なんでも治せる？
万能細胞

It Can Heal Anything? The Almighty Cell

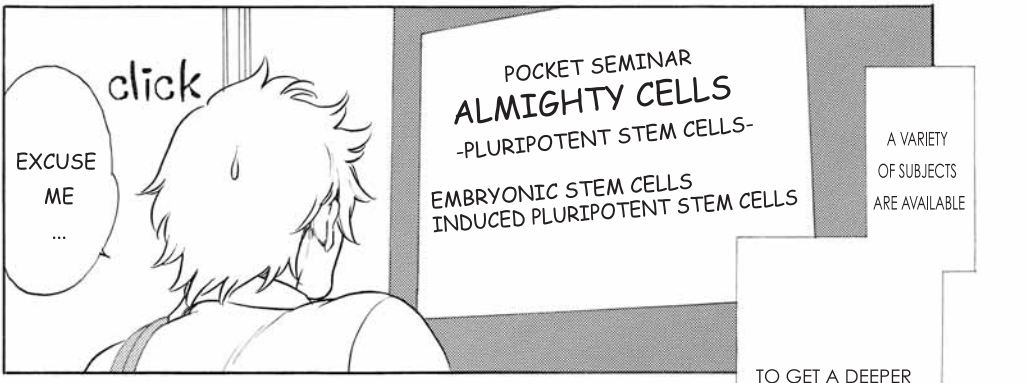
作画：大岩摩衣・玉懸はるね
ART: Mai Oiwa, Harune Tamakake


KYOTO UNIVERSITY
WAAAAH... THIS PLACE IS SO HUGE!
CLASS... I HAVE A CLASS!
running
Kyoto University
NEW! Campus Map
Don't get lost at Yoshida any more!
※ GAAAN
Aaaah!!
slap!!
Aaaaah! I don't believe this!
bang
bang
bang
HUH!
WHOAA AS FAST AS I CAN.
bump
PEOPLE HURRYING TO CLASS
THAT'S WHY IT'S FASTER BY BIKE OVER HERE!
swish
swish
ガーン※
WHY DON'T I HAVE ONE!
Left it back home with my parents.

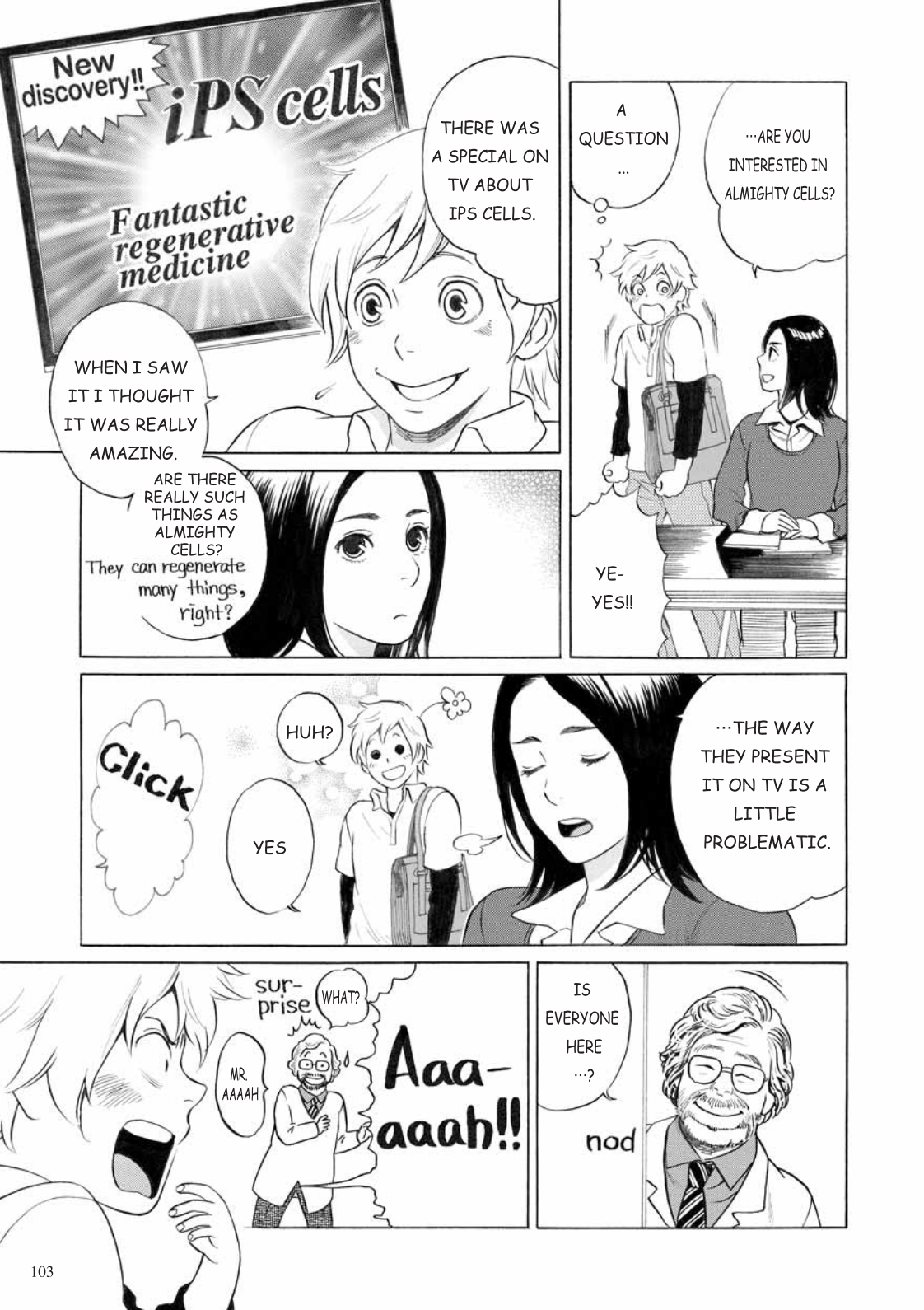

CAN YOU GET UP?
stops
I DON'T HAVE THE WILL POWER TO GET UP …
WHICH MEANS I DON'T WANT TO SEE THE BICY-CLES I'VE KNOCKED OVER.
ARE YOU OK?
IT'S A TEACHER FROM SOMEWHERE …
AH.
UMM…
YES ?
You fell down in front of me.
YES
I'M SORRY, THANK YOU FOR HELPING ME.


I'M A KYOTO UNIVERSITY MED SCHOOL STUDENT.
YANAGI DEMACHI! FRESHMAN!
Straighteens up!!
YES
MY CLASS IS OVER THERE!!
dash
RIGHT THEN YES
THANK YOU.
YES
HERE I SHOULD ASK HIS NAME! WHAT AM I INTRODUCING MYSELF FOR?
Aaaah!!
Now I look as if I'm really into myself!!
Ah


THE CLASS I'M GOING TO IS CALLED A POCKET SEMINAR.
INSTITUTE FOR FRONTIER MEDICAL SCIENCES
STEM CELL RESEARCH CENTER
YOU CAN PARTICIPATE REGARDLESS OF YOUR MAJOR.

