
Science Clarified
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There is No Milk
PART 1 + PART 2: COMPLETE
INTERNET OF THINGS
Coming Soon to Your Home!
STUDIO WAS PRESENTS A SCIENCE CLARIFIED STORY ABOUT INTERNET OF THINGS BY TIMO KIRAVUO
SEBASTIAN SONNTAG LE WANG DIRECTOR TIMO KIRAVUO EXECUTIVE PRODUCER 1 LE WANG
EXECUTIVE PRODUCER 2 SEBASTIAN SONNTAG LANGUAGE BY PIA SCHULTE
IN EPIC "INTERNET OF THINGS"

HELLO WORLD! AT LONG LAST WE ARE ABLE TO PROUDLY PRESENT YOU OUR INTERNET OF THINGS COMIC. WE ALWAYS IMAGINED THAT THERE IS A FUN WAY TO EXPLAIN DIFFERENT ASPECTS OF SCIENCE AND THAT COMICS ARE A USEFUL AND ENJOYABLE WAY TO DO SO. WE HOPE THAT AT THE END OF THIS STORY, YOU HAVE BOTH ENJOYED IT AND LEARNED SOMETHING NEW.

AUTHORS:

TIMO KIRAVUO
AUTHOR AND DIRECTOR

M.SC. TIMO KIRAVUO IS KNOWN FOR WRITING THE FIRST FINNISH NETIQUETTE IN LATE 1980'S, SINCE THEN HE HAS BROKEN NETWORKS AT HOME AND ABROAD. SOME OF HIS ACCOMPLISHMENTS ARE THE INTERNET SECURITY POLICY FOR THE FINNISH GOVERNMENT IN 1998 AND OPERATING THE SAUDI ARABIAN INTERNET BACKBONE A FEW YEARS LATER. CURRENTLY HE ENJOYS TWISTING YOUNG MINDS IN AALTO UNIVERSITY AND IS CONSIDERED SOMEWHAT HARMLESS.

SEBASTIAN SONNTAG AND LE WANG
PRODUCERS AND OTHER TASKS

SEBASTIAN AND LE ARE PHD STUDENTS AND ENTHUSIASTIC COMIC FANS. WE BELIEVE THAT SCIENCE, THE STIMULUS OF THE FUTURE, CAN BE PRESENTED IN COMICS; A FUN WAY TO LEARN AND SHARE KNOWLEDGE. WE HOPE THAT OUR READERS WILL FEEL THE SAME SO THAT THIS WORK CAN BE CONTINUED.

PIA SCHULTE
LANGUAGE GENIUS

PIA SCHULTE IS A TEACHER FOR ENGLISH AS A SECOND LANGUAGE AND BIOLOGY FROM GERMANY WHO ENDED UP PUTTING HER LOVE FOR SCIENCE AND LANGUAGE TOGETHER WITH HER HOBBY OF BEING A NERD. AS EVERYONE IN STUDIO WAS, SHE ALSO BELIEVES IN COMICS BEING A GOOD WAY TO COMBINE FUN AND EDUCATION.

WE WOULD LIKE TO THANK WILHELM RAUSS, RAIMO VUOPIONPERÄ, TUOMAS TIRRONEN, JUHA RÖNING, SASU TARKOMA, YEVGENI KOUCHERYAVY, DIGILE OY AND THE INTERNET OF THINGS PROJECT FOR THEIR HELP AND INSIGHT ON INTERNET OF THINGS!

COMIC APP AVAILABLE FOR BOTH ANDROID AND IOS DEVICES!
MORE THAN ONE COMIC COMING!

SUPPORT THE COMIC AND BUY AN ELECTRONIC VERSION FROM PLAY STORE OR APPSTORE!

SEARCH "SCIENCE CLARIFIED"
CHECK ALSO OUR WEBSITE AT WWW.CLARIFIED.INFO


SO, SUSHILA, HOW'S YOUR HUSBAND?
SHHH
CLICK
KABOOM


ENTERPRENEUR'S WIFE DIES IN GAS EXPLOSION.
MR. PATIL, I'M VERY SORRY FOR YOUR LOSS.
SOMEBODY SHOULD DO SOMETHING . . . THAT SOMEBODY IS ME!


UNIVERSITY MEETING ROOM.
HAVE YOU SEEN THIS "PATIL PRIZE" CONTEST? THIS INDIAN ENTREPRENEUR LOST HIS WIFE IN AN ACCIDENT AND NOW WANTS TO MAKE THE WORLD A BETTER PLACE.
I CHALLENGE YOU TO SOLVE THESE PROBLEMS FOR HUMANITY:
REDUCE HOUSEHOLD ACCIDENTS BY 50%
REDUCE WASTE IN LOGISTICS BY 50%
REDUCE HOME ENERGY USE BY 30%
REDUSE HOUSEHOLD WASTE BY 30%
BEST SOLUTION FOR EACH PROBLEM
WILL RECEIVE 10 MILLION USD
- DEEPAK PATIL, INDIA
HEY, PROFESSOR, 10 MILLION IS REAL GOOD MONEY! LET'S GO FOR THIS.
WHAT CHANCES DO WE HAVE TO SUCCEED?


ACTUALLY, I THINK WE MIGHT DO WELL.
IN ANY CASE I HAVE ALREADY DECIDED THAT THIS WILL BE OUR NEXT RESEARCH PROJECT
?
?
THIS IS NOT ABOUT THE MONEY. IT IS ABOUT THE RESEARCH, THIS IS WORTH DOING WITHOUT THE PRIZE., BUT WINNING WOULD FUND US FOR MANY YEARS

Patil Prize Contest

Deepak Patil is a wealthy individual who wants to change the world. There are many ways to do so, one is to set a goal and attach a prize to it.

Charles Lindbergh flew first non-stop from New York to Paris in 1927 to win the Orteig Award of 25 000 US dollars (worth 300 000 - 400 000 in current money). SpaceShipOne flew to space twice within two weeks to win the Ansari X Prize of 10 million US dollars.

These prize moneys encourage people to enter the contests and inspire them to develop different solutions and can lead to numerous advances in the the whole scientific area.

Even though the money does often not compensate the costs of the experiments and materials, being the first to do something and tearing down existing barriers in a field of science may be a gratification on its own. Also Lindbergh's flight excited a generation of people and boosted aviation in general, the X Prize has inspired space travel in a similar way.

What Patil is doing is encouraging people to solve environmental problems. He sees his wife's death as a problem in the system. A lesser man would see better gas hoses as a solution, Patil is looking at the whole infrastructure of our society and he knows that efficiency also increases safety.

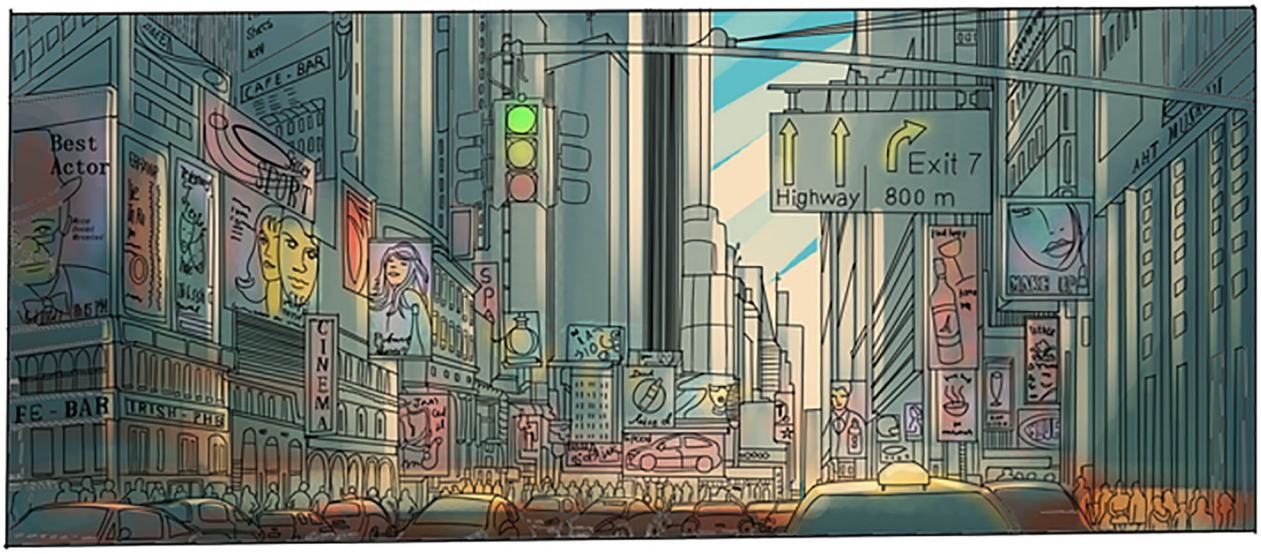
Internet of Things?

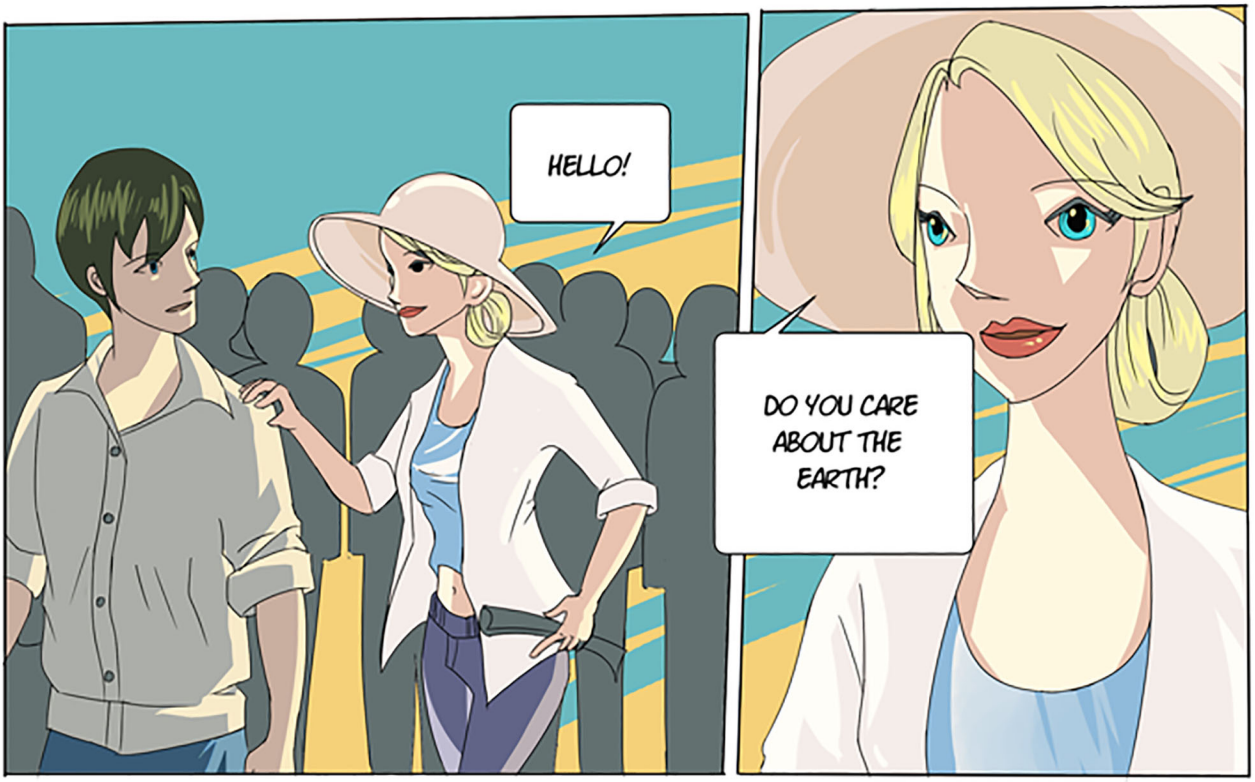
Patil's goals are tied to the Internet of Things. IoT means that all kinds of electronic devices, not only mobiles and laptops but also coffee makers and washing machines, will become connected to the Internet and lots of new devices and services will be created. The most important thing about IoT are the new services that are enabled by the devices

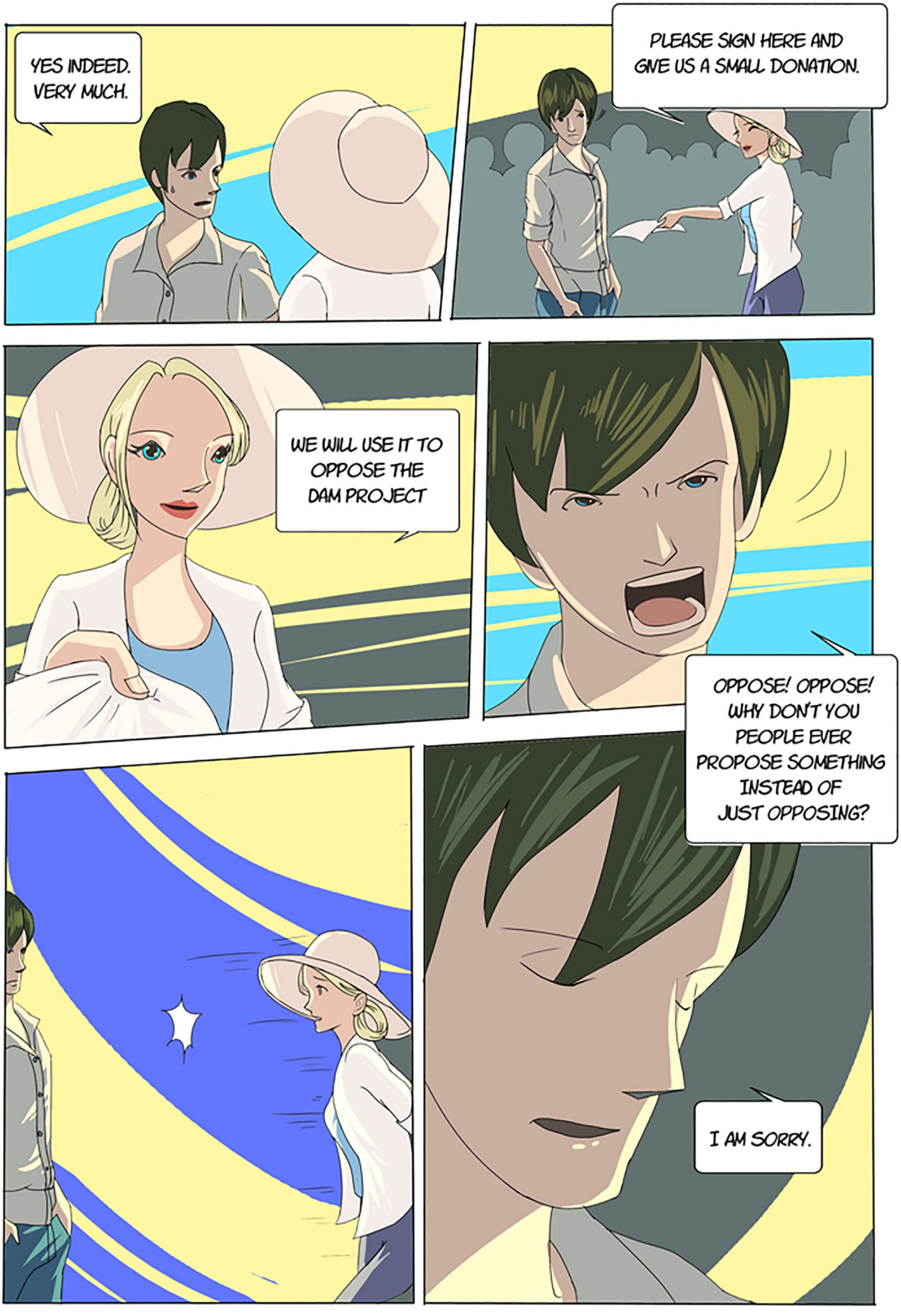
Some of the "things" will be additional features to existing home appliances, such as a stove that can be switched off over the Internet or a fridge that sends a message in case the cooling system breaks down. In addition to existing devices, cheap new devices can be added to the existing infrastructure, like road sensors that detect icing or animals and send information to a control system that can reduce the speed limit on signs or send a warning to cars.

Systems like these exist already, they become more powerful when the information is shared openly. The road condition information can also be sent to cars and used in route planning and animal information can be used to monitor wildlife.

The actual power of Internet of Things comes from information sharing, which enables new and unforeseen innovation (which we would like to tell you more about, but as it is unforeseen, we expect to be surprised by the future, too).

