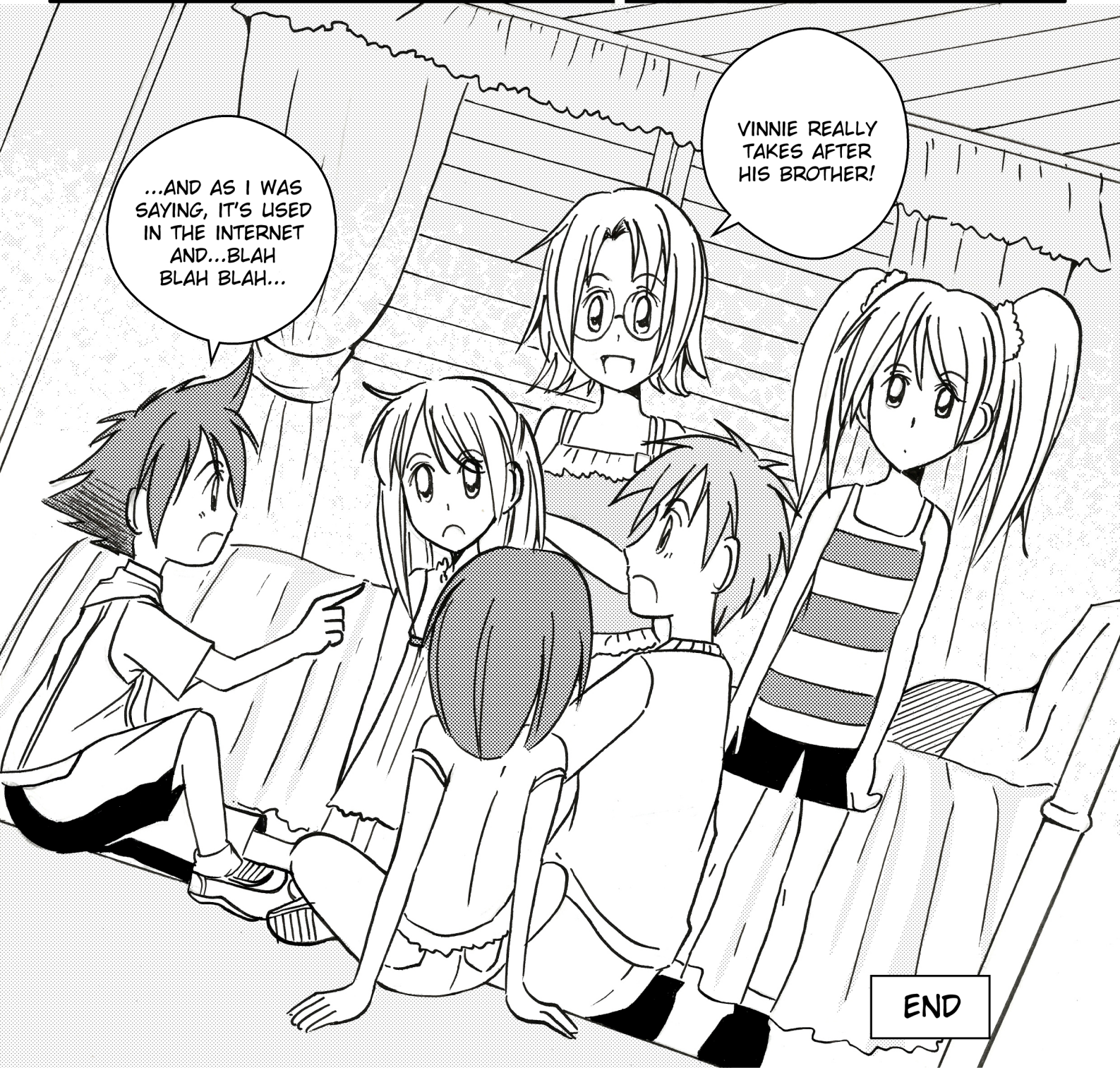
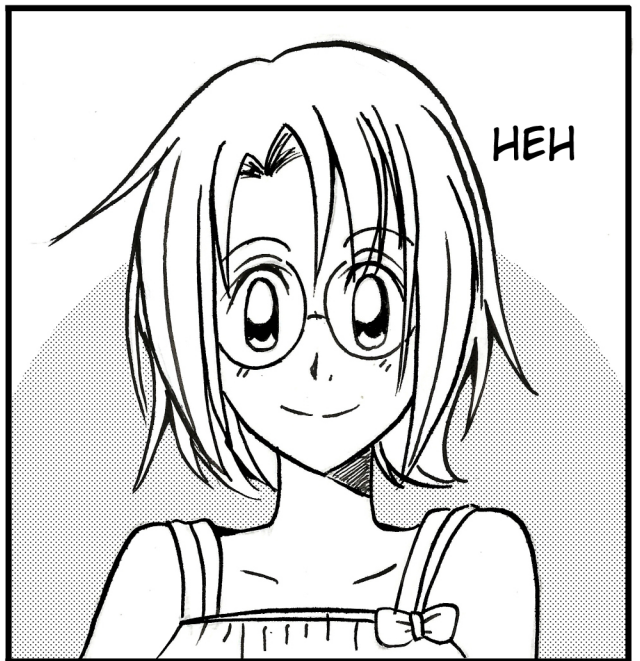
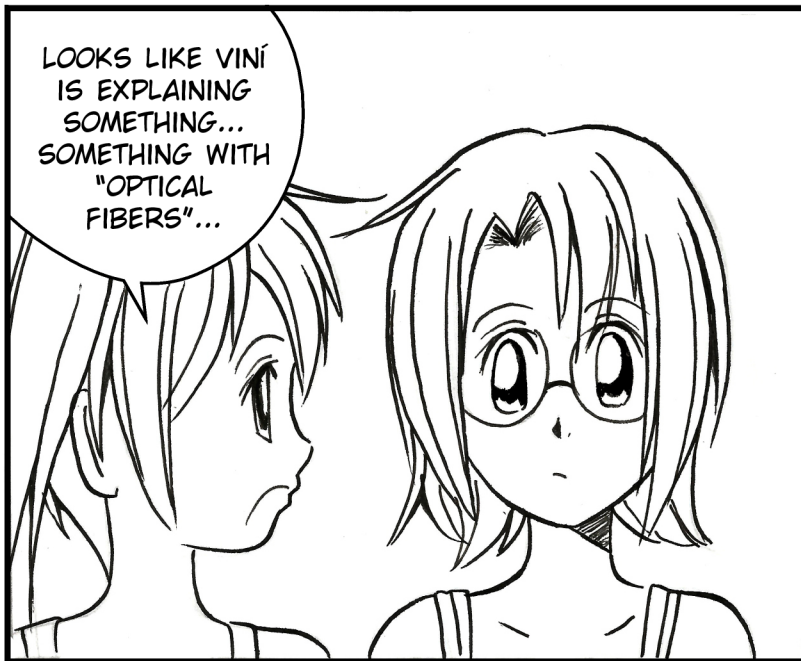
OPEN IT!
OPEN IT!