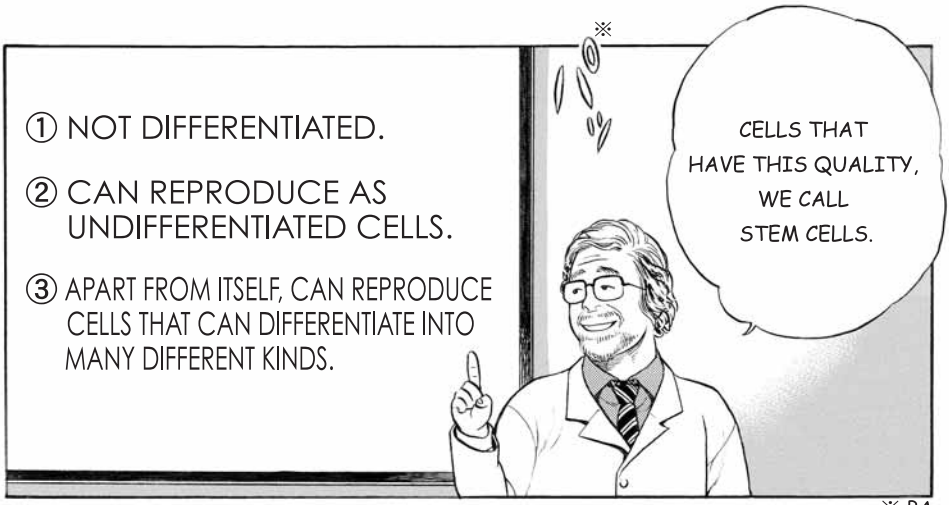

click
EXCUSE ME ...
POCKET SEMINAR
ALMIGHTY CELLS
-PLURIPOTENT STEM CELLS-
EMBRYONIC STEM CELLS
INDUCED PLURIPOTENT STEM CELLS
A VARIETY OF SUBJECTS ARE AVAILABLE
TO GET A DEEPER UNDERSTANDING OF THE FIELD YOU ARE INTERESTED IN.


a graduate student maybe?
nod
HI!
YOU CAN ASK THE PROFESSOR AND GRADUATE STUDENTS ANY QUESTION; THE CLASS IS REALLY HELPFUL.
HELLO

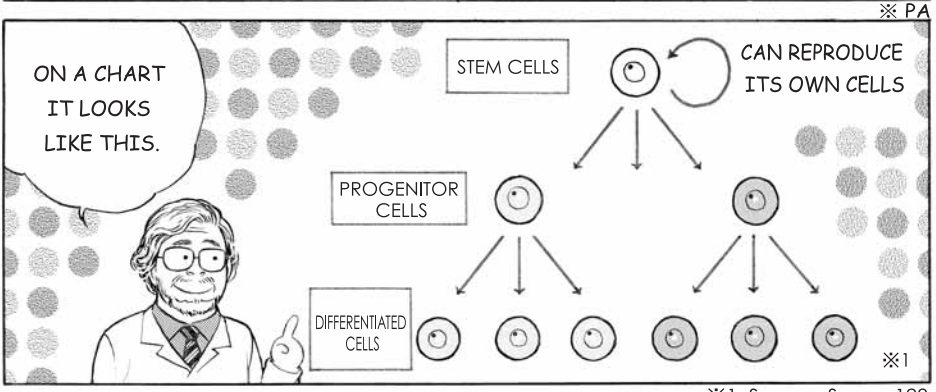

New discovery!!
iPS cells
Fantastic regenerative medicine
THERE WAS A SPECIAL ON TV ABOUT IPS CELLS.
WHEN I SAW IT I THOUGHT IT WAS REALLY AMAZING.
ARE THERE REALLY SUCH THINGS AS ALMIGHTY CELLS?
They can regenerate many things, right?
A QUESTION ...
…ARE YOU INTERESTED IN ALMIGHTY CELLS?
YE-YES!!
Click
HUH?
YES
…THE WAY THEY PRESENT IT ON TV IS A LITTLE PROBLEMATIC.
sur-prise
WHAT?
MR. AAAAH
Aaa-aaah!!
IS EVERYONE HERE …?
nod


I'M NORIO NAKATSUJI.
I'LL EXPLAIN ABOUT PLURIPOTENT STEM CELLS. IF YOU HAVE ANY QUESTIONS DON'T HESITATE TO ASK.
WHAT ARE PLURIPOTENT STEM CELLS?
WELL… I WAS ABOUT TO EXPLAIN RIGHT NOW.
I have a question.
PROFESSOR
.....
?
OH!?
NO! YOU WERE GOING TO TEACH ABOUT ALMIGHTY CELLS, RIGHT!?
Why is he starting about something else?
PLURIPOTENT STEM CELLS ARE ALMIGHTY CELLS, THEY'RE THE SAME THING
just called differently
Ah...
Heh...