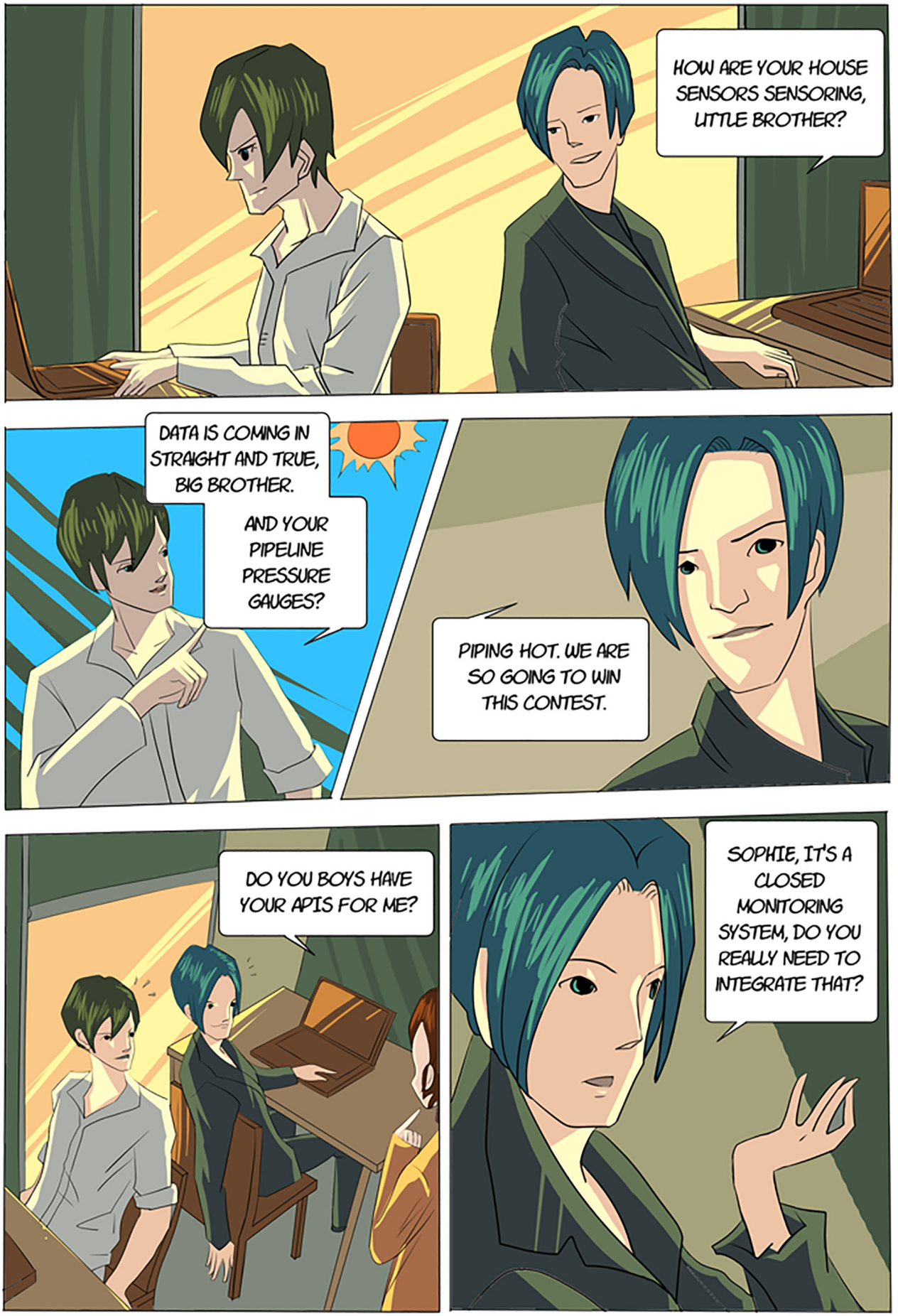

Best Actor
CAFE - BAR
CINEMA
Highway
Exit 7
800 m

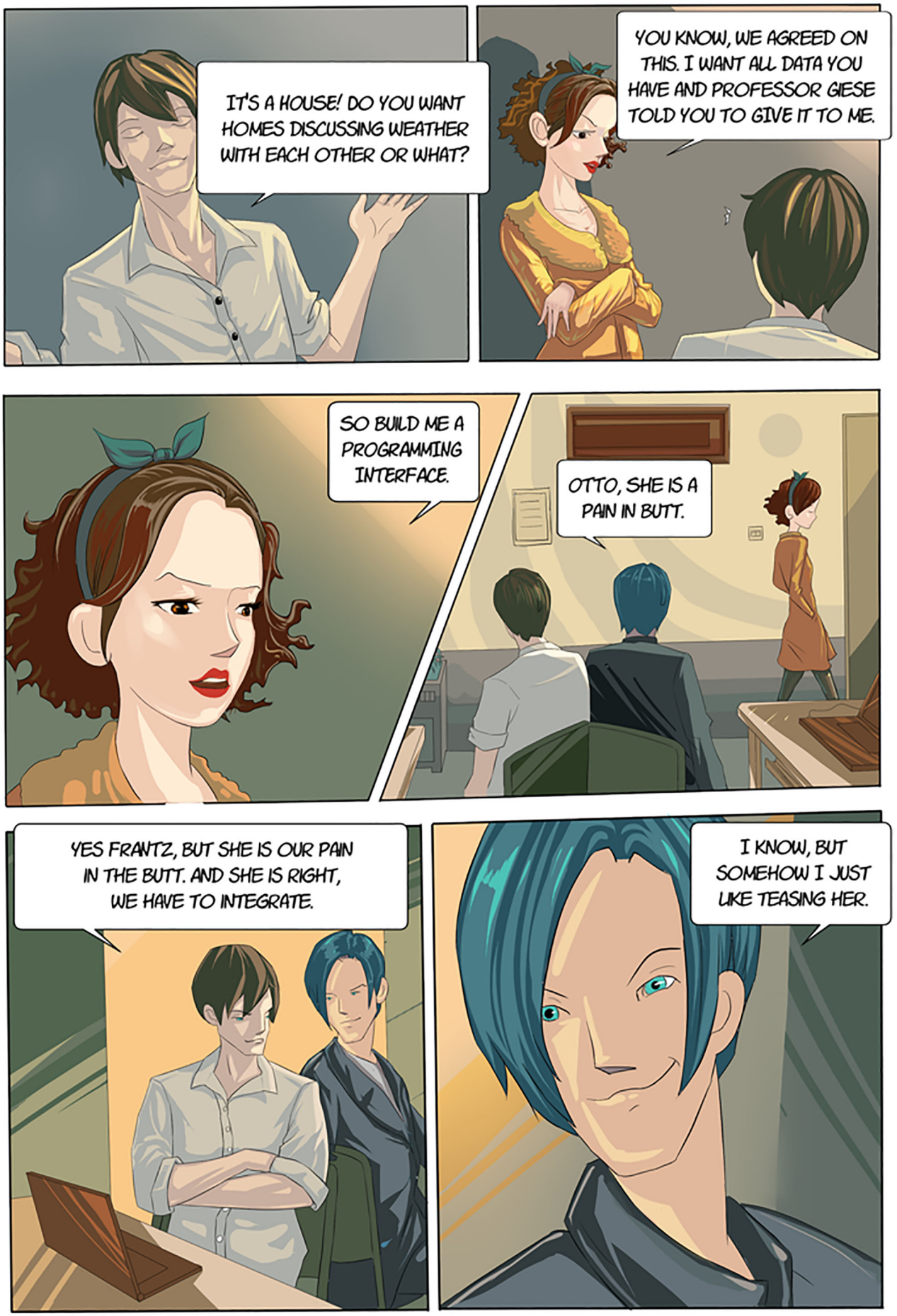

HELLO!
DO YOU CARE ABOUT THE EARTH?


YES INDEED. VERY MUCH.
PLEASE SIGN HERE AND GIVE US A SMALL DONATION.
WE WILL USE IT TO OPPOSE THE DAM PROJECT
OPPOSE! OPPOSE! WHY DON'T YOU PEOPLE EVER PROPOSE SOMETHING INSTEAD OF JUST OPPOSING?
I AM SORRY.

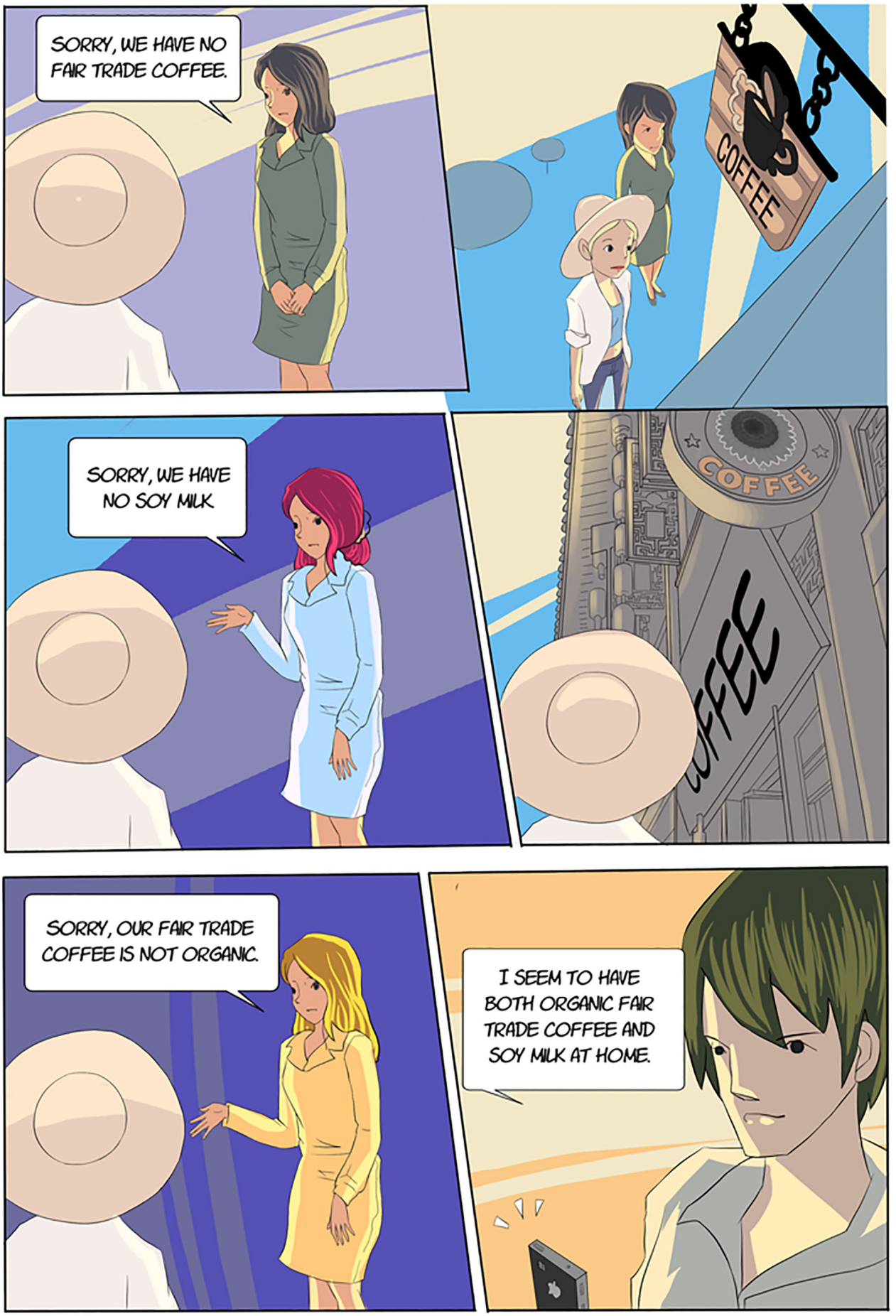

LONG DAY AT THE OFFICE, I AM REALLY TRYING TO SAVE THE EARTH, BUT I DON'T SEE ANY HELP FROM YOU PEOPLE
WHAT DO YOU MEAN "YOU PEOPLE"?
YOU EGO-TRIPPING LUDDITES! WE HAVE OVER SIX BILLION PEOPLE ON THIS GLOBE. WHY DON'T YOU THINK OF SOMETHING THAT WORKS INSTEAD OF JUST STOPPING EVERYTHING?
I WORK WITH THE MOST KIND AND CARING PEOPLE TO GUARANTEE A PLANET FOR THE NEXT GENERATION. WHAT HAVE YOU DONE?

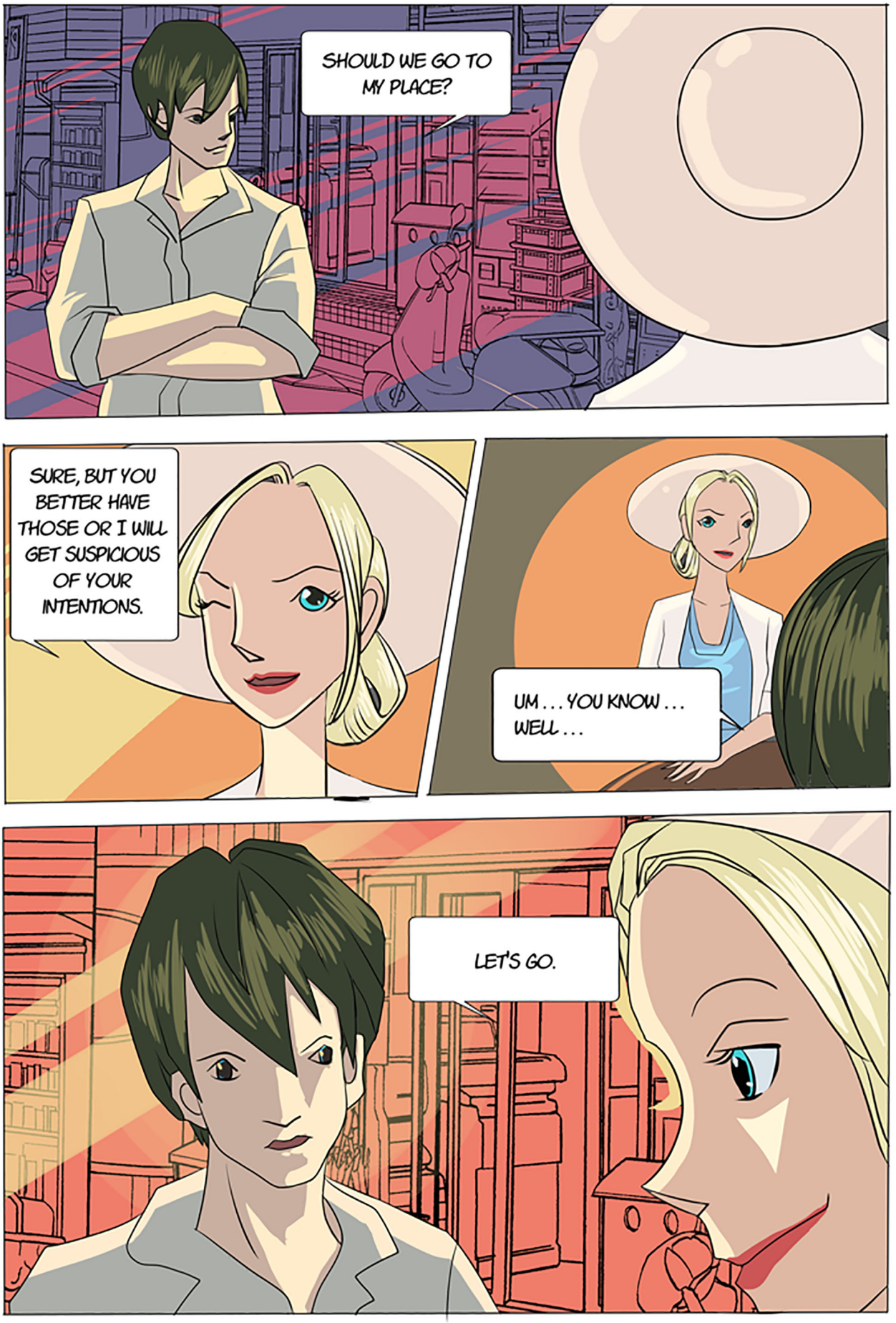

YOU PEOPLE JUST OPPOSE EVERYTHING.
I AM GOING TO REDUCE GREENHOUSE GAS EMISSIONS BY 20%!
OH YEAH?
OH YEAH!
SORRY ONCE AGAIN, ARE WE ON THE SAME SIDE ON THIS? I HAVE TO GO, HOW ABOUT MEETING FOR A COFFEE TOMORROW?
OK

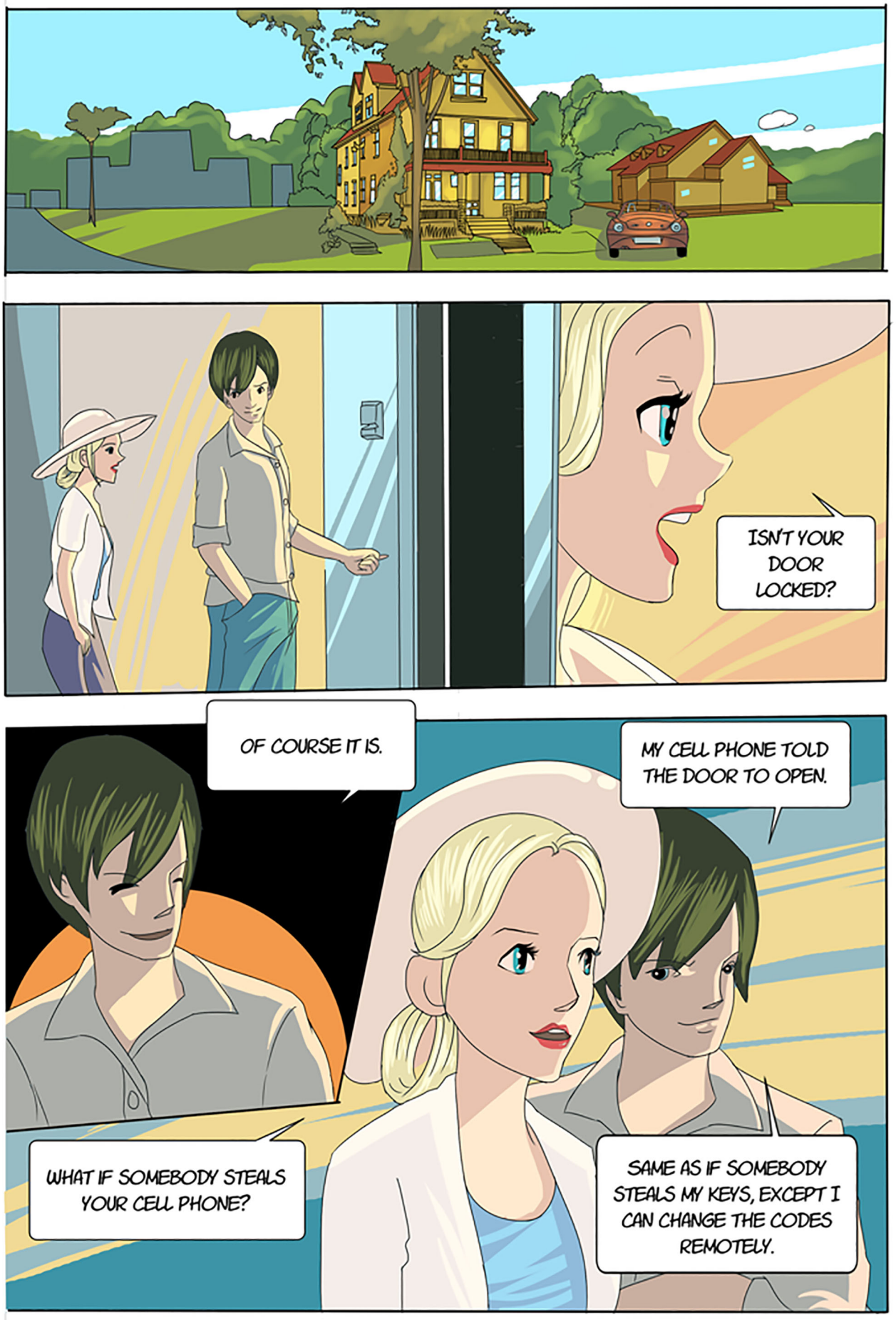

HOW ARE YOUR HOUSE SENSORS SENSORING, LITTLE BROTHER?
DATA IS COMING IN STRAIGHT AND TRUE, BIG BROTHER.
AND YOUR PIPELINE PRESSURE GAUGES?
PIPING HOT. WE ARE SO GOING TO WIN THIS CONTEST.
DO YOU BOYS HAVE YOUR APIS FOR ME?
SOPHIE, IT'S A CLOSED MONITORING SYSTEM, DO YOU REALLY NEED TO INTEGRATE THAT?

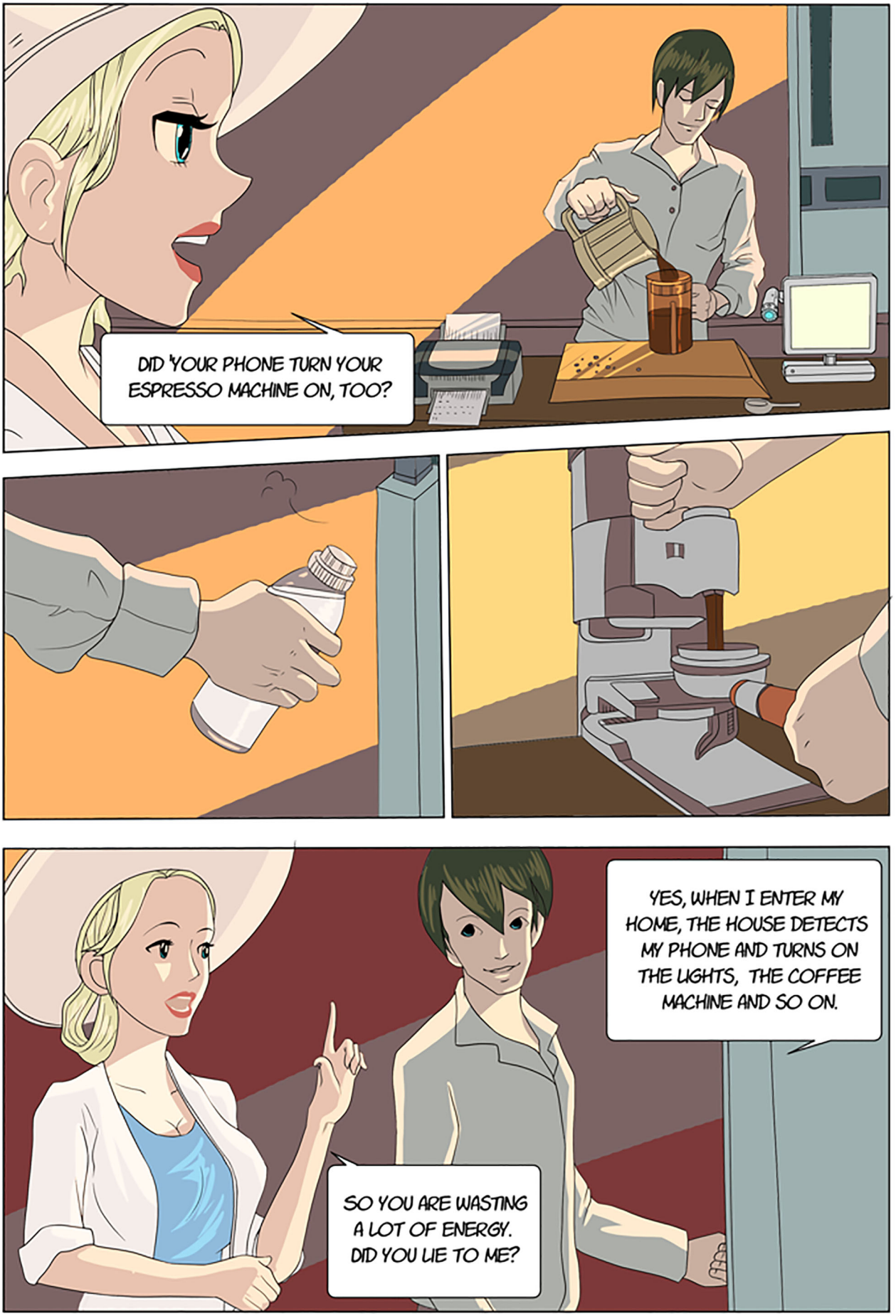

IT'S A HOUSE! DO YOU WANT HOMES DISCUSSING WEATHER WITH EACH OTHER OR WHAT?
YOU KNOW, WE AGREED ON THIS. I WANT ALL DATA YOU HAVE AND PROFESSOR GIESE TOLD YOU TO GIVE IT TO ME.
SO BUILD ME A PROGRAMMING INTERFACE.
OTTO, SHE IS A PAIN IN BUTT.
YES FRANTZ, BUT SHE IS OUR PAIN IN THE BUTT. AND SHE IS RIGHT, WE HAVE TO INTEGRATE.
I KNOW, BUT SOMEHOW I JUST LIKE TEASING HER.