YAAAY!

AH! IS
THAT A
LAMP?



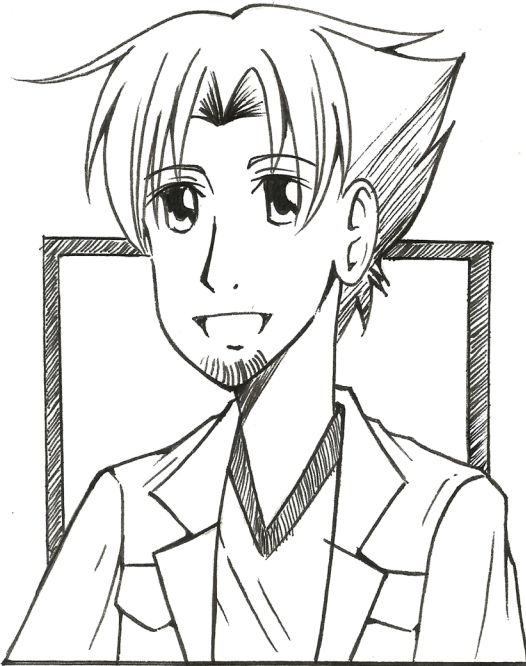




END

CROSSWORD PUZZLE

TEST YOUR KNOWLEDGE ABOUT OPTICAL FIBER!