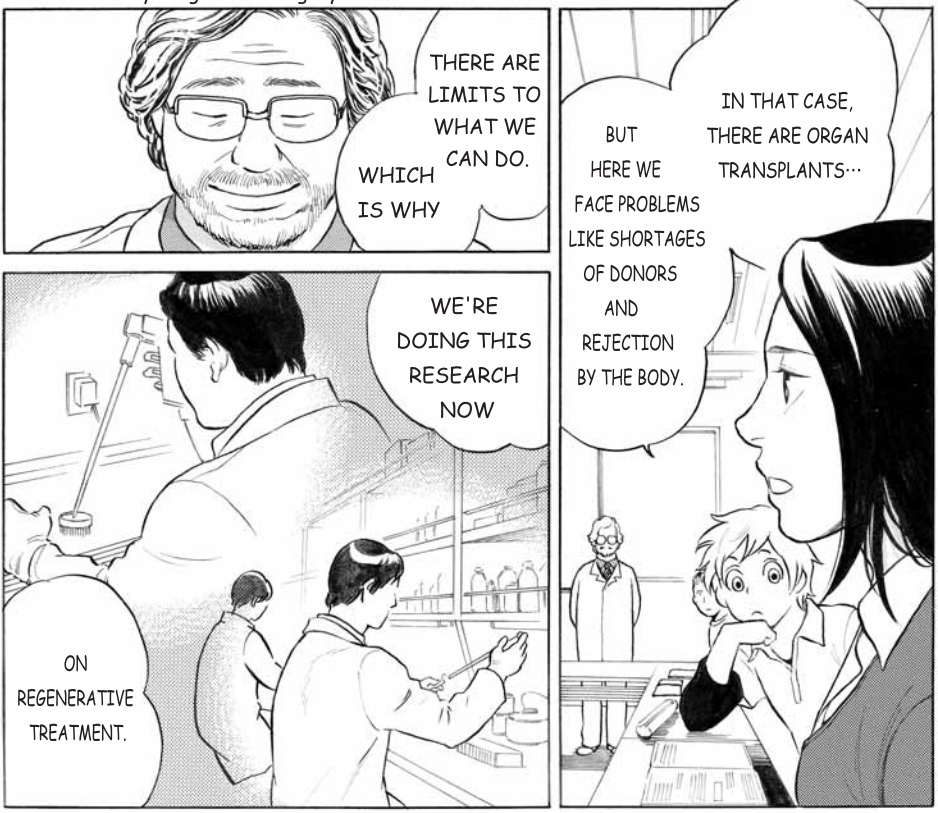

a mass of cells
YES, OUR BODIES ARE MADE OUT OF CELLS, BUT
WHEN WE ARE INJURED
Waaaah!
We get damaged!
TO REPLACE THE LOST CELLS, THE REMAINING CELLS REPRODUCE AND REPAIR THE WOUND.
We'll have to reproduce then.
It's filled up.
HA HA…
THE NAME "ALMIGHTY CELLS" IS MORE WIDELY KNOWN. I GUESS THAT CAN'T BE HELPED.
It's easier to pronounce, too.
FIRST, WHAT ARE STEM CELLS?
THEY ARE CELLS IN THE STATE BEFORE THEY TURN INTO CELLS THAT DIFFERENTIATE!!
THAT'S WHY WE NEED CELLS BEFORE THEY DIFFERENTTIATE.
I don't have a regular job yet.
I'll do it.
Keratin is the outermost layer of the skin.
I am supporting the layer of keratin in the epidermis: it's impossible to help others.
We're blood cells. We can't do it.
BUT CELLS THAT HAVE ALREADY DIFFERENTIATED TO FULFILL A CERTAIN FUNCTION, MANY OF THEM HAVE LOST THE ABILITY TO REPRODUCE.