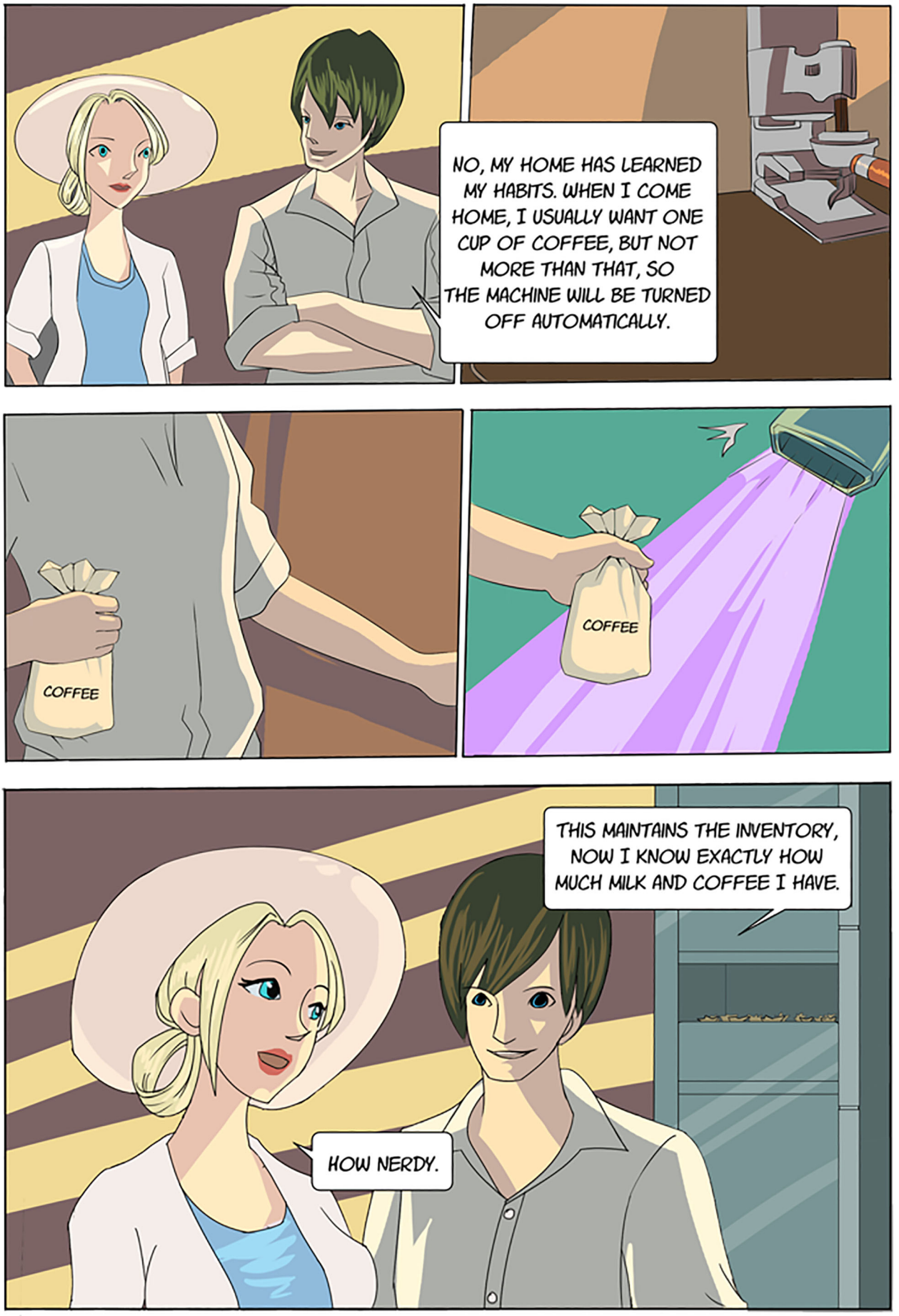

COFFEE
A LARGE ORGANIC FAIR TRADE LATTE WITH SOY MILK, PLEASE.

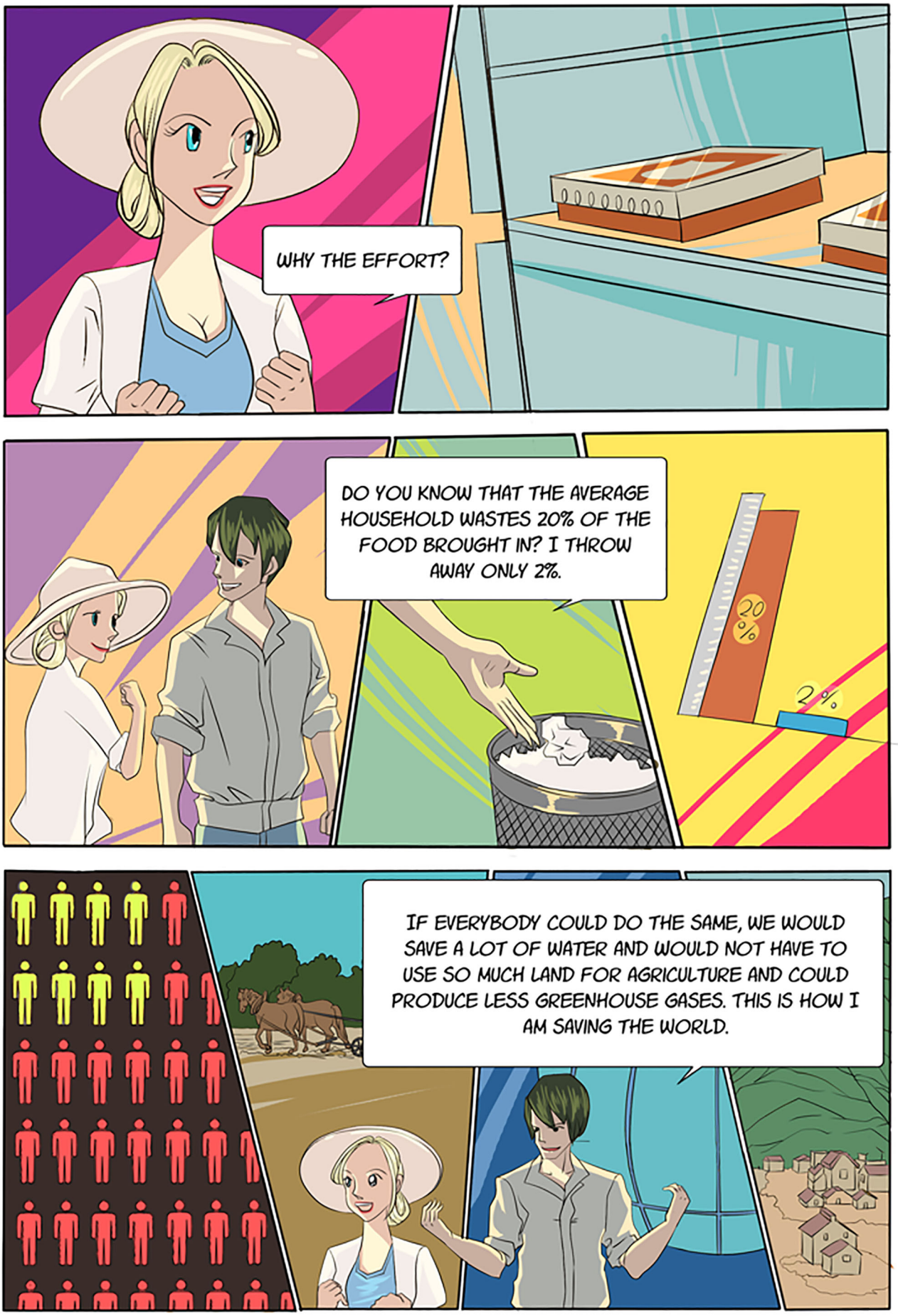

SORRY, WE HAVE NO FAIR TRADE COFFEE.
COFFEE
SORRY, WE HAVE NO SOY MILK.
COFFEE
COFFEE
SORRY, OUR FAIR TRADE COFFEE IS NOT ORGANIC.
I SEEM TO HAVE BOTH ORGANIC FAIR TRADE COFFEE AND SOY MILK AT HOME.

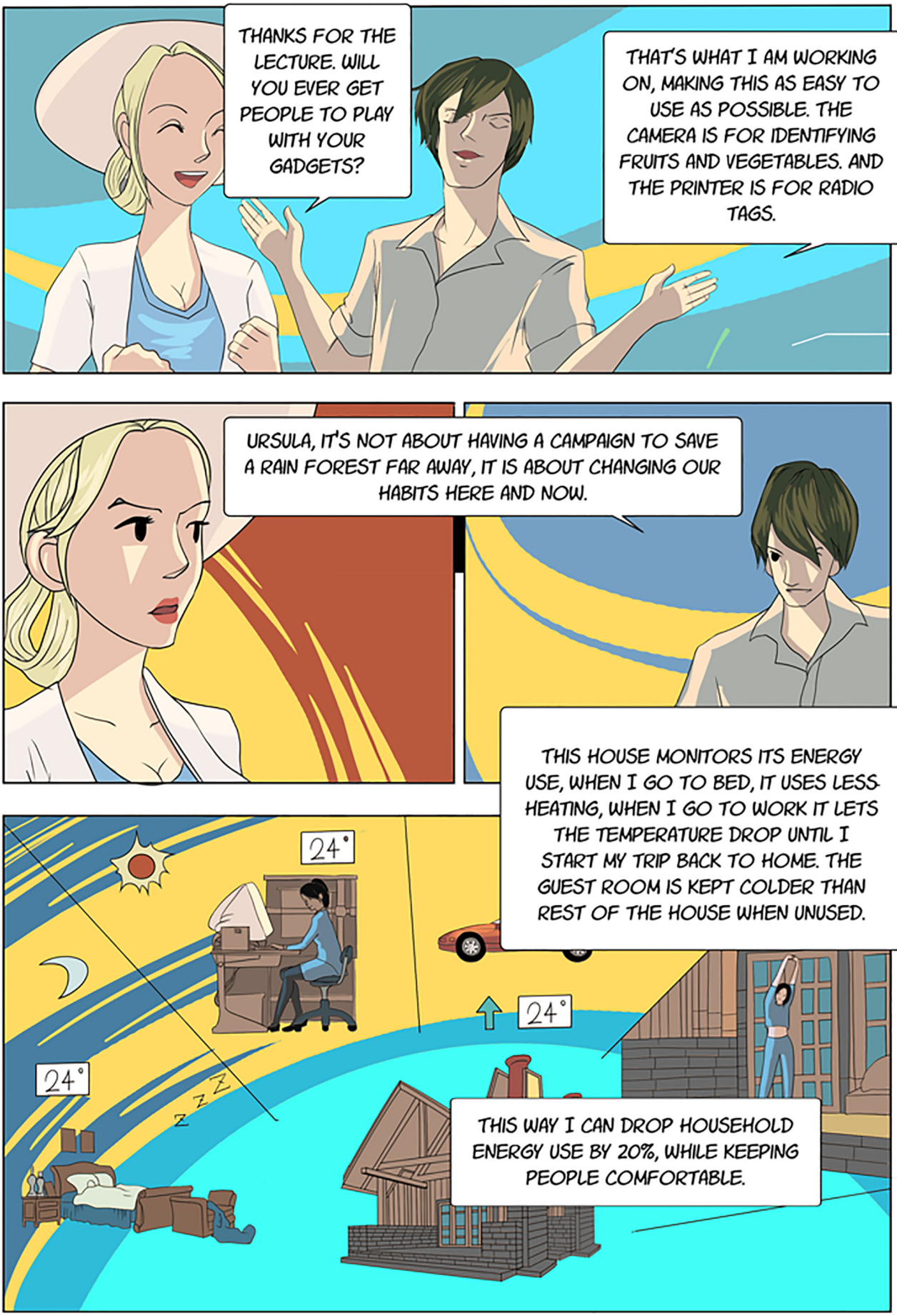

SHOULD WE GO TO MY PLACE?
SURE, BUT YOU BETTER HAVE THOSE OR I WILL GET SUSPICIOUS OF YOUR INTENTIONS.
UM . . . YOU KNOW . . . WELL . . .
LET'S GO.

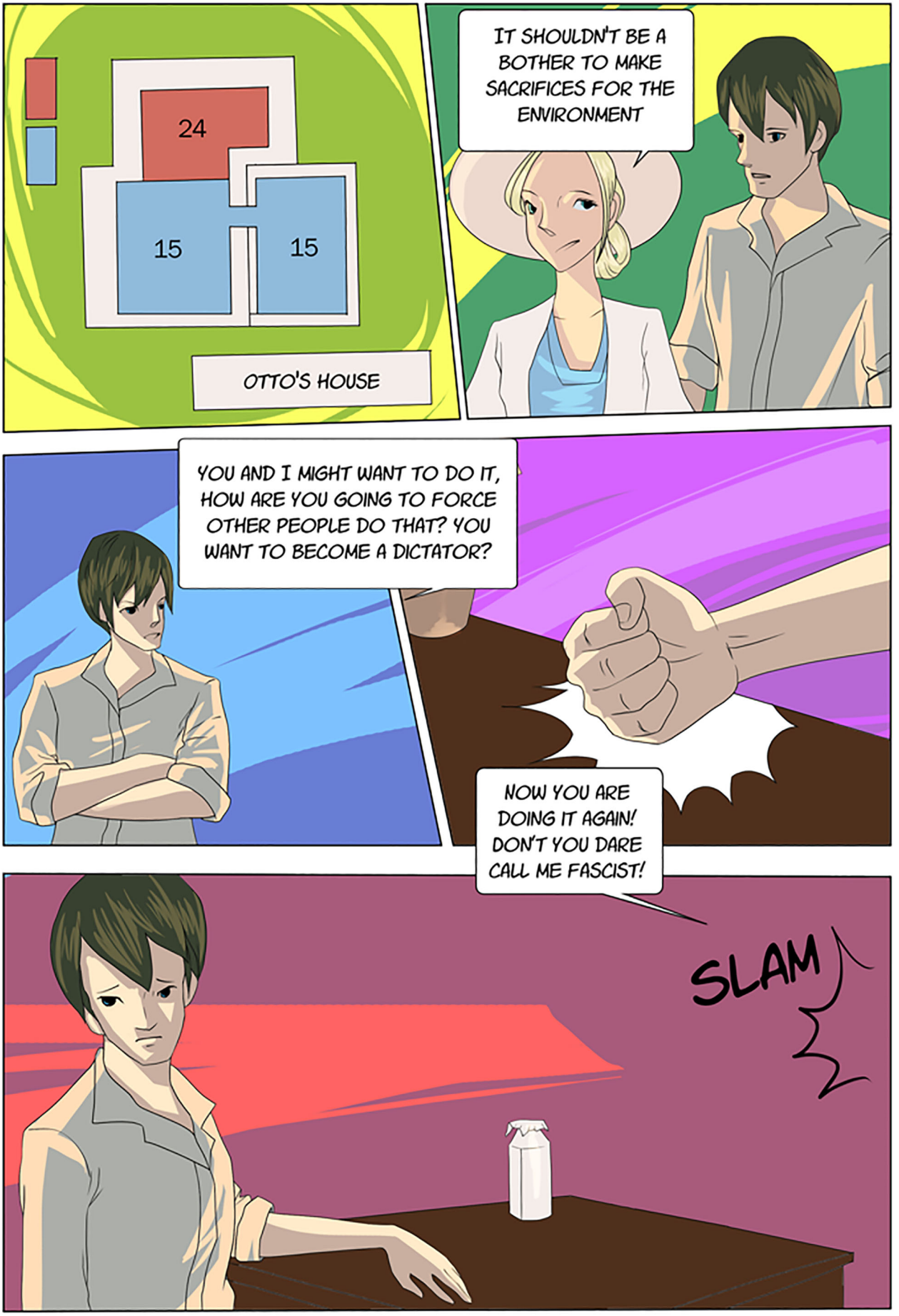

ISN'T YOUR DOOR LOCKED?
OF COURSE IT IS.
MY CELL PHONE TOLD THE DOOR TO OPEN.
WHAT IF SOMEBODY STEALS YOUR CELL PHONE?
SAME AS IF SOMEBODY STEALS MY KEYS, EXCEPT I CAN CHANGE THE CODES REMOTELY.


DID YOUR PHONE TURN YOUR ESPRESSO MACHINE ON, TOO?
YES, WHEN I ENTER MY HOME, THE HOUSE DETECTS MY PHONE AND TURNS ON THE LIGHTS, THE COFFEE MACHINE AND SO ON.
SO YOU ARE WASTING A LOT OF ENERGY. DID YOU LIE TO ME?


NO, MY HOME HAS LEARNED MY HABITS. WHEN I COME HOME, I USUALLY WANT ONE CUP OF COFFEE, BUT NOT MORE THAN THAT, SO THE MACHINE WILL BE TURNED OFF AUTOMATICALLY.
COFFEE
COFFEE
THIS MAINTAINS THE INVENTORY, NOW I KNOW EXACTLY HOW MUCH MILK AND COFFEE I HAVE.
HOW NERDY.


WHY THE EFFORT?
DO YOU KNOW THAT THE AVERAGE HOUSEHOLD WASTES 20% OF THE FOOD BROUGHT IN? I THROW AWAY ONLY 2%.
20%
2%
IF EVERYBODY COULD DO THE SAME, WE WOULD SAVE A LOT OF WATER AND WOULD NOT HAVE TO USE SO MUCH LAND FOR AGRICULTURE AND COULD PRODUCE LESS GREENHOUSE GASES. THIS IS HOW I AM SAVING THE WORLD.