1. SCIENCE THAT STUDIES LIGHT.
2. MATERIAL THAT THE COATING OF THE OPTICAL FIBER IS MADE.
3. THE OPTICAL FIBER CAN MAKE _____ EASIER.
4. THE WAY LIGHT TRAVELS THROUGH A CERTAIN MATERIAL.
5. THE SIGNAL THAT COMES FROM OTHER CONTINENTS COMES FROM THE OPTICAL FIBERS LOCATED IN THE _____.
6. RAW MATERIAL FROM WHICH THE OPTICAL FIBER IS MADE.
7. THE CHALCOGENIDE GLASSES ARE USED IN _____ DEVICES.
8. TYPE OF GLASS FORMED BY COMBINING VARIOUS DIFFERENT ELEMENTS.
9. MATERIAL THAT DOESN'T CONDUCT ELECTRICITY
10. THE _____ OXIDE CAN BE USED IN GLASS FABRICATION.
11. THE _____ SIGNAL COMES FROM THE OPTICAL FIBER.
12. THE OPTICAL FIBER MUST BE HANDLED WITH CARE BECAUSE IT IS _____.

1.			O								
			2.	P							
3.								T			
			4.					I			
								5.	C		
			6.					A			
			7.					L			
								8.	F		
								9.	I		
								10.	B		
			11.					E			
								12.	R		

THE ANSWERS TO THE ACTIVITIES ARE LISTED ON THE LAST PAGE!

WORD SEARCH

INTERNET
OPTICAL FIBER
REFRACTION
PHOTONIC

FLUORIDE GLASS
CHALCOGENS
SILICA

A E R Y S P W B R O V A W Y A U Y O L J
J C C O G B M O W E V A V U X U E H P X
B S Y H Q U Q O X N F G X A G H L E K W
I I D N A G E W P R E R H X E N V M W Z
A L F B F Q P B L T N U A P Y B K D J N
R I A L M S M M R V I D A C F P K A S O
U C P I U P K H P O Y C V O T Y U N Q U
T A Q N N O H B T H F K A F J I G N F X
Z K R T H T R O O I K N P L J X O Z N M
N N B N P N E I T Q F P B P F N C N F K
G X O G Q C N R D O B Z V Y G I J Q C E
P J A E E K A W N E N X T G A Z B T U Z
Z D Y B U B S F B E G I A N M I V E I G
C X B P J X F V I G T L C Q Z S I T R D
S Q V Y C B D F I U N F A A F K Z F F F
O G I S J Y P J H G B M J S E N T V J F
U V C T O Y B T J E O J W L S P C V G R
T I T A T H V C H Q N R D R R C A U N F
B A O D U V M O A M C H A L C O G E N S
L Y D V D V K H D E X H E B S A W V J I

ANSWERS TO THE ACTIVITIES:

CROSSWORD PUZZLE:

- 1) PHOTONIC
- 2) POLYMER
- 3) COMMUNICATION
- 4) REFRACTION
- 5) OCEAN
- 6) SILICA
- 7) MEDICAL
- 8) FLUORIDE
- 9) INSULATOR
- 10) BISMUTH
- 11) INTERNET
- 12) FRAGILE

WORD SEARCH

A E R Y S P W B R O V A W Y A U Y O L J
J C C O G B M O W E V A V U X U E H P X
B S Y H Q U Q O X N F G X A G H L E K W
I I D N A G E W P R E R H X E N V M W Z
A L F B F Q P B L T N U A P Y B K D J N
R I A L M S M M R V I D A C F P K A S O
U C P I U P K H P O Y C V O T Y U N Q U
T A Q N N O H B T H F K A F J I G N F X
Z K R T H T R O O I K N P L J X O Z N M
N N B N P N E I T O F P B P F N C N F K
G X O G Q C N R D O B Z V Y G I J Q C E
P J A E E K A W N E N X T G A Z B T U Z
Z D Y B U B S F B E G I A N M I V E I G
C X B P J X F V I G T L C Q Z S I T R D
S Q V Y C B D F I U N F A A F K Z F F F
O G I S J Y P J H G B M J S E N T V J F
U V C T O Y B T J E O J W L S P C V G R
T I T A T H V C H Q N R D R R C A U N F
B A O D U V M O A M C H A L C O G E N S
L Y D V D V K H D E X H E B S A W V J I

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