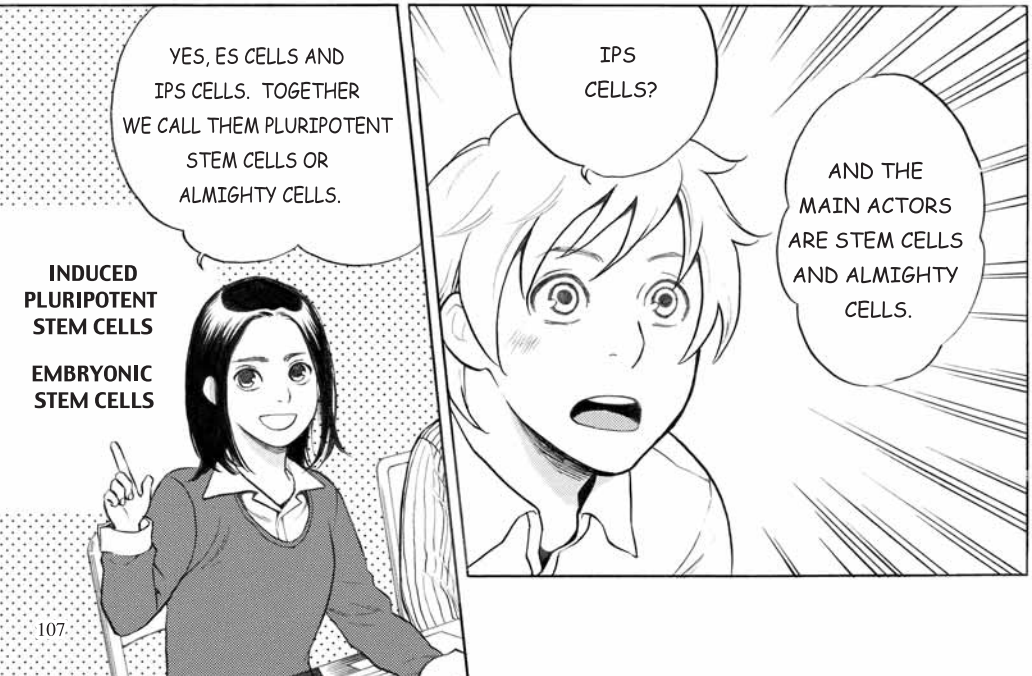


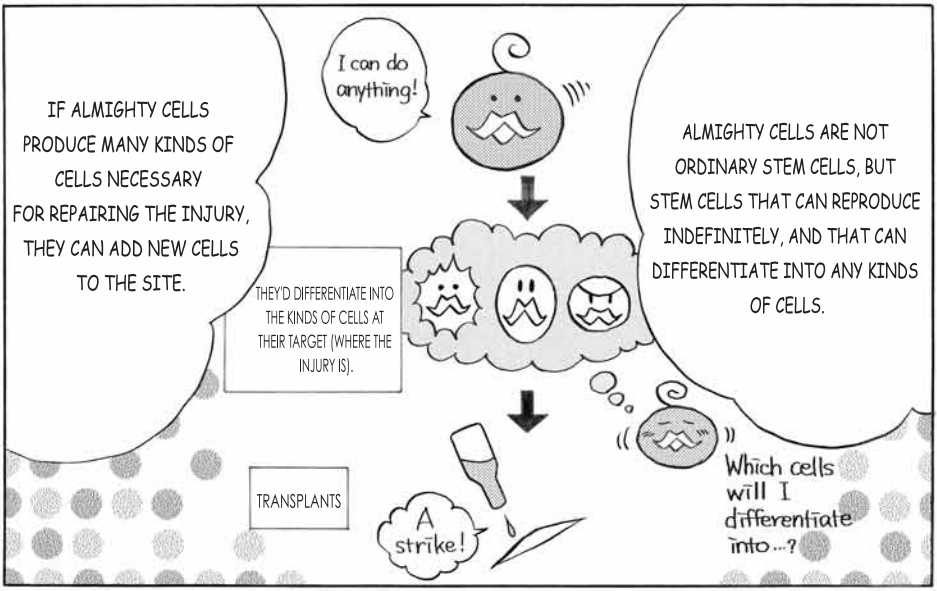
※ PA

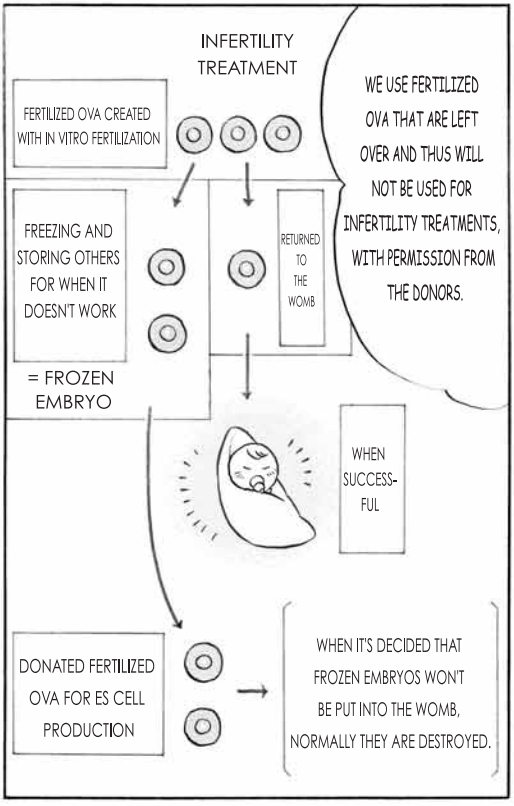


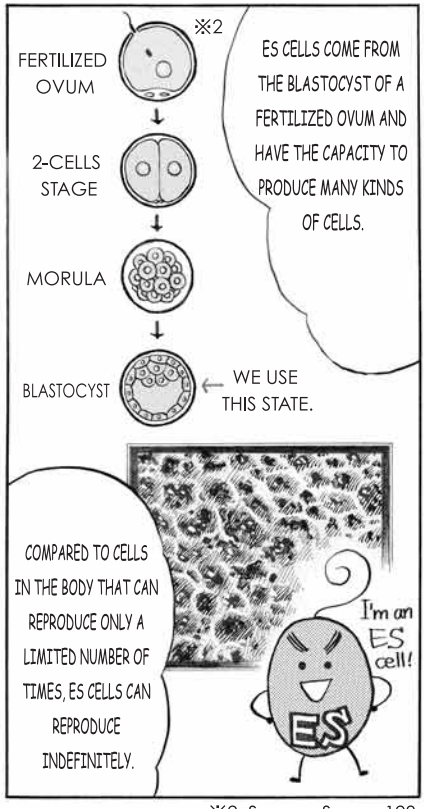
※1 Source: See p. 128


THERE ARE LIMITS TO WHAT WE CAN DO.
WHICH IS WHY
IN THAT CASE, THERE ARE ORGAN TRANSPLANTS…
BUT HERE WE FACE PROBLEMS LIKE SHORTAGES OF DONORS AND REJECTION BY THE BODY.
WE'RE DOING THIS RESEARCH NOW
ON REGENERATIVE TREATMENT.

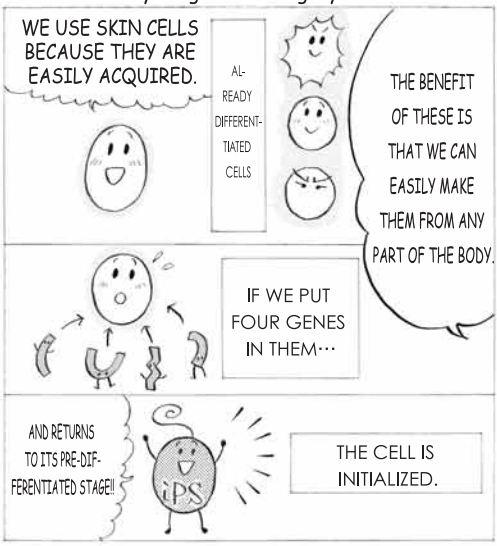

YES, ES CELLS AND IPS CELLS. TOGETHER WE CALL THEM PLURIPOTENT STEM CELLS OR ALMIGHTY CELLS.
INDUCED PLURIPOTENT STEM CELLS
EMBRYONIC STEM CELLS
IPS CELLS?
AND THE MAIN ACTORS ARE STEM CELLS AND ALMIGHTY CELLS.

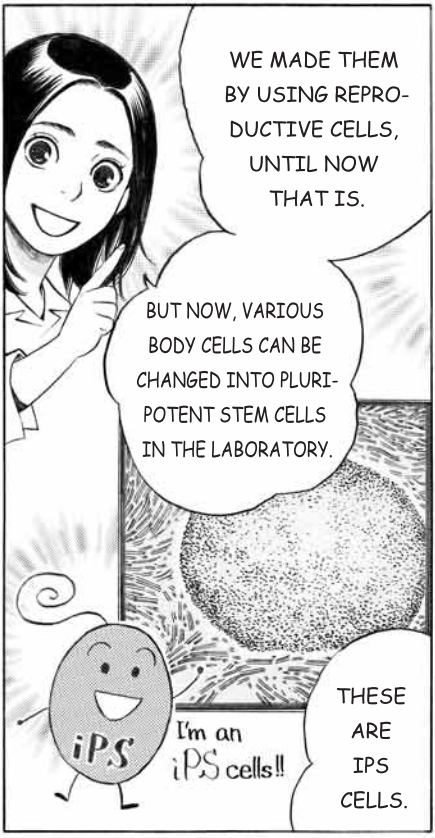


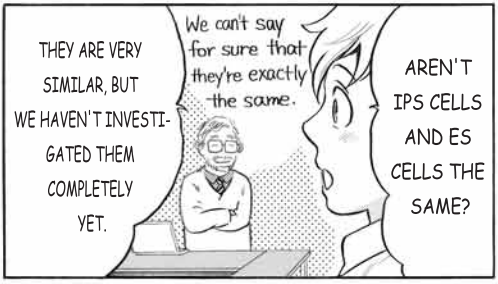


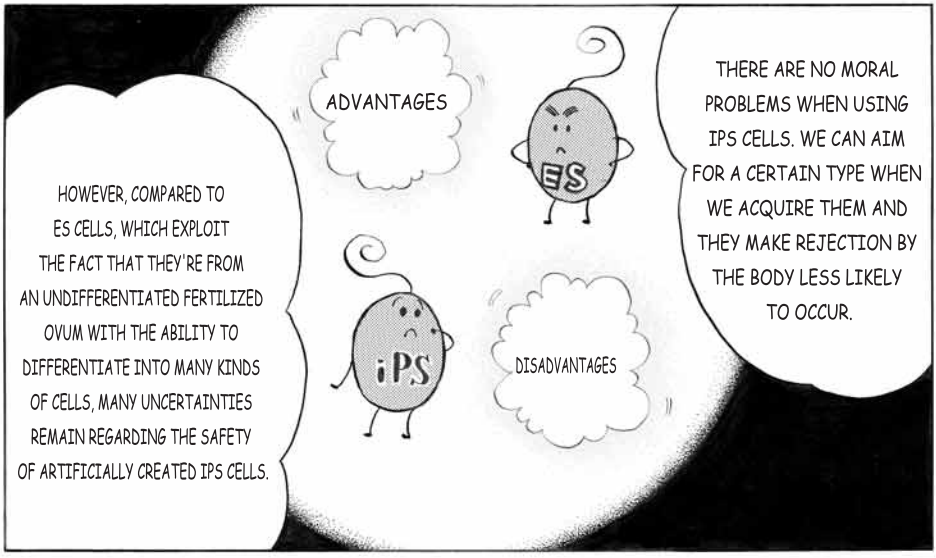


※2 Source: See p. 128


WE USE SKIN CELLS BECAUSE THEY ARE EASILY ACQUIRED.
AL-READY DIFFERENT-TIATED CELLS
THE BENEFIT OF THESE IS THAT WE CAN EASILY MAKE THEM FROM ANY PART OF THE BODY.
IF WE PUT FOUR GENES IN THEM…
AND RETURNS TO ITS PRE-DIF-FERENTIATED STAGE!!
iPS
THE CELL IS INITIALIZED.


WE MADE THEM BY USING REPRO-DUCTIVE CELLS, UNTIL NOW THAT IS.
BUT NOW, VARIOUS BODY CELLS CAN BE CHANGED INTO PLURI-POTENT STEM CELLS IN THE LABORATORY.
iPS
I'm an iPS cells!!
THESE ARE IPS CELLS.


THEY ARE VERY SIMILAR, BUT WE HAVEN'T INVESTI-GATED THEM COMPLETELY YET.
We can't say for sure that they're exactly the same.
AREN'T IPS CELLS AND ES CELLS THE SAME?