THANKS FOR THE LECTURE. WILL YOU EVER GET PEOPLE TO PLAY WITH YOUR GADGETS?
THAT'S WHAT I AM WORKING ON, MAKING THIS AS EASY TO USE AS POSSIBLE. THE CAMERA IS FOR IDENTIFYING FRUITS AND VEGETABLES. AND THE PRINTER IS FOR RADIO TAGS.
URSULA, IT'S NOT ABOUT HAVING A CAMPAIGN TO SAVE A RAIN FOREST FAR AWAY, IT IS ABOUT CHANGING OUR HABITS HERE AND NOW.
THIS HOUSE MONITORS ITS ENERGY USE, WHEN I GO TO BED, IT USES LESS HEATING, WHEN I GO TO WORK IT LETS THE TEMPERATURE DROP UNTIL I START MY TRIP BACK TO HOME. THE GUEST ROOM IS KEPT COLDER THAN REST OF THE HOUSE WHEN UNUSED.
24°
24°
24°
THIS WAY I CAN DROP HOUSEHOLD ENERGY USE BY 20%, WHILE KEEPING PEOPLE COMFORTABLE.


24
15
15
OTTO'S HOUSE
IT SHOULDN'T BE A BOTHER TO MAKE SACRIFICES FOR THE ENVIRONMENT
YOU AND I MIGHT WANT TO DO IT, HOW ARE YOU GOING TO FORCE OTHER PEOPLE DO THAT? YOU WANT TO BECOME A DICTATOR?
NOW YOU ARE DOING IT AGAIN! DON'T YOU DARE CALL ME FASCIST!
SLAM

Otto's Kitchen

Science fiction writer William Gibson has reputedly said: "The future is already here – it's just not evenly distributed."

What Otto is trying to do is to create the future and he is doing it for himself. He knows that running each product by a bar code scanner and weighing it to see how much he has used is clumsy, but he also knows that in the future, this process will be easier and more automatic. By accepting today's inept way, he can experiment with what might become regular for everybody in the future.

Various studies estimate that between 30% to 50% of food produced in the world is thrown away for various reasons e.g. buying unnecessary amounts. Otto is trying to reduce the household waste, which is a large part of the problem in the developed world.

What Otto's system will ideally be, is that each item of food will have a radio readable sticker. RFID, radio-frequency identification, is a system where a cheap sticker has an antenna and just enough electronics to send a number over the radio. The RFID tag does not have a battery, it obtains its power from the radio waves used to send the query and uses the same energy to respond. Basically it just sends an identity number back, this identity information can then be used to find out things about the item.

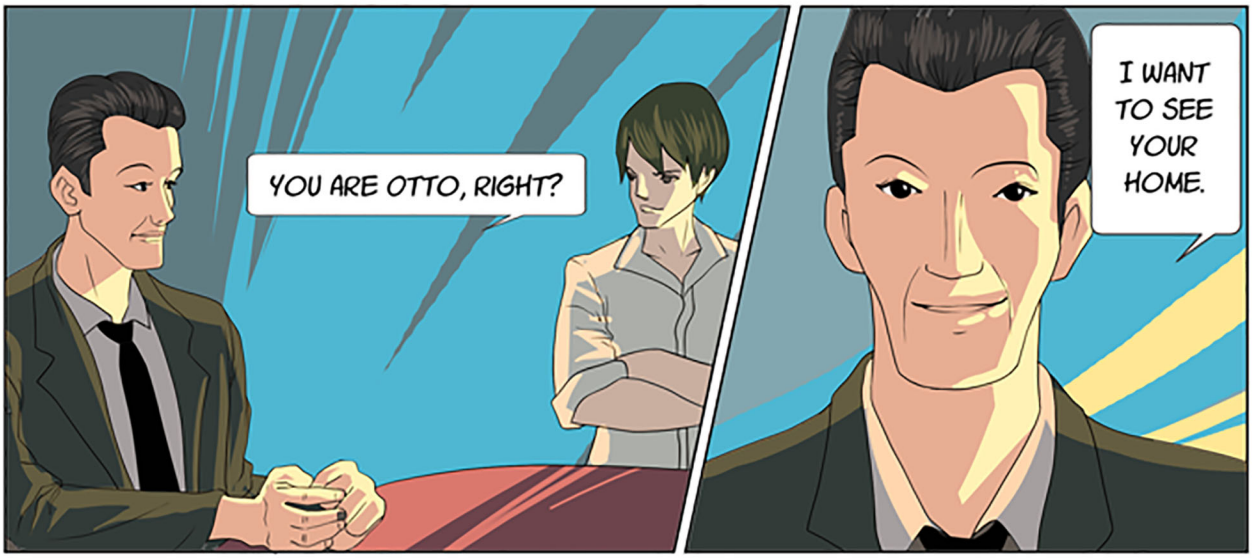
For example RFID tags in clothes could let a washing machine find out how to wash a dress or make it refuse to wash reds and whites together (remember, Otto is a bachelor).

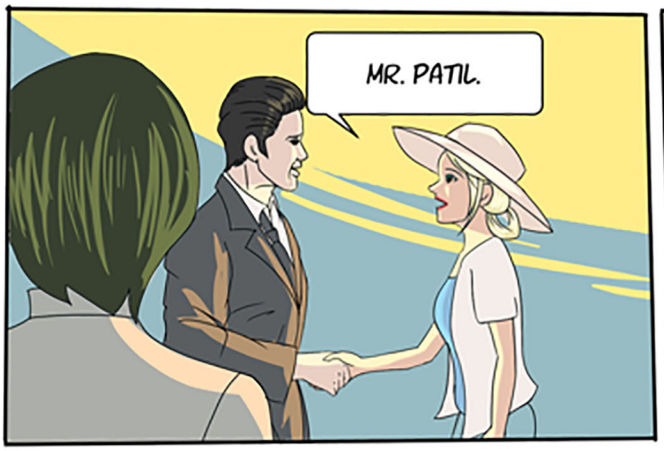
Otto is still using bar codes, but he has also started printing RFID stickers for those products that do not yet have a tag. Printable electronics is a recent invention; electronic components can be formed from conductive inks using an inkjet printer. This technology is suitable for low performance electronics, which is exactly what RFID stickers are.

So when every food item is tagged, Otto's kitchen can scan all the products in the cupboards and fridge and knows the exact inventory, when it was bought and its shelf life. He could get the same information from the barcodes currently printed on products, but the RFID technology allows better inventory management, as the contents of the kitchen can be easily scanned. In addition, barcodes have to be visible to be scanned, which is difficult if they are in a closed cupboard.

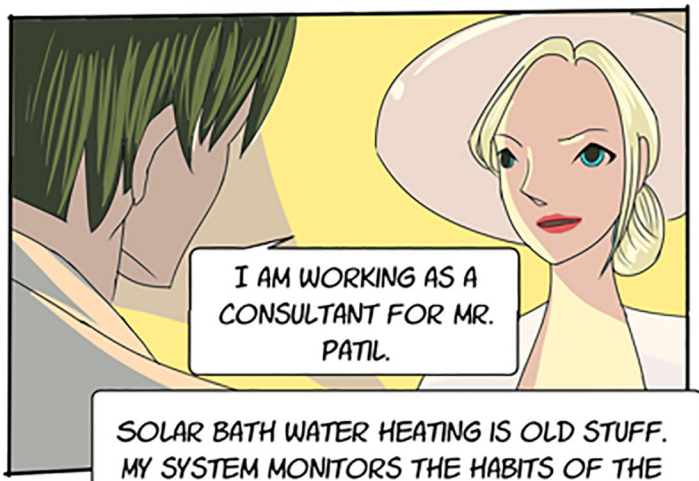

PRESENTING THE PROJECT TO MR. PATIL


THANK YOU. BUT I WAS EXPECTING SOMETHING MORE, SHALL I SAY, CREATIVE.

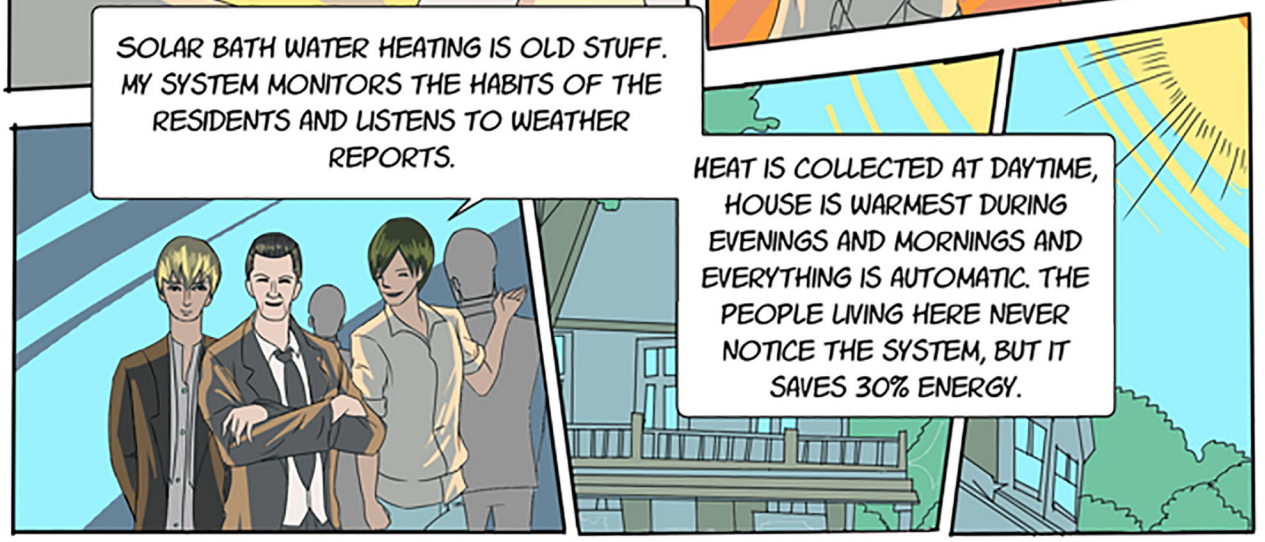

YOU ARE OTTO, RIGHT?
I WANT TO SEE YOUR HOME.


MR. PATIL.


URSULA? WHAT ARE YOU DOING HERE?


I AM WORKING AS A CONSULTANT FOR MR. PATIL.


I RECOMMENDED THE VISIT TO YOUR HOUSE.
YOU'RE AN ANGEL.


SOLAR BATH WATER HEATING IS OLD STUFF. MY SYSTEM MONITORS THE HABITS OF THE RESIDENTS AND LISTENS TO WEATHER REPORTS.
HEAT IS COLLECTED AT DAYTIME, HOUSE IS WARMEST DURING EVENINGS AND MORNINGS AND EVERYTHING IS AUTOMATIC. THE PEOPLE LIVING HERE NEVER NOTICE THE SYSTEM, BUT IT SAVES 30% ENERGY.


I WANT TO MAKE THIS SO AUTOMATIC THAT PEOPLE NEVER HAVE TO THINK ABOUT THE TECHNOLOGY.
I AM STILL WAITING FOR RFID TAGS TO APPEAR ON FOOD PACKAGES.
YOU ARE YOUR OWN GUINEA PIG?
I DO BY HAND WHAT IS NOT AUTOMATED YET, TO UNDERSTAND THINGS
YES, I LIVE WHAT I RESEARCH.


THIS IS WHAT I WANT TO SEE. CREATIVE INNOVATION. YOUR GROUP MOVES FORWARD TO THE NEXT ROUND
I WAS ANGRY AT YOU, BUT THEN I REALIZED THAT YOU CARE AND ARE TRYING YOUR BEST. EVEN IF YOU HAVE NO MANNERS AND CAN BE AN IDIOT AT TIMES.
THANK YOU.

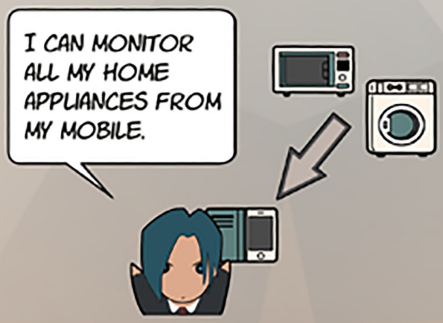
Internet of Things

We have created this comic to let you know what is awaiting you in the future. Of course we can not predict exactly what will happen and most likely the future will surprise us all.

We do not yet know what the "Internet of Things" will be. What we know is: Internet has been a huge world changing success and it will grow, until most of this planet is covered by some kind of wireless network service. The network can be wireless LAN, cellular service, satellite or something else, but it will cover all of populated areas on Earth.

We also feel certain that the production cost of electronics will continue to drop and the available complexity will rise for many years to come. We can pack more functionality into smaller and cheaper packages. These two things mean that people will invent and innovate all kinds of new devices, that can process information and are connected to the Internet.

These devices will have sensors that sense what is happening around them. There is a huge amount of physical phenomena we can detect: temperature, humidity, sound, light, acceleration etc. A farmer can sow a field with cheap sensors that measure soil moisture and other properties, allowing planting and fertilizing to be more efficient. Mobile phones already have acceleration measurement devices in them to turn the display the right way up.

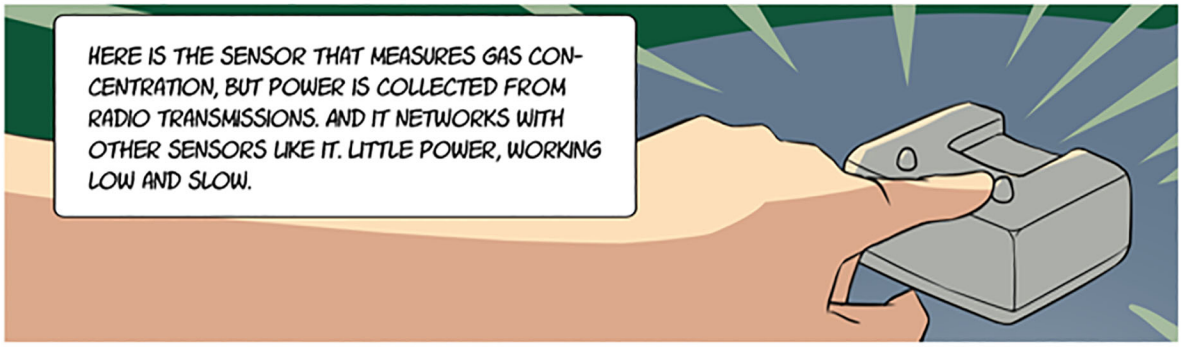


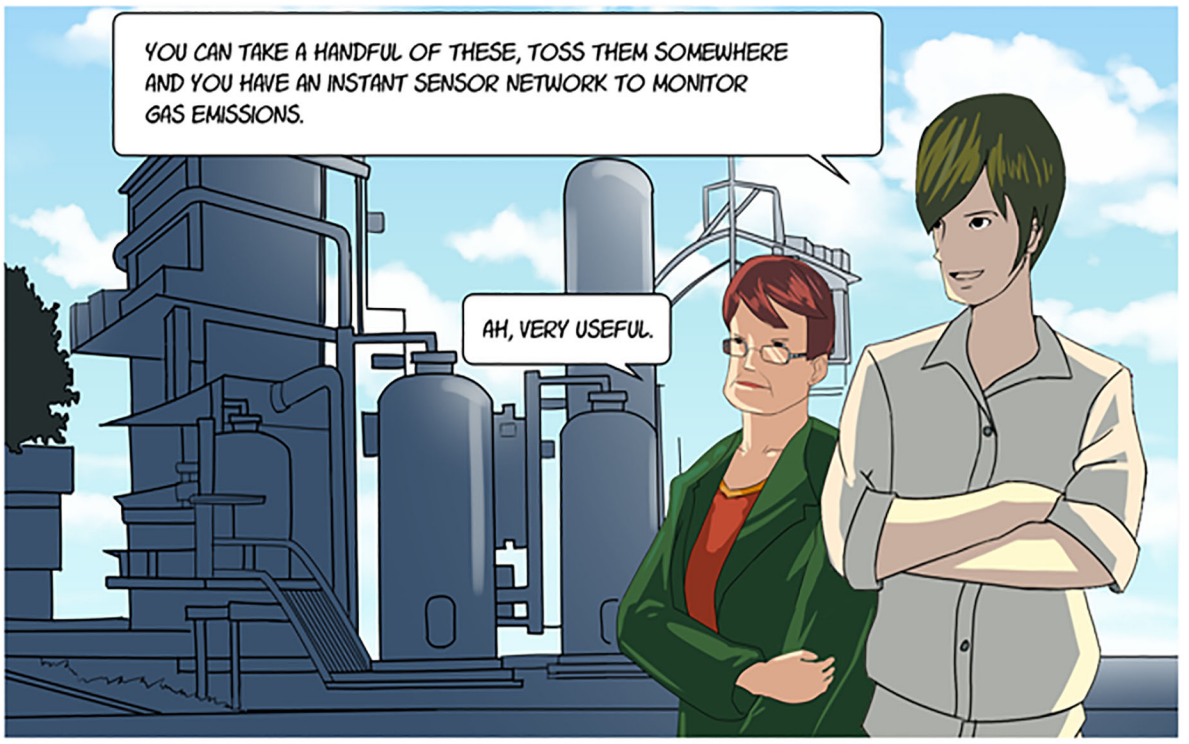
Simple applications are just a beginning. What is really world changing is when information from these devices are joined together. The rainfall measurement from all farmers in an area can be used to predict the flow to the river, guiding the release from dams. The acceleration information from a mobile phone in a car can be used to determine the quality of the traffic. There is already an application to find pot holes on streets that uses data from several mobile phones to statistically identify where they all are jarred by the same hole.

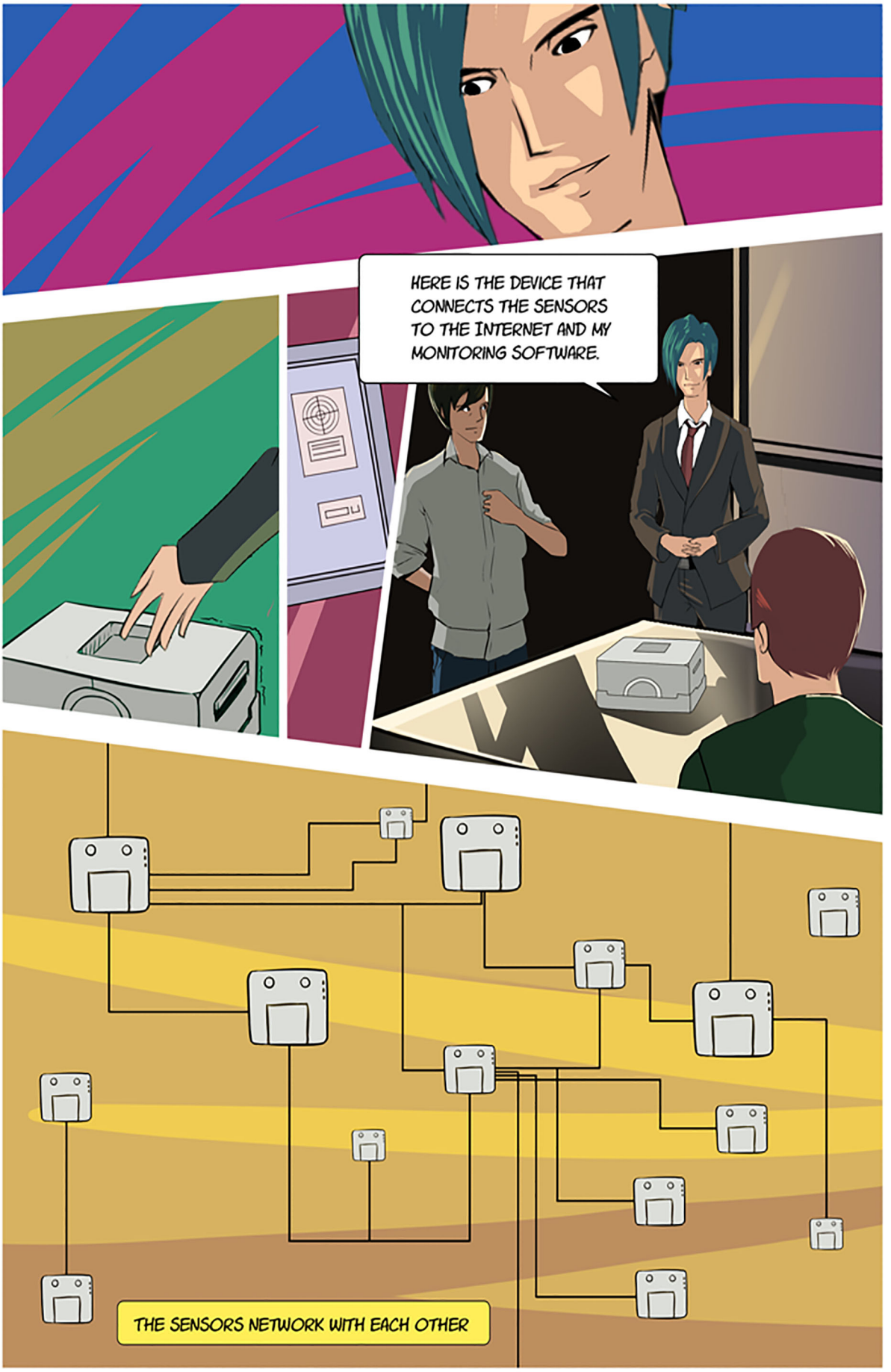

UNIVERSITY LABORATORY


LOOK AT THIS!
NO POWER SOURCE!


NICE WORK BIG BRO. HARVESTING ENERGY FROM RADIO WASTE.
SO WHAT CAN IT DO?


HERE IS THE SENSOR THAT MEASURES GAS CONCENTRATION, BUT POWER IS COLLECTED FROM RADIO TRANSMISSIONS. AND IT NETWORKS WITH OTHER SENSORS LIKE IT. LITTLE POWER, WORKING LOW AND SLOW.


YOU CAN TAKE A HANDFUL OF THESE, TOSS THEM SOMEWHERE AND YOU HAVE AN INSTANT SENSOR NETWORK TO MONITOR GAS EMISSIONS.
AH, VERY USEFUL.


HERE IS THE DEVICE THAT CONNECTS THE SENSORS TO THE INTERNET AND MY MONITORING SOFTWARE.
THE SENSORS NETWORK WITH EACH OTHER

Frantz's Device

Frantz has put together a nice sensor package that the others admire for a reason. He is solving one of the Patil problems, detecting gas leakage. This might sound like a boring and mundane problem, but as we remember, Mrs. Patil was killed by a gas explosion. Leakage is also a issue in the whole gas transmission system and causes both waste and accidents.

Frantz has analyzed the problem and decided that the best solution is a set of small cheap gas sensors that are independent and can be distributed anywhere. His sensor system uses several advanced techniques: Energy harvesting from radio waves is a way to gain very small amounts of electrical power from cellular transmissions, such as TV and radio broadcasts. His device must communicate rarely and is most of the time dormant, collecting power for the next operation.

Ad-Hoc networking means that his devices create their own network and pass messages from and to each other. Frantz's devices form a slow and low-powered network.

Together these two things mean that there is no need for a power source or network wires. These two things together enable a sensor network without a need for a power source nor network wires, which in turn means that this system can be installed anywhere or literally tossed into an environment. Frantz's bigger device is known as a "sink node" and connects the sensor network to the Internet. This device uses the cellular network and therefore needs a power supply.

When a sensor node detects gas in the air, it sends a message to its neighbour sensors, who forward/ pass on the message until it reaches the sink node and is forwarded to Frantz's monitoring station. One thing that is missing is the location information. Frantz will know which sensor has detected gas, but he has to keep track of which sensor is where. If somebody moves the sensor device, he does not know where it is. In addition, he does not have enough energy in his device to use GPS or some other location service. Sophie is thinking differently. She does not have a clear plan yet, but she wants to keep all systems as open as possible. In this case she is thinking that most likely these sensors will operate in an environment where there will be other Internet-connected devices and she is planning to use radio measurement techniques to find the location of Frantz's devices.


YOUR SOFTWARE
HOW ABOUT MY SOFTWARE?
YOU CAN USE MY SOFTWARE, ANYTIME.
I DON'T WANT YOUR SOFTWARE, I WANT TO INTEGRATE YOUR HARDWARE TO MY SOFTWARE.
MY SOFTWARE IS GOOD, WHY DO YOU ALWAYS WANT YOUR OWN SOFTWARE?
BECAUSE YOUR SOFTWARE DOES NOT DO EVERYTHING. DO YOU HAVE LOCATION DATA?


YOU KNOW MY POWER BUDGET, OF COURSE NOT.
HA! I CAN TRIANGULATE YOU, IF YOU GIVE ME YOUR API.
GET A ROOM, YOU TWO!
SOPHIE IS RIGHT, WE NEED HORIZONTAL INTEGRATION.

Application Programming Interface

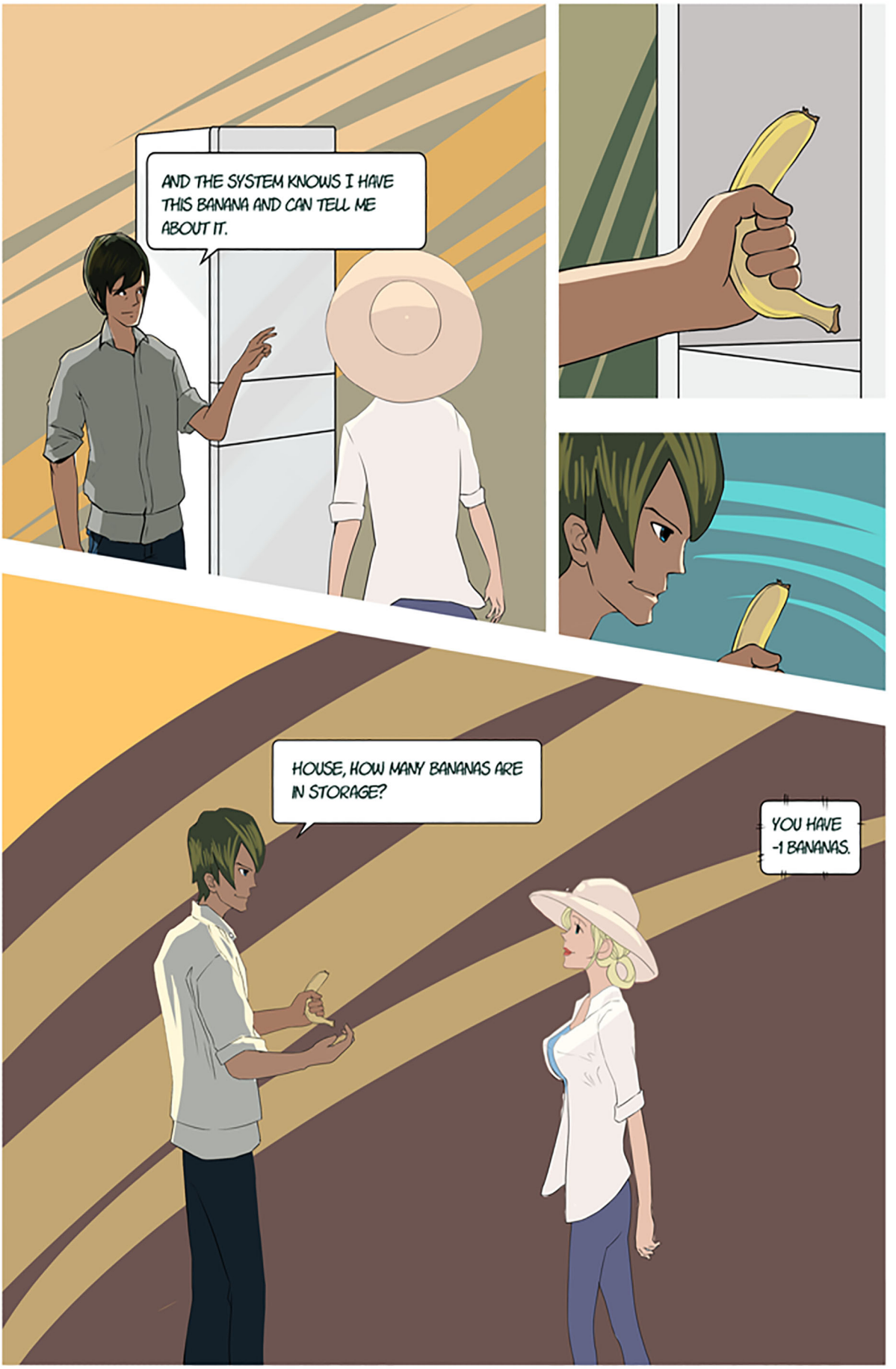
Why is our Sophie talking so much about APIs and horizontal integration? API is short for an Applications Programming Interface. This means a method for software or computer programs to communicate with each other. Though it does not sound very spectacular, it is actually a terribly powerful world-changing concept. Let us say that you like to eat in restaurants and have evaluated all the local restaurants. You want to publish your evaluations on the web. Now, of course it would be nice to show the locations of the restaurants. You could buy or draw a map for your web page, but somebody else has already built a map service and provided an API for the service. So, you can write a little software application to show the restaurant information with the map provided by an another service. You both benefit: your restaurant guide gains a map and the map service gains restaurant information. (In practice it is usually a little bit more complicated, there might be service fees, licences or other agreements needed before the joining the services is possible).

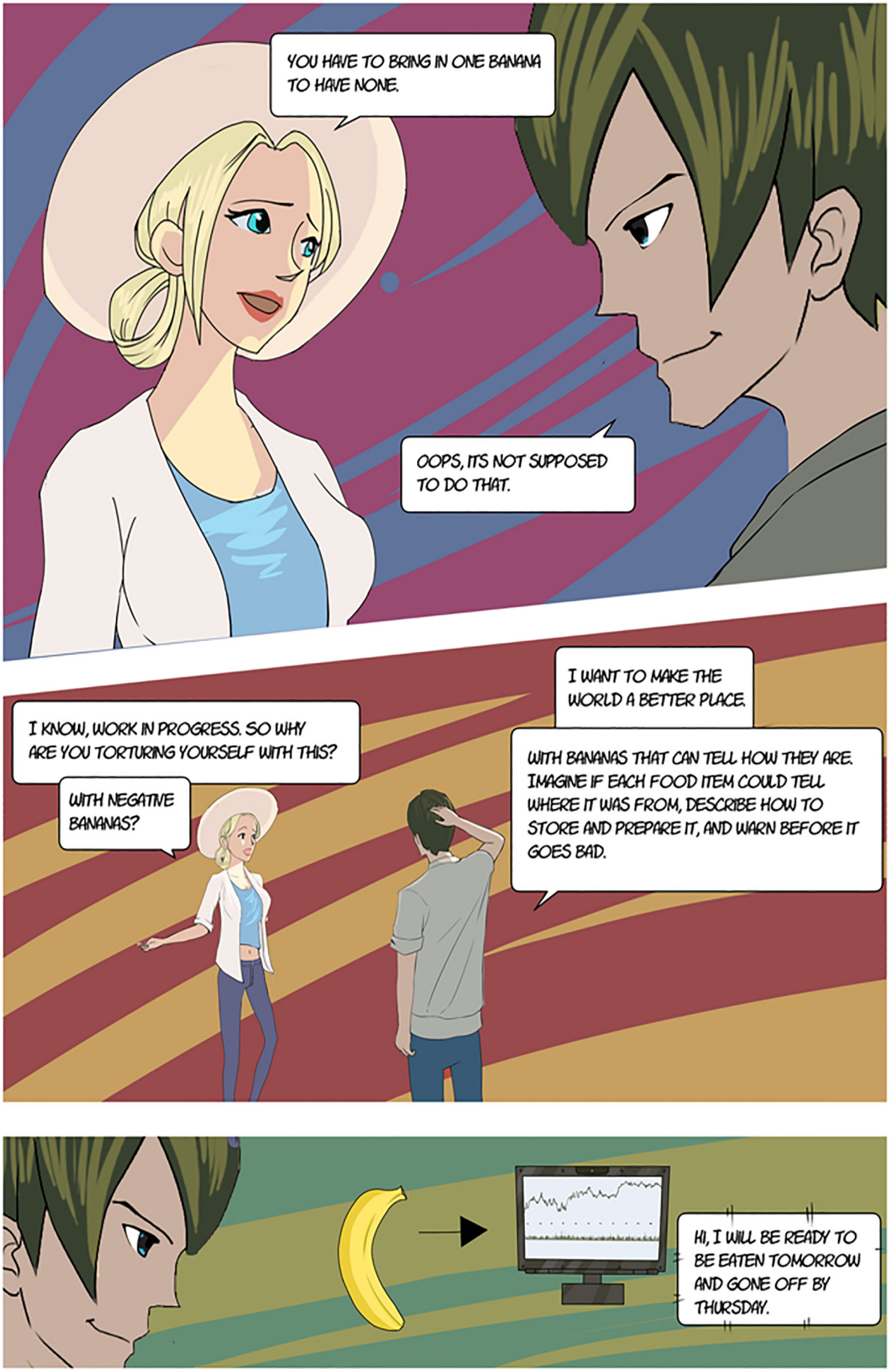
Frantz and Otto are engineers at heart. They come across a problem and solve it. Sophie is a little different, she is a world-builder. Otto's kitchen system includes sensors (bar code and RFID readers), a database to store the information on the contents of his kitchen and a user interface that talks to him.

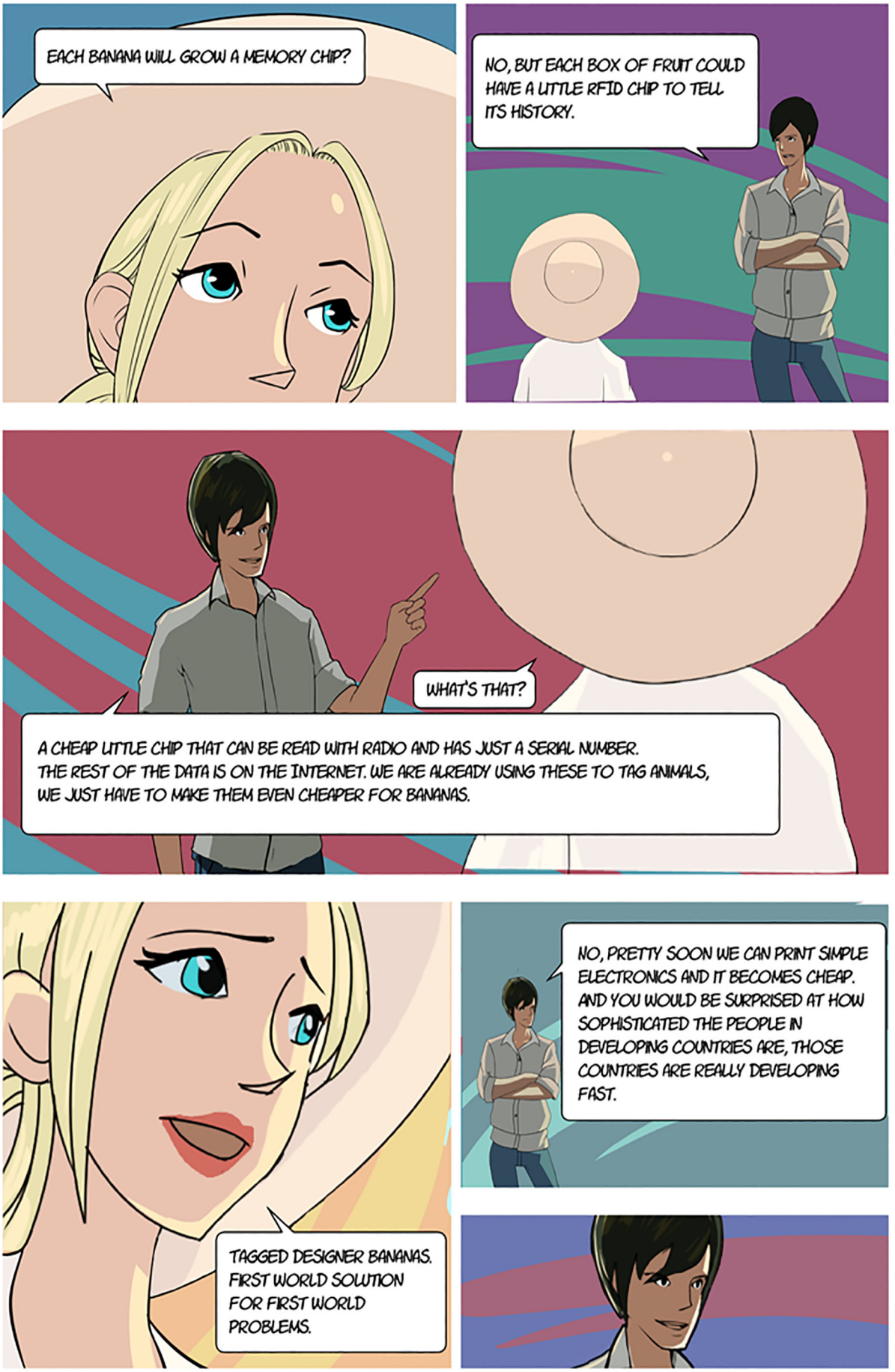
This is called a vertical solution, it is a solution to a problem (kitchen management) that includes all components, but does not necessarily offer access for later changes or additions of new interfaces.. But this is not enough for Sophie. She wants Otto's system to have interfaces, so that other software can communicate with Otto's kitchen. When Otto says that he has already integrated his solution with a recipe bank and asks what else is needed, Sophie has no answer because she does not know (can't foresee future developements?) . But she has a very strong belief that somebody, someday will invent something that makes Otto's kitchen much more excellent. And despite their teasing, Frantz and Otto know that she is right.

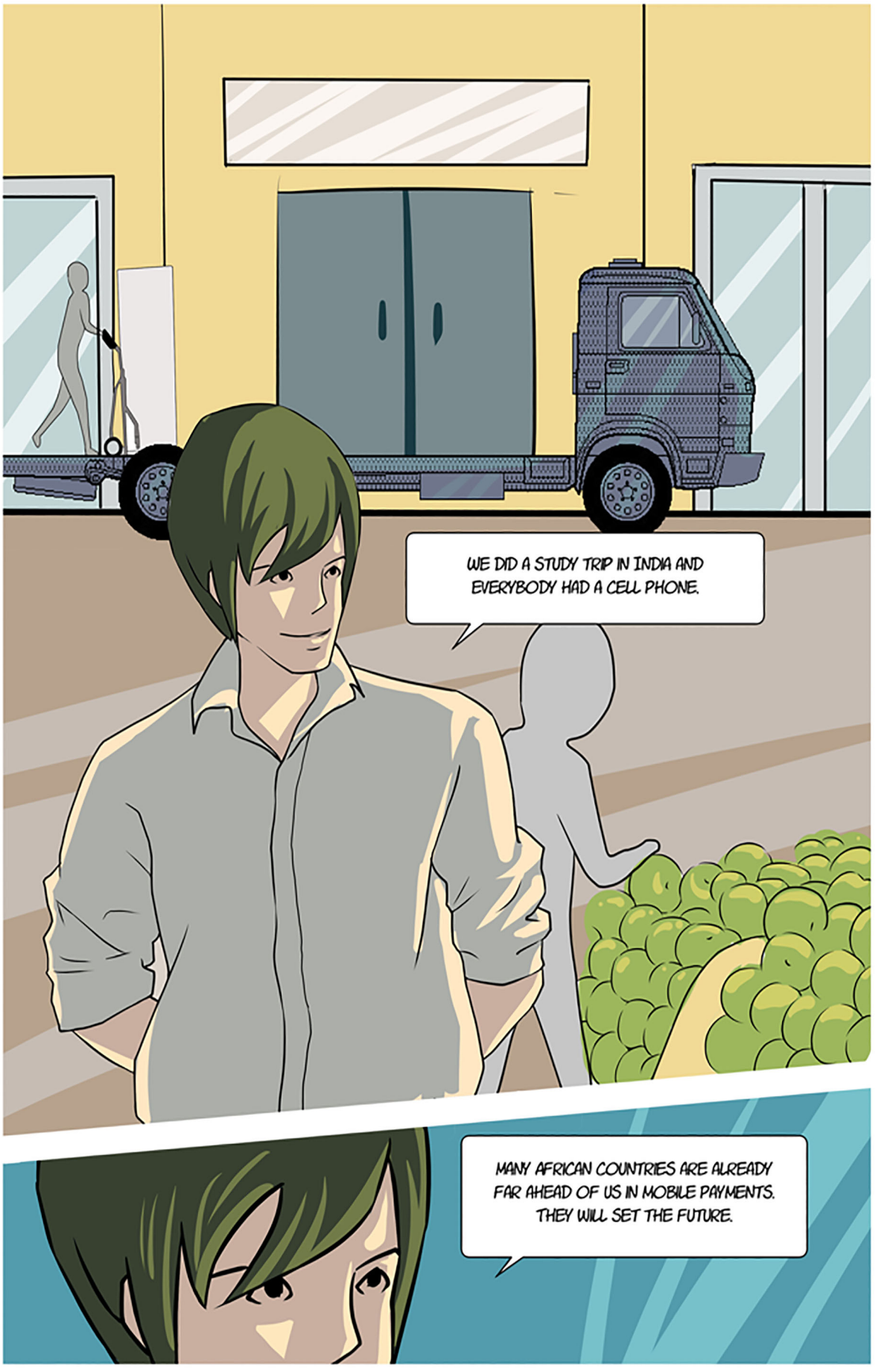
Sophie sees a world of possibilities. She does not know all the possibilities, but she knows that they are there. By insisting that each device and piece of software has an API, she guarantees that somebody, somewhere in the future can use it as a building block to do something she can not yet think about (she guarantees that it can be used as a building block in the future to do something now unimaginable). She demands to include a defined protocol to talk to a device or a documented software library when building a new program. This allows horizontal integration, different types of devices and products from different manufacturers can communicate and work together.