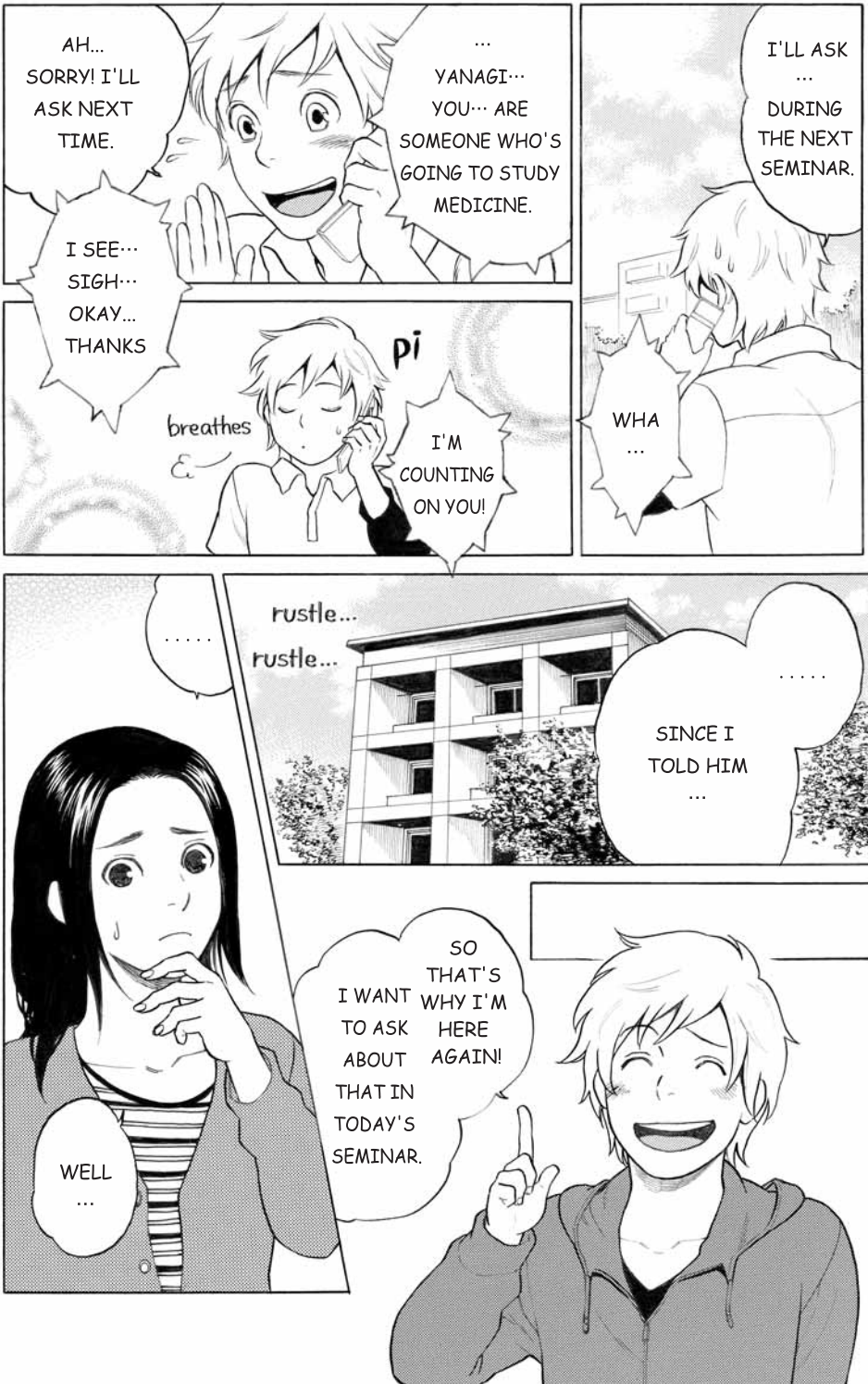

HOWEVER, COMPARED TO ES CELLS, WHICH EXPLOIT THE FACT THAT THEY'RE FROM AN UNDIFFERENTIATED FERTILIZED OVUM WITH THE ABILITY TO DIFFERENTIATE INTO MANY KINDS OF CELLS, MANY UNCERTAINTIES REMAIN REGARDING THE SAFETY OF ARTIFICIALLY CREATED IPS CELLS.
ADVANTAGES
ES
iPS
DISADVANTAGES
THERE ARE NO MORAL PROBLEMS WHEN USING IPS CELLS. WE CAN AIM FOR A CERTAIN TYPE WHEN WE ACQUIRE THEM AND THEY MAKE REJECTION BY THE BODY LESS LIKELY TO OCCUR.


WITH ALMIGHTY CELLS YOU'LL BE ABLE TO TREAT MANY MORE CONDITIONS THAN YOU CAN NOW, RIGHT?
WHAT KINDS OF CONDITIONS WOULD YOU BE ABLE TO HEAL?
scribble
scribble
AND··· IN THE FUTURE IT SHOULD BE POSSIBLE TO PROVIDE EACH PATIENT WITH MATCHING TYPES OF ES CELLS TO REDUCE REJECTION.
UM ...
scribble
scribble
scribble
ARE THERE ANY QUESTIONS?
• PARKINSON'S DISEASE
• SPINAL CORD INJURIES
• AGE-RELATED MACULAR DEGENERATION
• OPHTHALMOLOGIC (EYE) DISEASES LIKE PIGMENTARY DEGENERATION OF THE RETINA
• CORONARY DISEASE
• DIABETES
• CIRRHOSIS OF THE LIVER
AND MORE···
WHAT WE'RE LOOKING AT NOW ARE...
.....
WE'RE STILL ON THE LEVEL WHERE WE'RE ONLY AIMING FOR···
Tack
Tack
scribble
scribble
Parkinsons disease
Spinal cord injuries
SPINAL CORD ... INJURIES?


REALLY?
YES!
YES!
I WONDER IF HE'S ALL RIGHT ...
Ah...
THANK YOU SO MUCH!
THANK YOU!
MR. AAAAH
bang!
I WOULD JUST LIKE TO ADD ...
GOOD BYE !
YOUR LEGS… YOUR SPINAL CORD INJURY WOULD HEAL, HE SAID!
IF YOU HAVE THOSE ALMIGHTY CELLS,
… REALLY ?


THEY SAID SOMETHING ABOUT IT ON TV, SO...
IS THAT REALLY TRUE!?
THERE WAS A SEMINAR SO I WENT. YES, IT LOOKS LIKE IT'S TRUE.
I'M TELLING YOU, YES!
THE PROFESSOR SAID SO!
ABLE TO RUN!
NO YOU'LL BE ABLE TO RUN! LIKE YOU USED TO.
YOU'LL BE ABLE TO WALK AGAIN!


ABLE TO RUN !!
WHEN WILL PEOPLE BE ABLE TO USE THIS TREATMENT !?
WHEN ?
SO MAKE SURE YOU'RE READY ...
UM ...
UM ...
IS IT RELIABLE? IS IT SAFE?
HOW MUCH DOES IT COST? HOW MUCH DOES THE TREATMENT COST?
CAN I GET IT IN JAPAN?
LET'S SEE ...