HELLO, HOUSE!
WELCOME, OTTO!


AND THE SYSTEM KNOWS I HAVE THIS BANANA AND CAN TELL ME ABOUT IT.
HOUSE, HOW MANY BANANAS ARE IN STORAGE?
YOU HAVE -1 BANANAS.


YOU HAVE TO BRING IN ONE BANANA TO HAVE NONE.
OOPS, ITS NOT SUPPOSED TO DO THAT.
I KNOW, WORK IN PROGRESS. SO WHY ARE YOU TORTURING YOURSELF WITH THIS?
WITH NEGATIVE BANANAS?
I WANT TO MAKE THE WORLD A BETTER PLACE.
WITH BANANAS THAT CAN TELL HOW THEY ARE. IMAGINE IF EACH FOOD ITEM COULD TELL WHERE IT WAS FROM, DESCRIBE HOW TO STORE AND PREPARE IT, AND WARN BEFORE IT GOES BAD.
HI, I WILL BE READY TO BE EATEN TOMORROW AND GONE OFF BY THURSDAY.


EACH BANANA WILL GROW A MEMORY CHIP?
NO, BUT EACH BOX OF FRUIT COULD HAVE A LITTLE RFID CHIP TO TELL ITS HISTORY.
WHAT'S THAT?
A CHEAP LITTLE CHIP THAT CAN BE READ WITH RADIO AND HAS JUST A SERIAL NUMBER. THE REST OF THE DATA IS ON THE INTERNET. WE ARE ALREADY USING THESE TO TAG ANIMALS, WE JUST HAVE TO MAKE THEM EVEN CHEAPER FOR BANANAS.
NO, PRETTY SOON WE CAN PRINT SIMPLE ELECTRONICS AND IT BECOMES CHEAP. AND YOU WOULD BE SURPRISED AT HOW SOPHISTICATED THE PEOPLE IN DEVELOPING COUNTRIES ARE, THOSE COUNTRIES ARE REALLY DEVELOPING FAST.
TAGGED DESIGNER BANANAS. FIRST WORLD SOLUTION FOR FIRST WORLD PROBLEMS.


WE DID A STUDY TRIP IN INDIA AND EVERYBODY HAD A CELL PHONE.
MANY AFRICAN COUNTRIES ARE ALREADY FAR AHEAD OF US IN MOBILE PAYMENTS. THEY WILL SET THE FUTURE.


I'LL SHOW YOU ANOTHER THING, TAKE MY KEYS AND HIDE THEM IN THE LIVING ROOM.


HOUSE, FIND KEYS
OTTO, HONEY, THE KEYS ARE ON THE COUCH, BETWEEN CUSHIONS.
SEE, I HAVE ATTACHED RFID TAGS TO EVERYTHING I OWN AND SOPHIE WROTE A PROGRAM TO LOCATE THEM.
YOU NEVER HAVE TO LOSE ANYTHING AGAIN. NOW LET'S HAVE DINNER.
31415926

Automation of the Future

When all the things are connected to the Internet it's possible to automate every tedious and mundane task.

Automated systems can bring you your food and move all the tangible items. Systems like this exist already.

These robots need to understand their surroundings. The Internet of Things is needed for robots to operate in the human environment.

Shopping for food and cleaning your home yourself might very well be forgotten errands of the future.

This automation is not only simplifying human life but it's also able to save the environment by making everything more efficient.

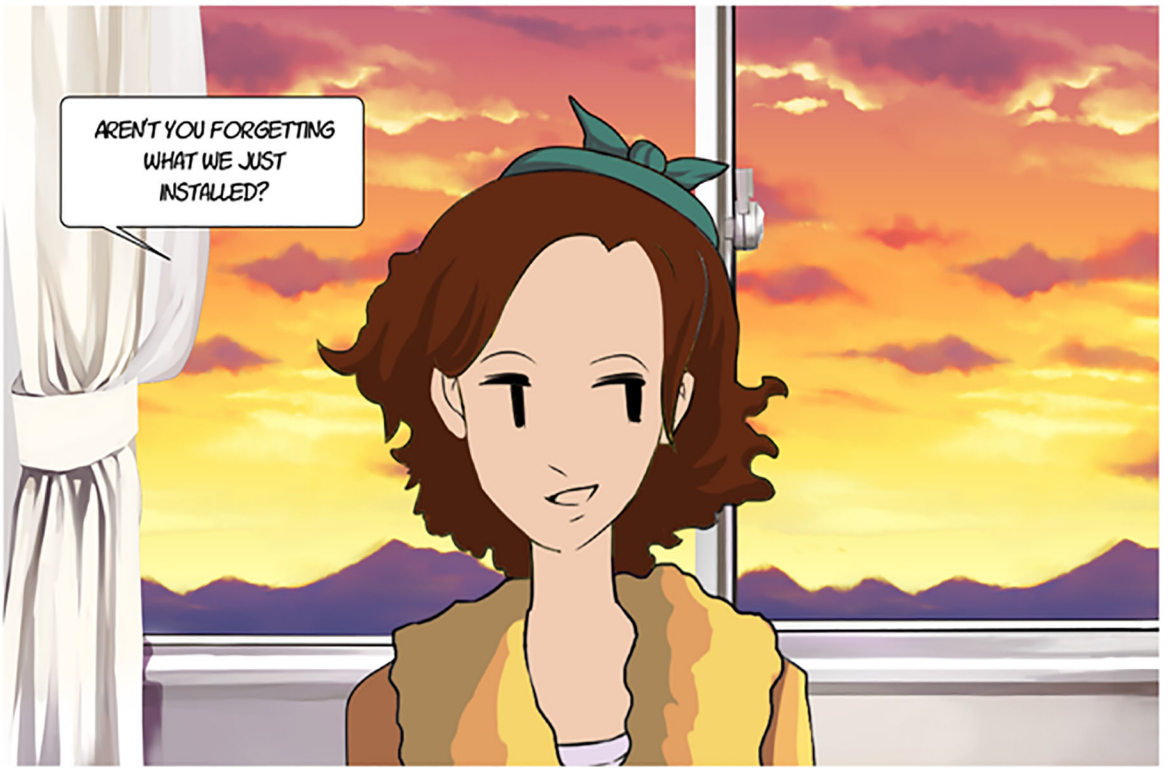
This progress is already on going as you are reading this comic.

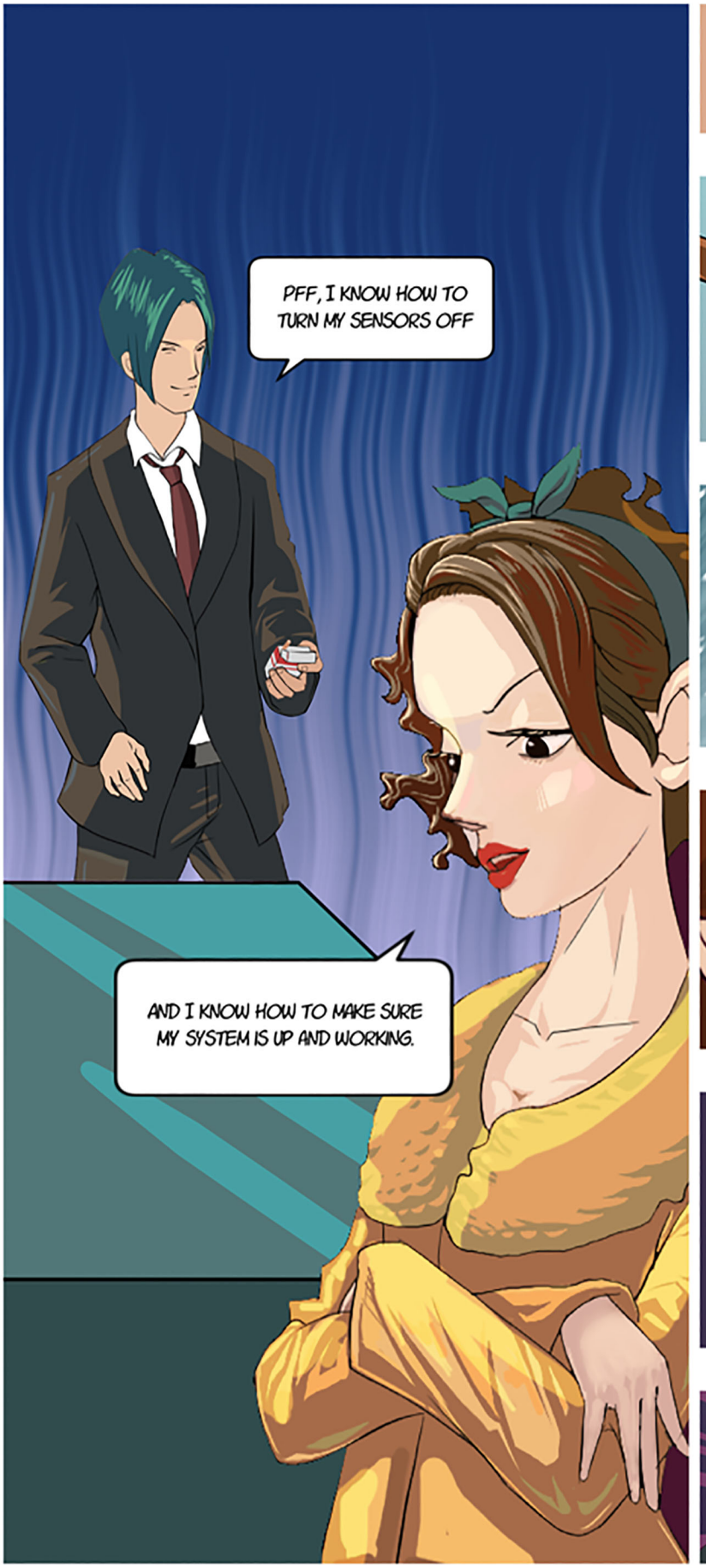

. . . AND I DECLARE THIS DEPARTMENT AN ACCIDENT FREE ZONE. MY STAFF HAS WIRED AND PROGRAMMED THIS PLACE TO PROTECT US.
I WILL DEMONSTRATE HOW THIS WORKS. I LIGHT THIS BUNSEN BURNER ON THE DESK.
THIS IS ALLOWED BY THE SAFETY PROTOCOL.
NOW I DROP THIS MATCH INTO A WASTE BASKET.

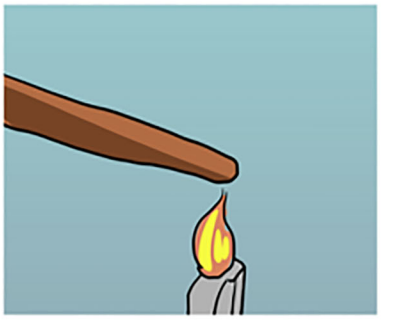

SEE, JUST THE RIGHT AMOUNT OF WATER. NO MESS.
OUR WHOLE DEPARTMENT IS COVERED BY THIS PROTECTION. FRANTZ, HERE, BUILT THE SENSOR NETWORK WITH HIS STUDENTS, OTTO INSTALLED THE WATER JETS AND SOPHIE INTEGRATED THE SYSTEMS WITH EACH OTHER.


THIS CALLS FOR A CELEBRATION.


UHH, WHAT A FILTHY HABIT.
ONLY WHEN THERE IS AN OCCASION.


AREN'T YOU FORGETTING WHAT WE JUST INSTALLED?

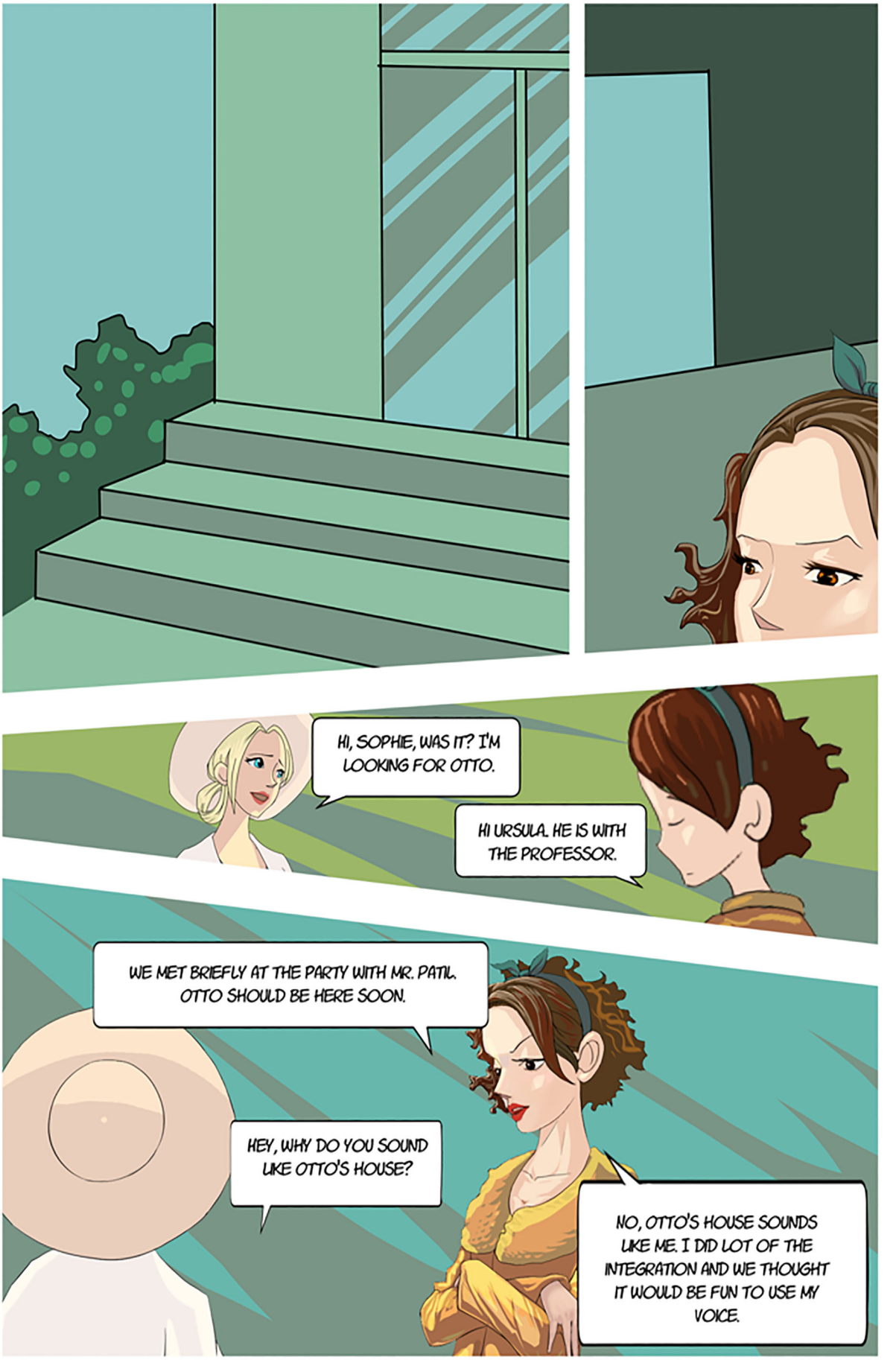

PFF, I KNOW HOW TO TURN MY SENSORS OFF
AND I KNOW HOW TO MAKE SURE MY SYSTEM IS UP AND WORKING.



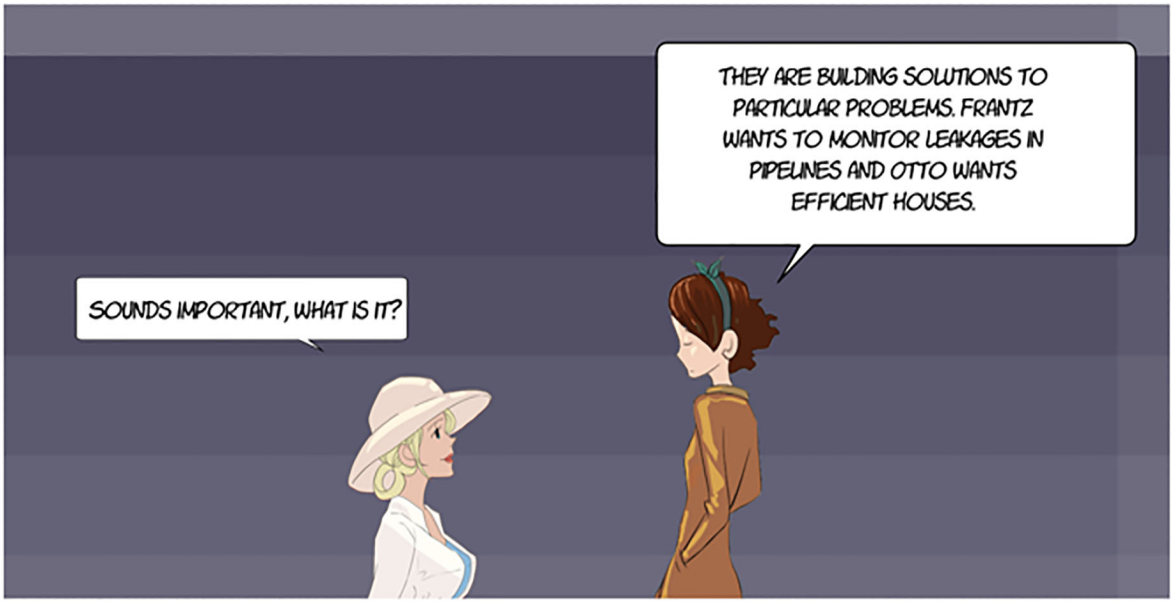

YOU LITTLE MINX!!!

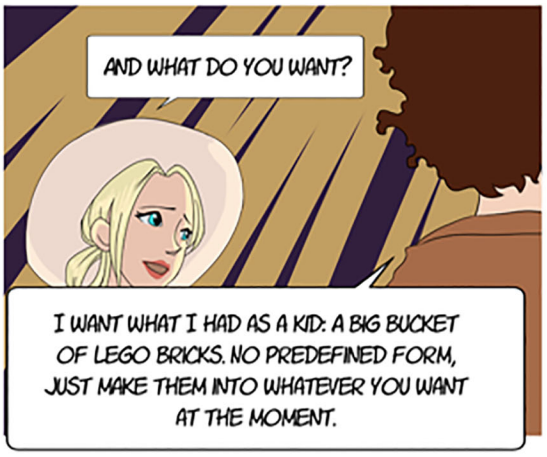

TURN AROUND


HI HI!


HI, SOPHIE, WAS IT? I'M LOOKING FOR OTTO.
HI URSULA. HE IS WITH THE PROFESSOR.
WE MET BRIEFLY AT THE PARTY WITH MR. PATIL. OTTO SHOULD BE HERE SOON.
HEY, WHY DO YOU SOUND LIKE OTTO'S HOUSE?
NO, OTTO'S HOUSE SOUNDS LIKE ME. I DID LOT OF THE INTEGRATION AND WE THOUGHT IT WOULD BE FUN TO USE MY VOICE.

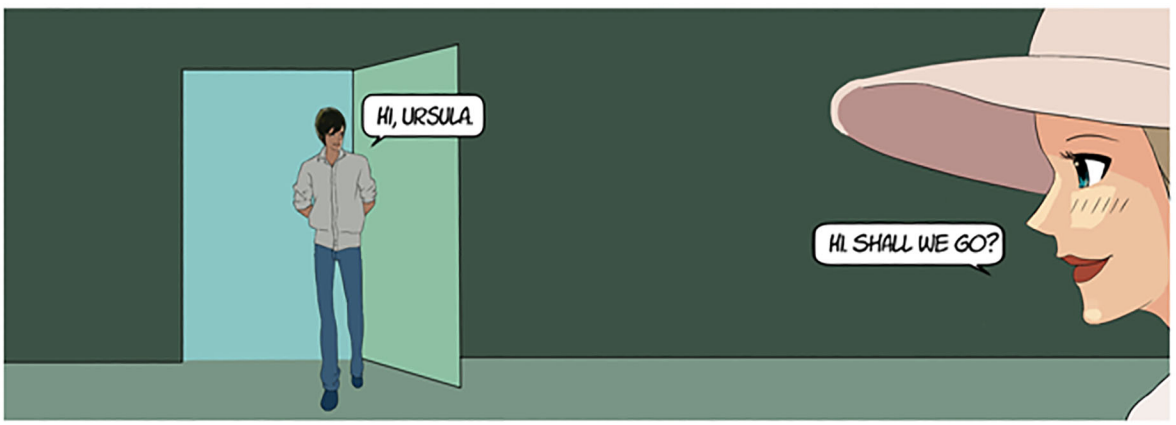

SO, YOU AND OTTO WORK A LOT TOGETHER THEN?
YES. AND DON'T LOOK SO WORRIED, I AM NOT AFTER HIM.
EH, I'LL HAVE TO ADMIT THAT HAVING MY BOYFRIEND SPENDING TIME WITH A PRETTY GIRL LIKE YOU MAKES ME A LITTLE BIT WORRIED.
YOUR BOY TOY AND HIS BROTHER DON'T REALLY UNDERSTAND THE CONCEPT OF HORIZONTAL INTEGRATION.
THANK'S FOR CALLING ME PRETTY. REALLY. I AM THE ONLY PERSON HERE BESIDES THE PROFESSOR WHO IS LOOKING AT THE BIG PICTURE AND I HAVE TO WORK TOGETHER WITH EVERYBODY.


THEY ARE BUILDING SOLUTIONS TO PARTICULAR PROBLEMS. FRANTZ WANTS TO MONITOR LEAKAGES IN PIPELINES AND OTTO WANTS EFFICIENT HOUSES.
SOUNDS IMPORTANT, WHAT IS IT?

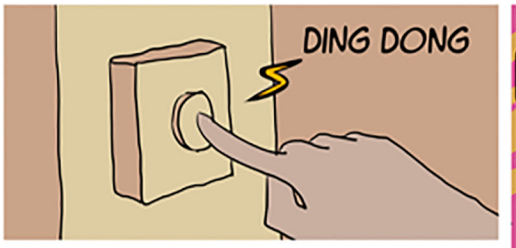

AND WHAT DO YOU WANT?
I WANT WHAT I HAD AS A KID: A BIG BUCKET OF LEGO BRICKS. NO PREDEFINED FORM, JUST MAKE THEM INTO WHATEVER YOU WANT AT THE MOMENT.

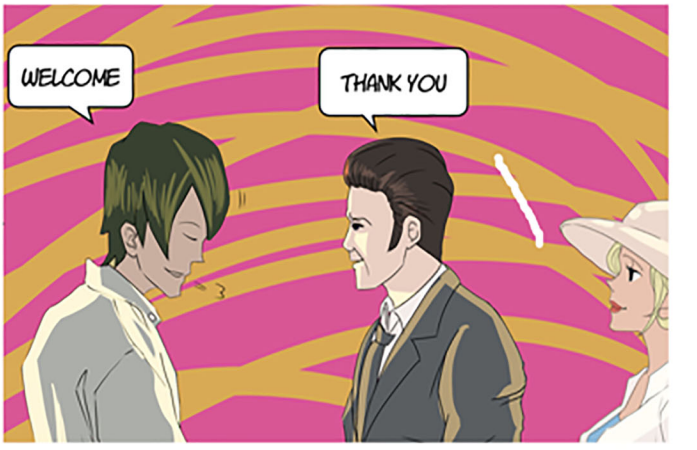

I MAKE SURE THAT THEIR WORK CAN BE USED FOR ANYTHING. I CAN PUT FRANTZ'S GAS DETECTOR TO OTTO'S HOUSE AND ADD OTTO'S PERISHABLE GOODS TRACKING TO FRANTZ'S LOGISTICS NETWORK. THAT IS HORIZONTAL INTEGRATION, ONE COMPONENT CAN BE USED FOR MANY PURPOSES.

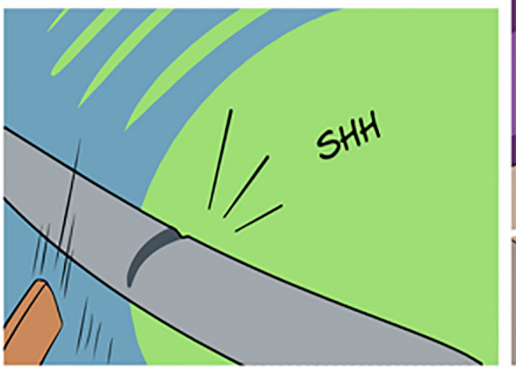

IMPRESSIVE. AND DO YOU ALSO BELIEVE YOU WILL SAVE THE WORLD?
OF COURSE!

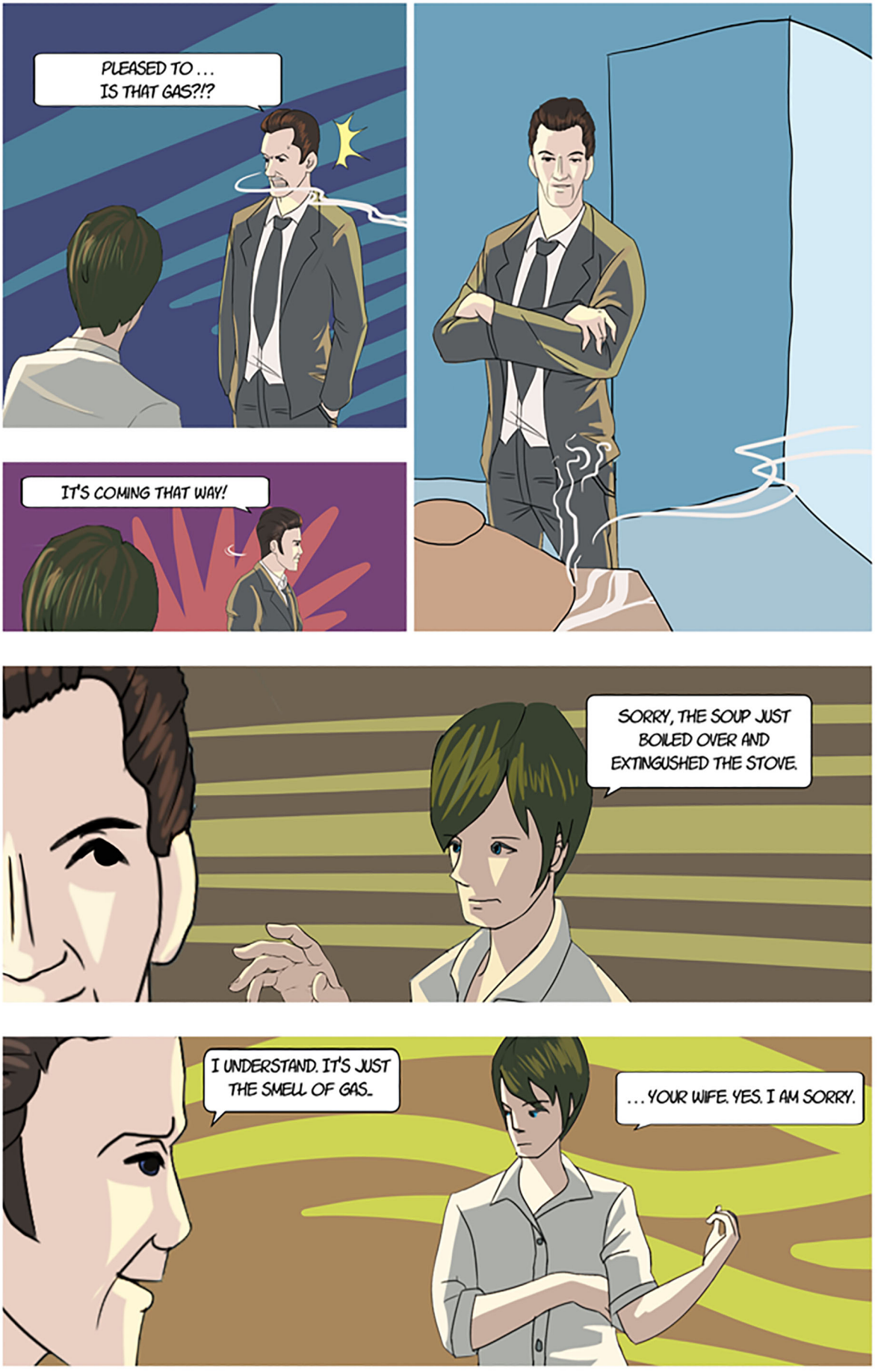

HI, URSULA.
HI. SHALL WE GO?

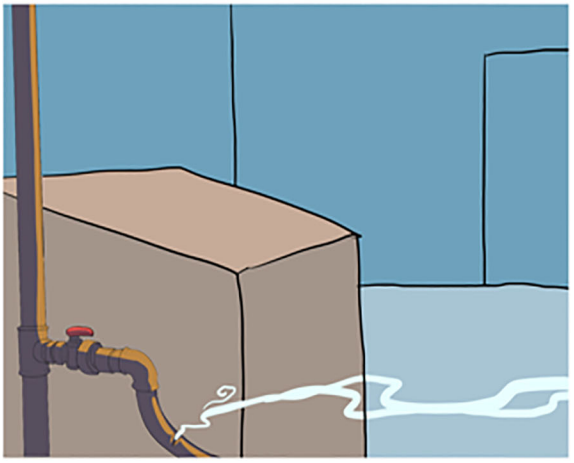

BYE, SOPHIE.
NICE TALKING TO YOU.
OTTO, ARE YOU ALL REALLY TRYING TO SAVE THE WORLD?

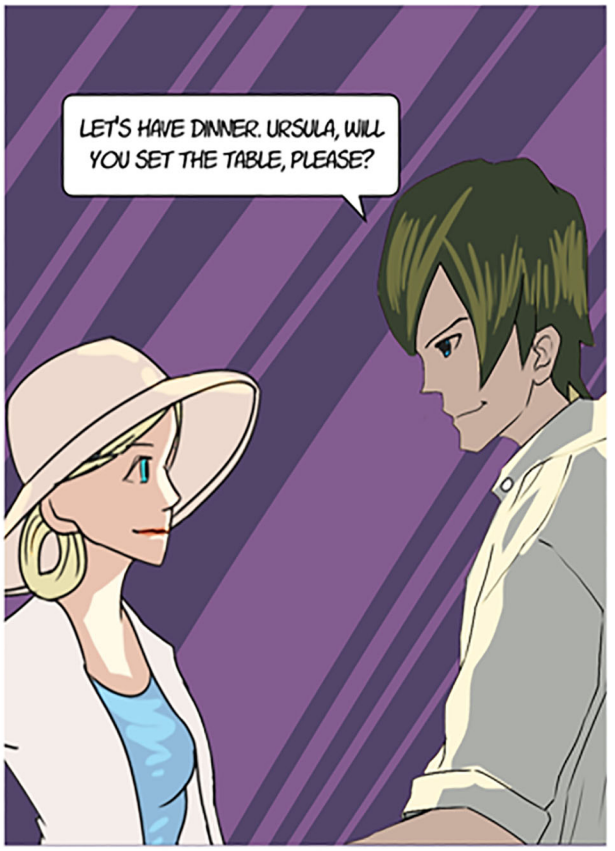

DING DONG

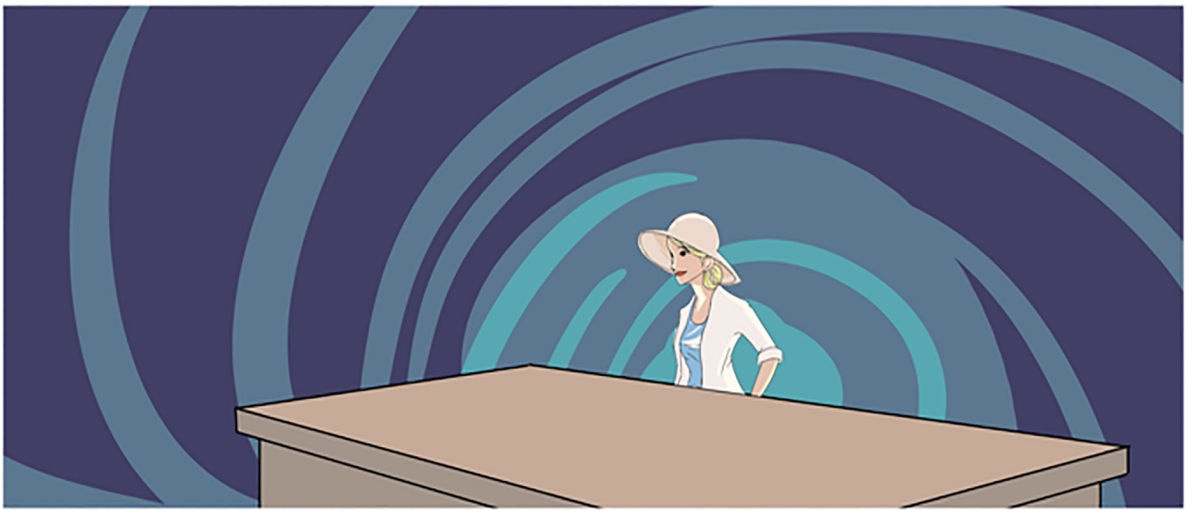

WELCOME
THANK YOU


SHH


PLEASED TO . . .
IS THAT GAS?!?
IT'S COMING THAT WAY!
SORRY, THE SOUP JUST BOILED OVER AND EXTINGUISHED THE STOVE.
I UNDERSTAND. IT'S JUST THE SMELL OF GAS.
. . . YOUR WIFE. YES. I AM SORRY.

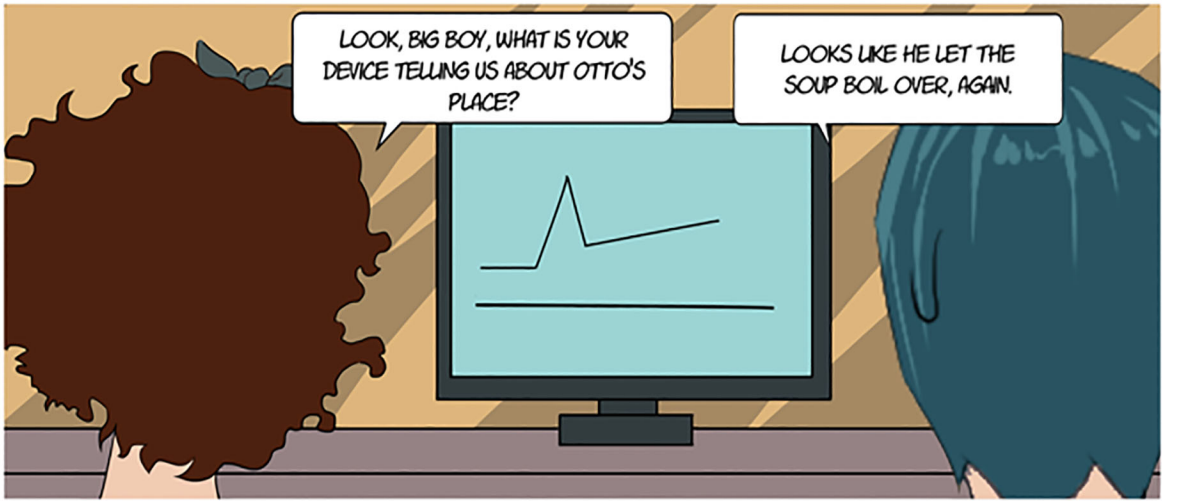


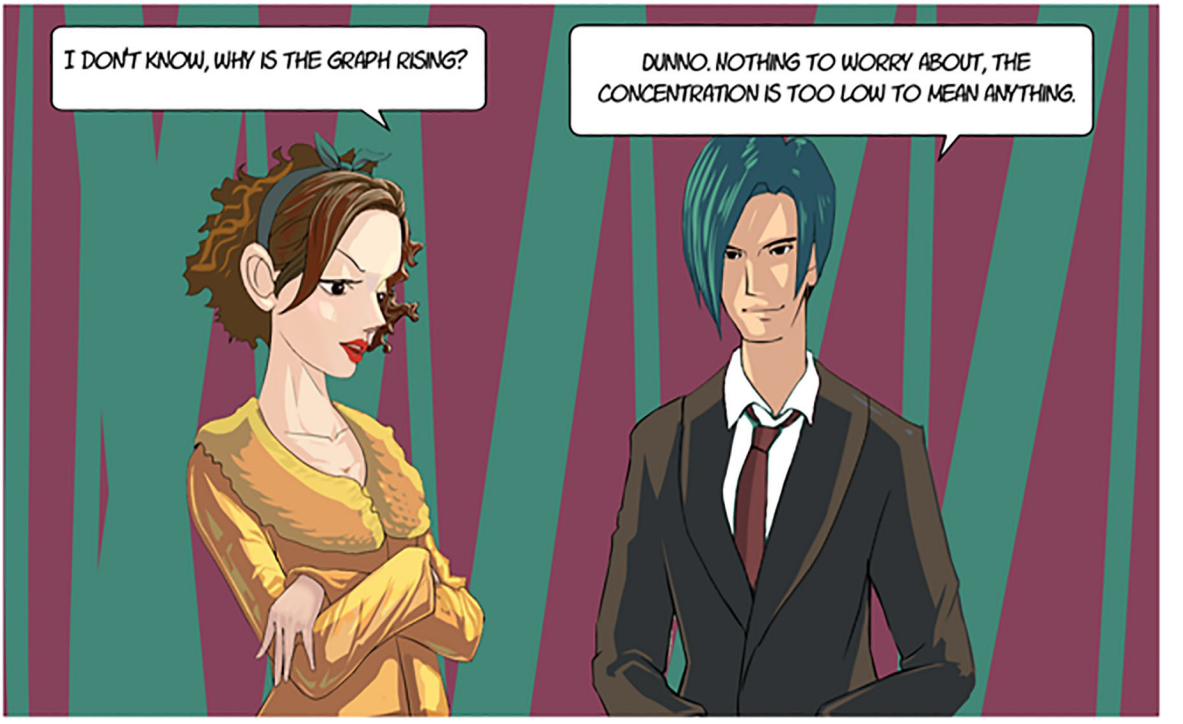

LET'S HAVE DINNER. URSULA, WILL YOU SET THE TABLE, PLEASE?