AH... SORRY! I'LL ASK NEXT TIME.
... YANAGI... YOU... ARE SOMEONE WHO'S GOING TO STUDY MEDICINE.
I SEE... SIGH... OKAY... THANKS
breathes
pi
I'M COUNTING ON YOU!
I'LL ASK ... DURING THE NEXT SEMINAR.
WHA ...
rustle...
rustle...
.....
SINCE I TOLD HIM ...
.....
WELL ...
I WANT TO ASK ABOUT THAT IN TODAY'S SEMINAR.
SO THAT'S WHY I'M HERE AGAIN!


…I'M SURE THAT BOY WANTS TO BE ABLE TO GET TREATMENT AS SOON AS POSSIBLE.
ER… IS THAT… DIFFICULT?
YES.
YES, IT'S NOT A MATTER OF TWO OR THREE YEARS…
WE CAN'T SAY WHEN EXACTLY…
BUT… AN APPROXIMATE DATE MIGHT BE…
WE'RE NOT ON THE LEVEL WHERE WE CAN SAFELY PERFORM TREATMENT.
YOU SHOULDN'T HAVE TOLD HIM ANYTHING YOU DON'T KNOW FOR SURE AND GET HIS HOPES UP.


POSSIBILITY THAT THE BODY MIGHT REJECT THEM. IPS CELLS ARE MADE BY INSERTING GENES INTO CELLS OR BY ALTERNATIVE METHODS BUT IT'S UNCLEAR WHETHER THEY'RE SAFE. WE CAN'T GUARANTEE THAT THEY ARE YET.
AND THE FACT THAT ES CELLS USED FOR RESEARCH FOR MANY YEARS WERE MADE BY DESTROYING EMBRYOS PRESENTS AN ETHICAL CONCERN, AND THERE THE
But we're investigating how to reduce rejection.
WITH ALMIGHTY CELLS,
THERE ARE STILL PROBLEMS REMAINING REGARDING SAFETY AND SO ON.
.....


YOU CAN'T MAKE ORGANS OUT OF THE BLUE. CANCER DOESN'T HEAL JUST BY PUTTING ALMIGHTY CELLS INTO IT.
AND THERE ARE THINGS WE CAN'T HEAL WITH THESE CELLS.


SO IT'S NOT REALLY… ALMIGHTY… AT ALL.


SIGH
...
THERE'S A LOT OF RESEARCH TO BE DONE YET.
FOR SPINAL CORD INJURIES, WHEN THE INJURY HAS JUST OCCURRED, WE HAVE HIGH HOPES FOR RESULTS. BUT WHEN IT'S AN OLDER INJURY, WE CAN'T RULE OUT THAT IT WOULD MAKE THINGS WORSE.
.....
clack
click
AHHHH... WHAT DO I TELL HIM?

I'M SURE THAT BOY WANTS TO BE ABLE TO GET TREATMENT AS SOON AS POSSIBLE.

I DIDN'T TELL HIM… THAT HE'D GET BETTER RIGHT AWAY…

IT'S NOT AS IF I… LIED TO HIM …

WHAT A COINCI-DENCE.

I NEVER THOUGHT I'D MEET THE PROFESSOR HERE ON A SUNDAY.

pat pat

AH!

IS THAT...? MR. DEMACHI?

YES

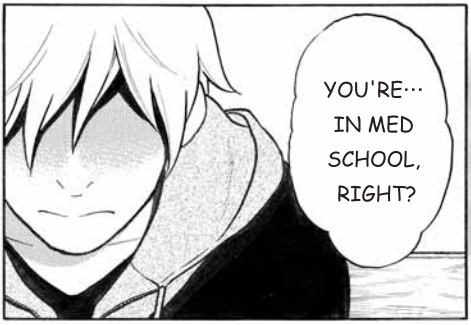
WHAAT!?

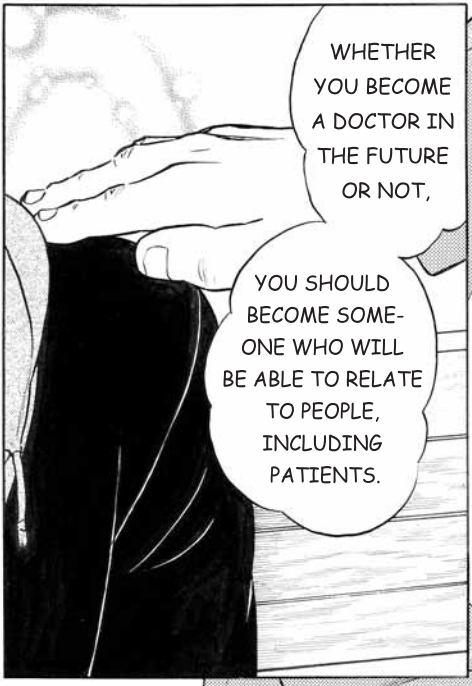

UM… PROFESSOR, THERE'S SOME-THING…
…IF YOU DON'T MIND.
. . . . .
?
… I SEE
I OFTEN GET LETTERS AND E-MAIL MESSA-GES FROM PATIENTS …
MANY OF THEM SAY THAT NOW THEY HAVE HOPE.
AND IN RETURN I …


HAVE TO TELL THEM THAT IT'S STILL TOO SOON TO USE THE TREATMENT IN CLINICAL PRACTICE.
BUT IN JAPAN IT'S DIFFICULT TO STAY AT THE FOREFRONT OF RESEARCH.
YOU NEED A 'CLEAN ROOM' FACILITY WHERE SAFETY CAN BE GUARANTEED.
RIGHT NOW WE'RE DOING RESEARCH USING HUMAN AND MONKEY ES CELLS, IN DIFFERENTIATION INDUCTION RESEARCH AND TRANSPLANTS IN MODEL ANIMALS, FOR VARIOUS DISEASES.
…IS THE RESEARCH AT THAT LEVEL YET?
BUT …
ON THE OTHER HAND, WE DON'T KNOW HOW HIGH THE COST WHEN WE CAN FINALLY USE IT FOR TREATMENT…
OF COURSE IT WOULD BE A GREAT MEDICAL PROGRESS…
IT TAKES A LOT OF TIME TO GET RESEARCH PLANNING THROUGH ALL THE FORMALITIES.
AND THERE ARE SO MANY REGULATIONS AND PAPER WORKS IN JAPAN.


I HOPE THEY'RE HAPPY WHEN THEY AT LEAST GET A REPLY.
IT'S IMPORTANT FOR PATIENTS TO HAVE HOPE.
RIGHT NOW, ALL OVER THE WORLD, MANY TEAMS ARE WORKING ON DIFFERENT TASKS BUT ALL WITH THE SAME PURPOSE.
BUT IT'S TRUE THAT WE'RE DOING THIS RESEARCH BE-CAUSE OUR AIM IS TO GIVE IT A PURPOSE IN THE FUTURE.
OF COURSE THE RESEARCH WILL TAKE A LOT OF TIME …
IT'S HARD TO EXPLAIN, BUT…

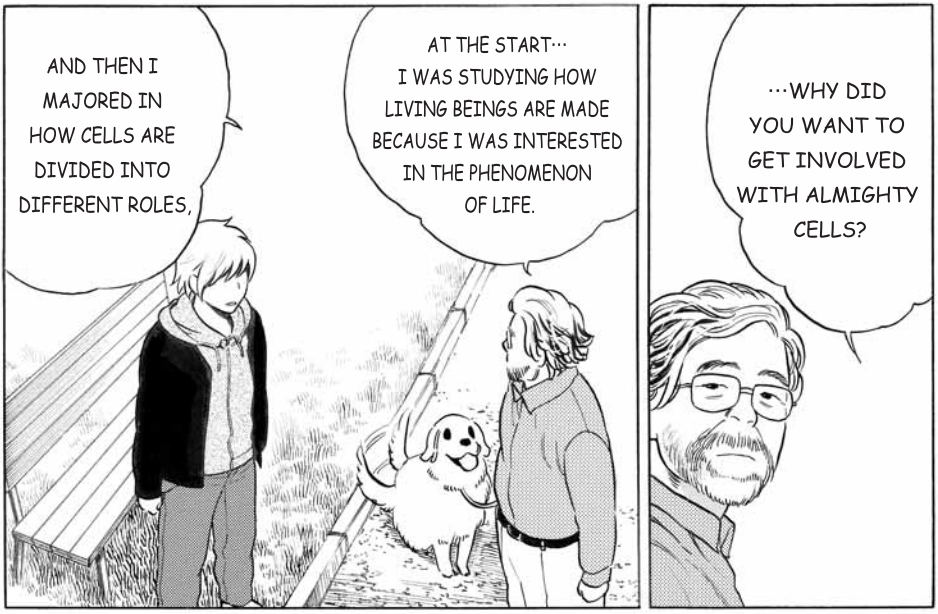

I CAN RUN AGAIN!


YOU'RE… IN MED SCHOOL, RIGHT?


WHETHER YOU BECOME A DOCTOR IN THE FUTURE OR NOT,
YOU SHOULD BECOME SOME-ONE WHO WILL BE ABLE TO RELATE TO PEOPLE, INCLUDING PATIENTS.

WHEN INTERACTING WITH DIFFERENT PEOPLE, THINK ABOUT WHAT TO TELL THEM ABOUT HOW YOU THINK AND FEEL,
IT'S VERY IMPORTANT TO IMAGINE HOW THEY FEEL


AH!
THANK YOU …
AH …
I HAVE TO GO.


AND THEN I MAJORED IN HOW CELLS ARE DIVIDED INTO DIFFERENT ROLES,
AT THE START… I WAS STUDYING HOW LIVING BEINGS ARE MADE BECAUSE I WAS INTERESTED IN THE PHENOMENON OF LIFE.
…WHY DID YOU WANT TO GET INVOLVED WITH ALMIGHTY CELLS?


I HAD TO DO IT.
THEN, IT TURNED OUT THAT PEOPLE WOULD BENEFIT IN FROM OUR RESEARCH IN THE FUTURE.

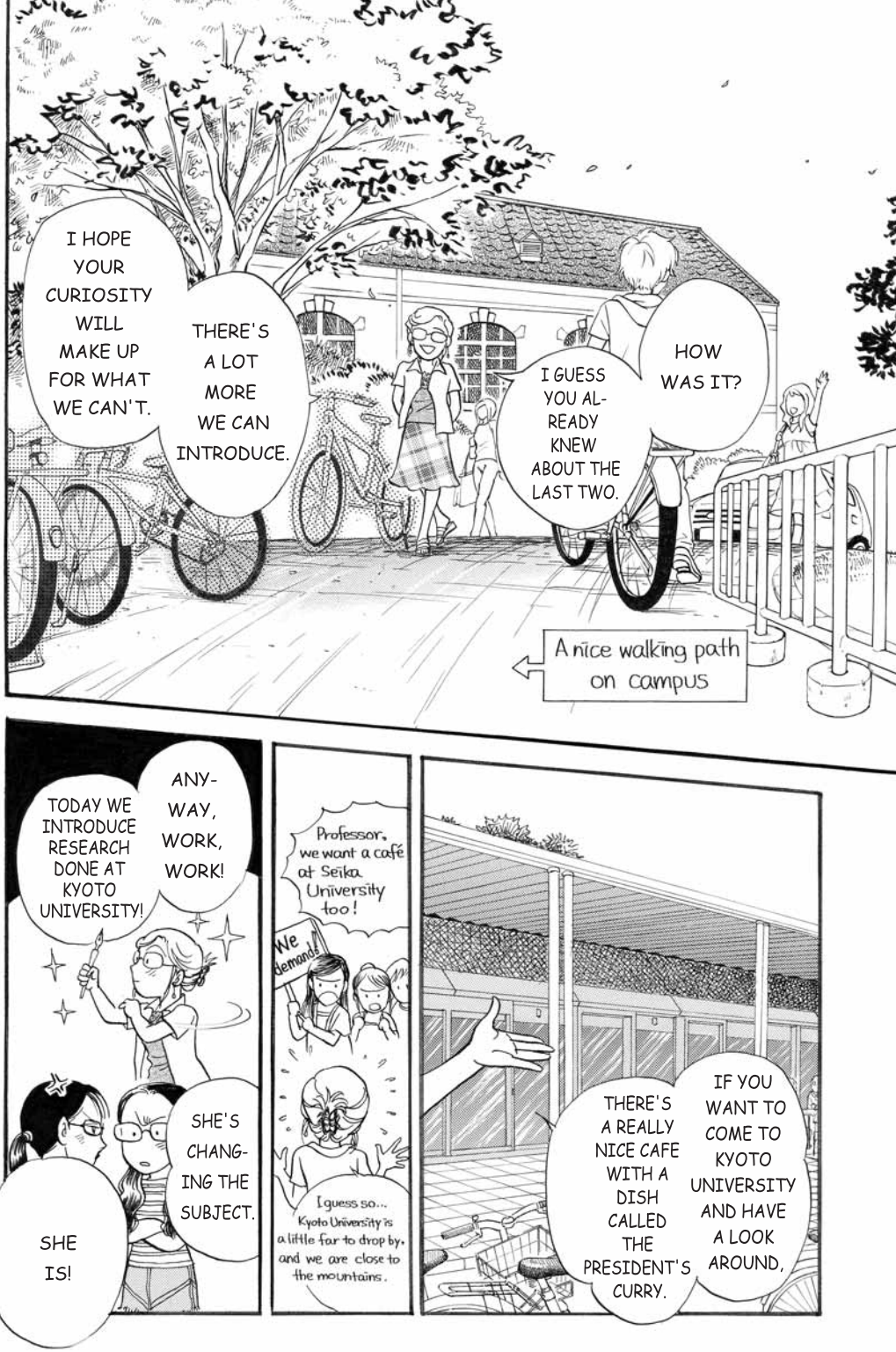

PU
PU
PU
rrring
rrring
I WANT TO GET IT OVER WITH ...
A TEXT MESSAGE.
WHAT I HAVE TO DO NOW ...
SENDING NEW MAIL
click
click
EUCLIDES.S
.....
click
Ah.