SMELL THAT?


WEIRD. THAT GAS SMELL IS STILL LINGERING.

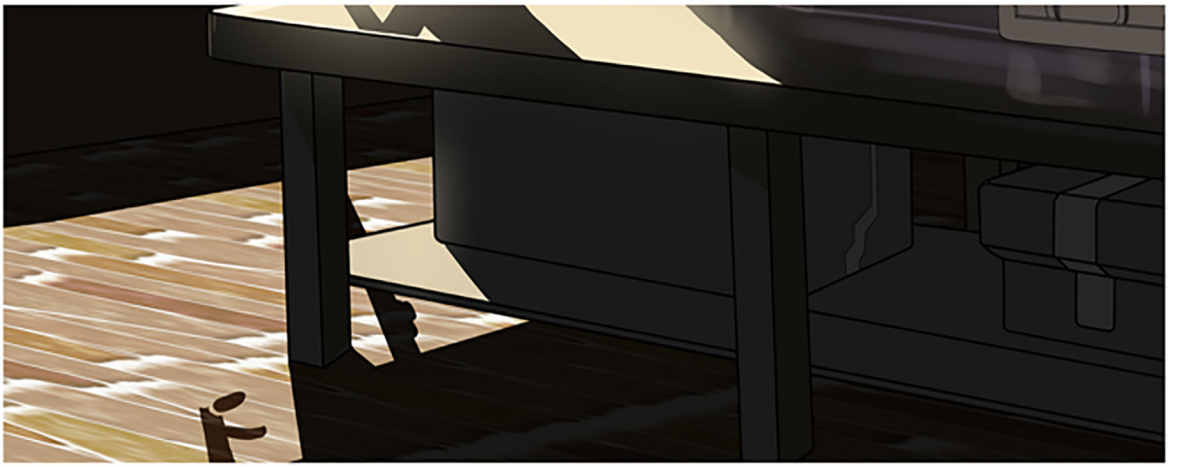

LOOK, BIG BOY, WHAT IS YOUR DEVICE TELLING US ABOUT OTTO'S PLACE?
LOOKS LIKE HE LET THE SOUP BOIL OVER, AGAIN.


I DON'T KNOW, WHY IS THE GRAPH RISING?
DUNNO. NOTHING TO WORRY ABOUT, THE CONCENTRATION IS TOO LOW TO MEAN ANYTHING.

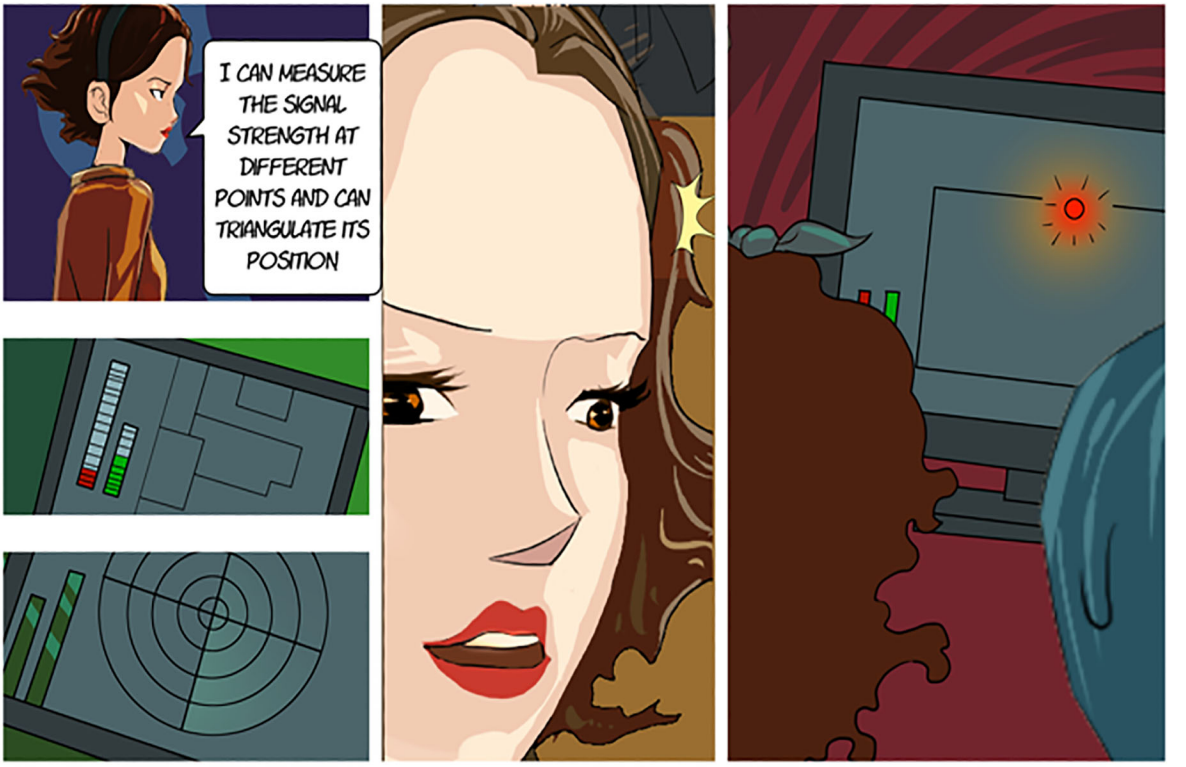

I'LL LIGHT SOME CANDLES
CAN YOU SHOW ME WHERE THE SOUP PLATES ARE, FIRST?

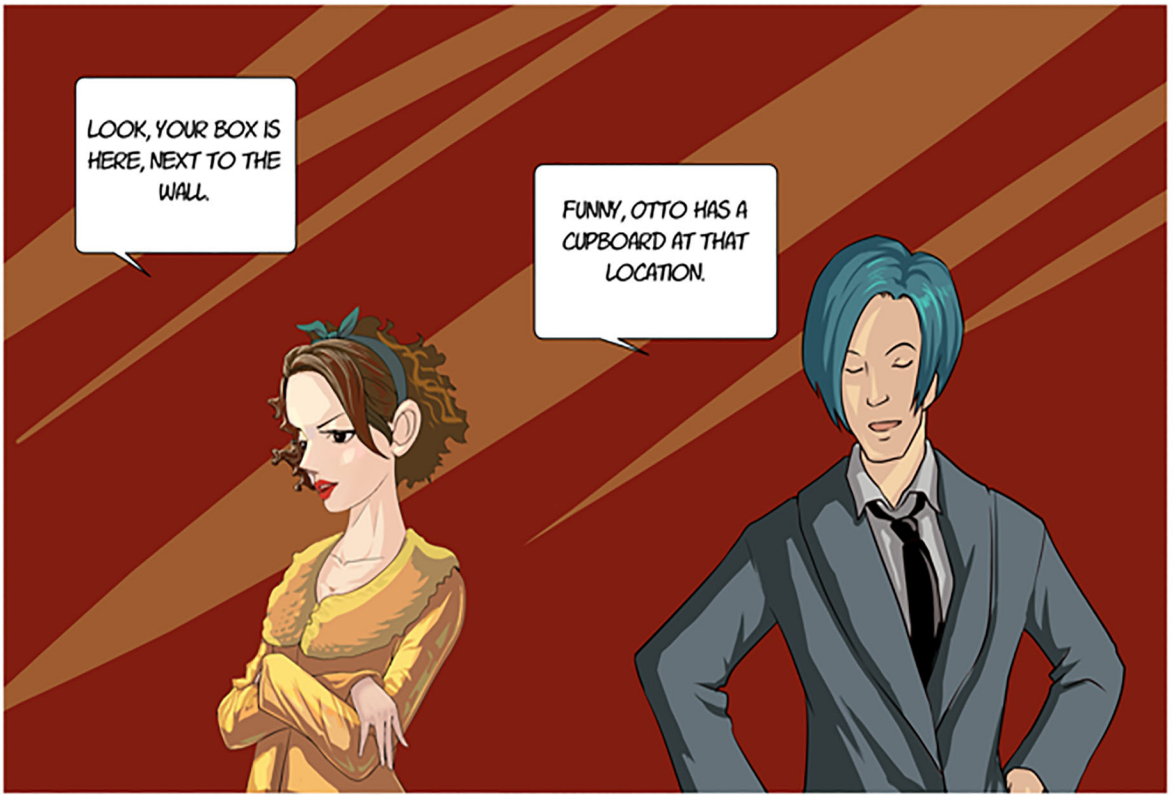

GIVE OTTO SOME PRIVACY, EVEN WITH HIS PERMISSION WE SHOULD NOT MESS AROUND
I AM WORRIED.
I CAN'T MAKE ANY SENSE OF THIS DATA
COME ON, YOU KNOW THAT YOU ARE THE SAME WAY, IT'S THE CURSE OF OUR PROFESSION.
SOPHIE THE SCIENTIST.
THE WORLD IS WRONG IF THERE IS SOMETHING SHE DOESN'T UNDERSTAND.
ANYWAY, MY BROTHER HAS A WORKING NOSE.
HE CAN TELL IF THERE IS A GAS LEAK


I CAN STILL SMELL GAS.
IT'S THE ENERGY SAVING AIR CONDITIONING, IT EXCHANGES AIR SLOWER.
AND I MIGHT JUST BE TOO SENSITIVE.




I'LL SHOW YOU.


I CAN MEASURE THE SIGNAL STRENGTH AT DIFFERENT POINTS AND CAN TRIANGULATE ITS POSITION


LOOK, YOUR BOX IS HERE, NEXT TO THE WALL.
FUNNY, OTTO HAS A CUPBOARD AT THAT LOCATION.


RINGING

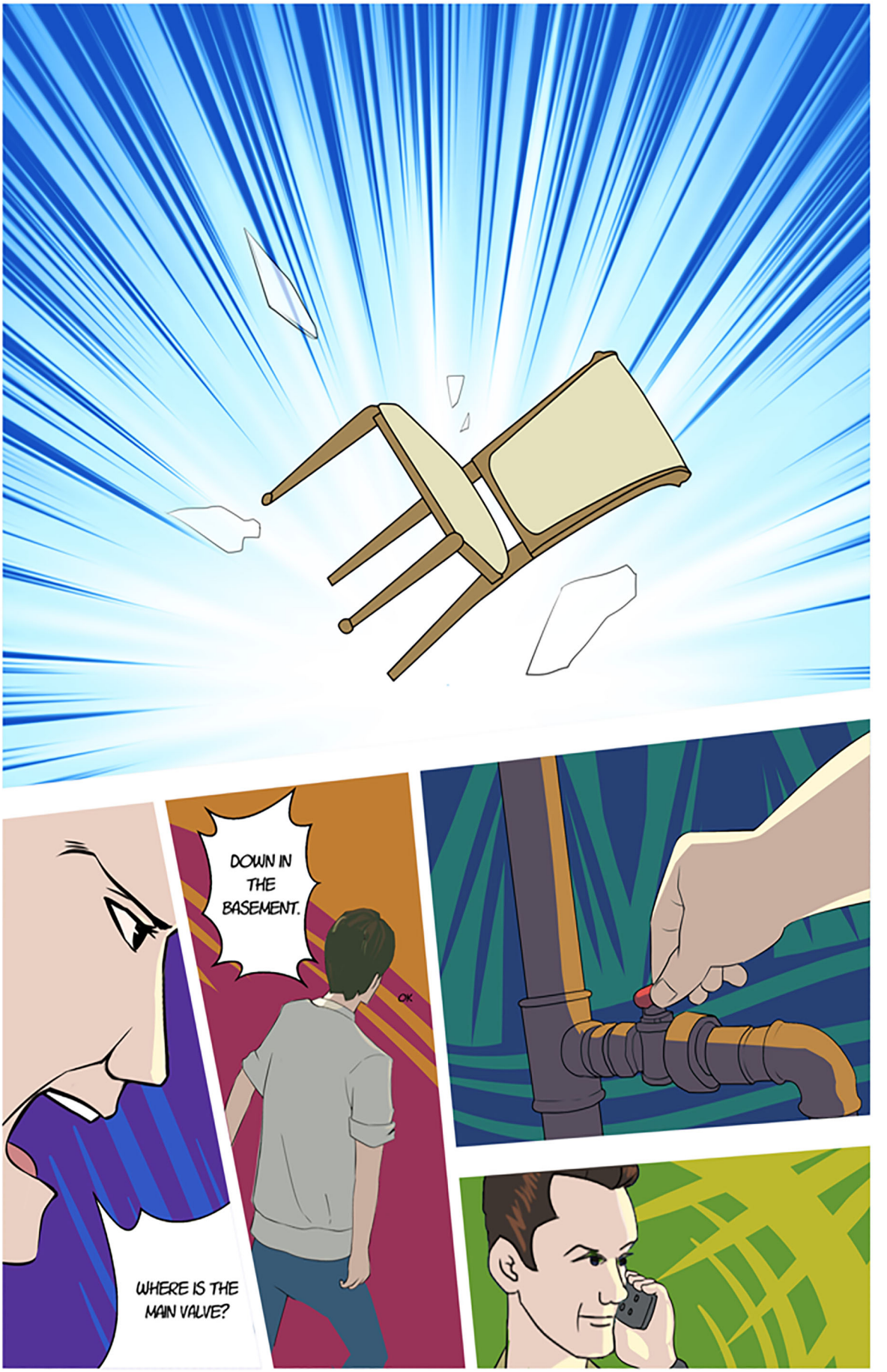

COME ON, OTTO! ANSWER THE PHONE!

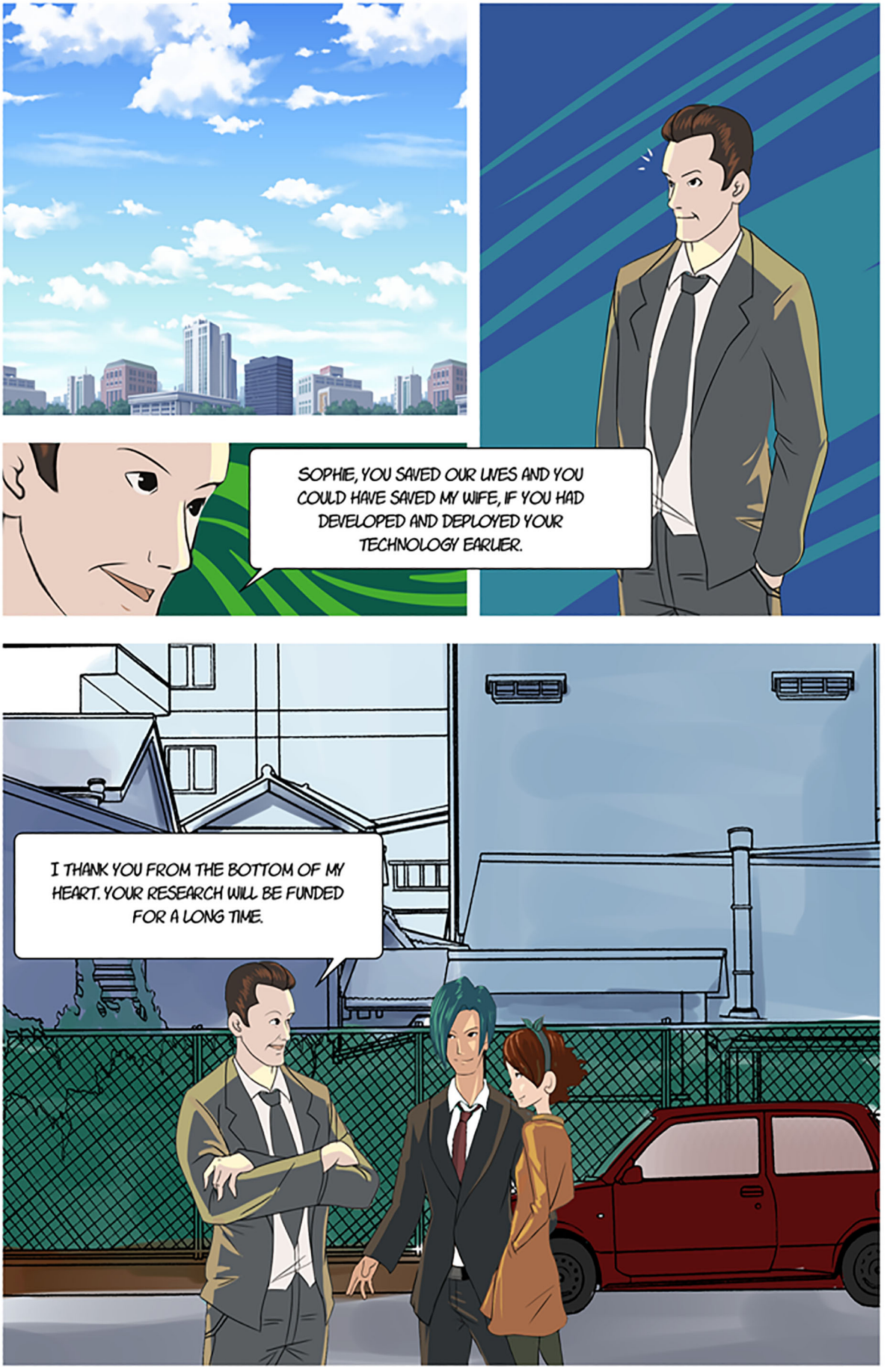

!
YOU HAVE A GAS LEAK! OPEN THE WINDOWS. NOW!


YES, I KNOW. I JUST LET THE SOUP BOIL OVER.
NO!
THERE IS A SECOND LEAK!
THE GAS RATIO IS RISING, NOT GOING DOWN.


SOPHIE SAYS WE HAVE A REAL GAS LEAK
I CAN'T OPEN THE WINDOW!
PA!!
.....
COURT


WAIT, THEY ARE ON REMOTE CONTROL, I'LL OPEN THEM
NO SPARKS! DON'T TOUCH ANYTHING ELECTRICAL!
I'LL BREAK THE WINDOW!


WHERE IS THE MAIN VALVE?
DOWN IN THE BASEMENT.
OK.


SOPHIE, YOU SAVED OUR LIVES AND YOU COULD HAVE SAVED MY WIFE, IF YOU HAD DEVELOPED AND DEPLOYED YOUR TECHNOLOGY EARLIER.
I THANK YOU FROM THE BOTTOM OF MY HEART. YOUR RESEARCH WILL BE FUNDED FOR A LONG TIME.

Possibilities of the Internet of Things

The Internet of Things provides huge possibilities with health services. Different kind of sensors can monitor you and prevent illnesses before they become serious. They can also help you to stay fit.

Your healt data can be shown on any device capable of connecting to the Internet. It might very well be glasses showing you the services.

Your mobile phone can serve as a hub for the rest of the devices or it can be a sensor in the same way as the others.

IoT health systems can be wearable sensors that transmit the data to the cloud.

The sensors can for example monitor your heart rate, blood pressure and your overall health.

The sensors can be integrated into your clothes such as your socks or shoes. This makes it easy to keep them along.

Most of these technologies exist already, but they are not yet integrated.

Science Clarified

www.clarified.info

A DRAMATIC STORY OF SCIENTISTS CREATING THE TECHNOLOGY THAT WILL CHANGE YOUR HOME IN TEN YEARS.

FUTURE IS A PLACE WHERE ALL THINGS TALK TO YOU THROUGH INTERNET OF THINGS.

SMART HOME: WILL IT SAVE YOU OR KILL YOU?

SEE THE SCIENTISTS FIGHT, FALL IN LOVE, LAUGH AND CRY!

THIS STORY STABS THROUGH THE FOG THAT HIDES OUR FUTURE. READ IT NOW, EXPERIENCE IT IN TWENTY YEARS!

INTERNET OF THINGS

Coming Soon to Your Home!