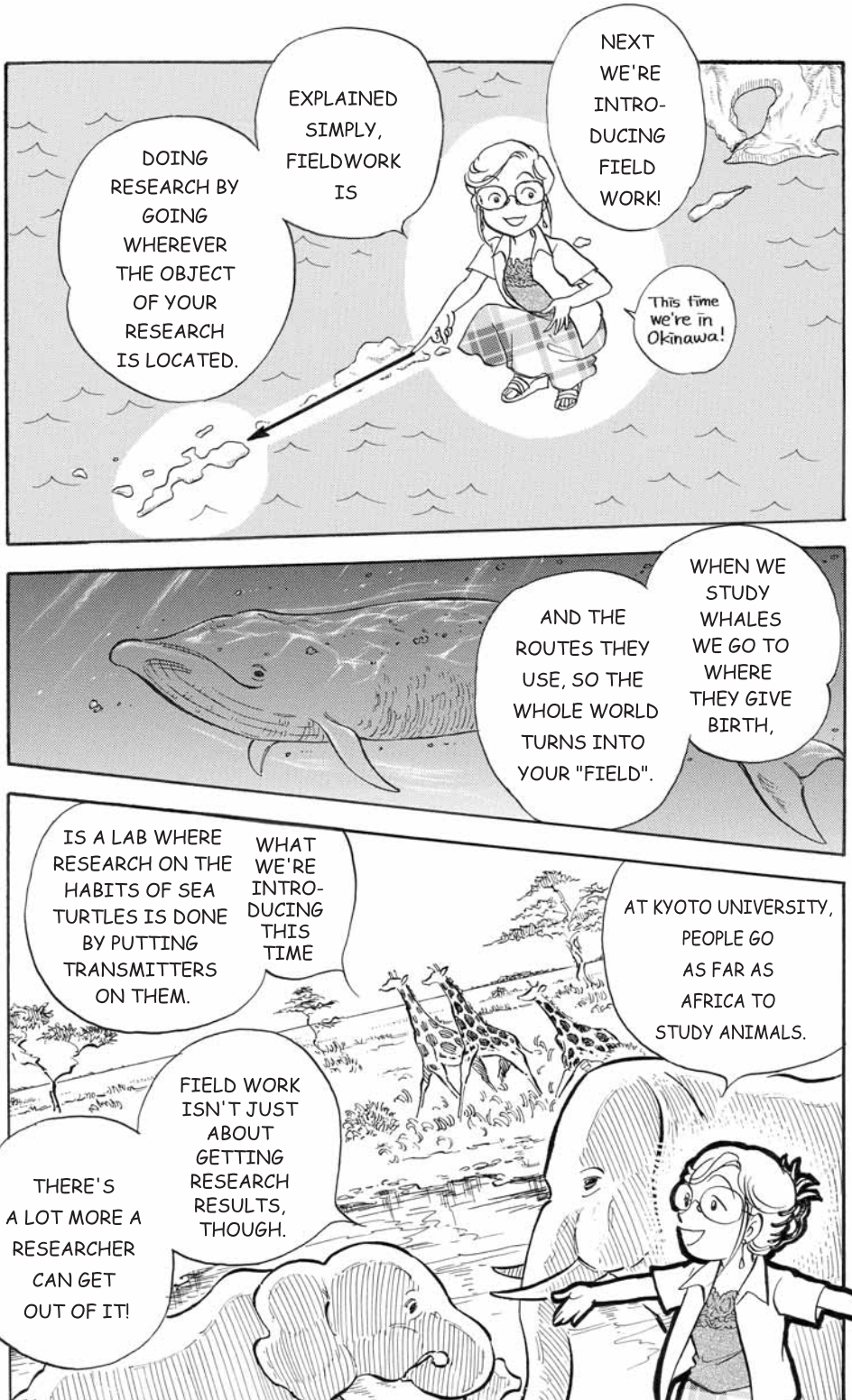

shock
THIS CALL IS BEING TRANSFERRED... …THIS IS THE MESSAGECENTER.
THE …
LAST TIME… I CALLED …
SORRY !!
About what ?
SORRY! WHAT DID YOU CALL ABOUT?
…THE …I MEAN…
FIRST …


SO… I'M SORRY …
UM… ABOUT… PRAISING IT TO THE SKIES.
…
YES …
silence… ouch…
…
IT WILL TAKE A LOT MORE TIME… I HEARD.
…..
THANKS FOR TELLING ME.
…IT'S REALLY A… …LET DOWN.
…
YEAH …
BUT …
……
…..
ON TV THEY DIDN'T SHOW WHAT I REALLY WANT TO KNOW.


I HAVE TO GO.
YES, YES, BUT…
YEAH, RIGHT NOW… YOU'VE GOT A GAME, RIGHT…
DO YOUR BEST! I'LL DO MY BEST TOO!
WHAT ? OKAY.
LET'S GIVE IT OUR BEST …
rub …
. . . . .
PU
HEY !
I'M COMING
OKAY !

All charts in this chapter are from Norio Nakatsuji's book, Hito bannou saibou naze bannou ka, Iwanami Science Library 88, published by Iwanami Shoten.


I HOPE YOUR CURIOSITY WILL MAKE UP FOR WHAT WE CAN'T.
THERE'S A LOT MORE WE CAN INTRODUCE.
I GUESS YOU ALREADY KNEW ABOUT THE LAST TWO.
HOW WAS IT?
A nice walking path on campus
TODAY WE INTRODUCE RESEARCH DONE AT KYOTO UNIVERSITY!
ANYWAY, WORK, WORK!
SHE'S CHANGING THE SUBJECT.
SHE IS!
Professor, we want a café at Seika University too!
We demands!
I guess so... Kyoto University is a little far to drop by, and we are close to the mountains.
THERE'S A REALLY NICE CAFE WITH A DISH CALLED THE PRESIDENT'S CURRY.
IF YOU WANT TO COME TO KYOTO UNIVERSITY AND HAVE A LOOK AROUND,


NEXT WE'RE INTRO-DUCING FIELD WORK!
EXPLAINED SIMPLY, FIELDWORK IS
DOING RESEARCH BY GOING WHEREVER THE OBJECT OF YOUR RESEARCH IS LOCATED.
This time we're in Okinawa!
WHEN WE STUDY WHALES WE GO TO WHERE THEY GIVE BIRTH,
AND THE ROUTES THEY USE, SO THE WHOLE WORLD TURNS INTO YOUR "FIELD".
AT KYOTO UNIVERSITY, PEOPLE GO AS FAR AS AFRICA TO STUDY ANIMALS.
WHAT WE'RE INTRO-DUCING THIS TIME IS A LAB WHERE RESEARCH ON THE HABITS OF SEA TURTLES IS DONE BY PUTTING TRANSMITTERS ON THEM.
FIELD WORK ISN'T JUST ABOUT GETTING RESEARCH RESULTS, THOUGH.
THERE'S A LOT MORE A RESEARCHER CAN GET OUT OF IT!