FREE
#5

UNIVERSITY OF LINCOLN AND TEESSIDE UNIVERSITY PRESENT

CHAMPION
circular bio-based polymers

GREENKID

SCIENCE! PUZZLES! THIS ISSUE: A FAMILIAR FACE STRIKES BACK! ALL THIS AND MORE.

GLOSSARY

AMINES – CHEMICALS THAT HAVE A NITROGEN ATOM THAT IS ATTACHED TO A CARBON ATOM THAT ITSELF IS ONLY ATTACHED TO OTHER CARBONS OR HYDROGENS.

BIODERIVED – ANYTHING WHERE THE ORIGINAL CARBON SOURCE IS CO_2 THAT IS THEN CONVERTED INTO SOMETHING ELSE BY A LIVING ORGANISM E.G. PLANTS TAKE CO_2 AND WATER TO MAKE SUGARS.

CARBON-CARBON DOUBLE BOND – WHEN TWO CARBON ATOMS ARE JOINED TOGETHER BY TWO BONDS (THIS IS WHAT MAKES SOME OILS/FATS BE CALLED UNSATURATED). THE SECOND BOND IS A BIT WEAKER SO IT CAN BE OPENED TO MAKE NEW COMPOUNDS.

CHAMPION – AN EU FUNDED PROJECT LOOKING AT PRODUCING SAFE, BIO-DERIVED POLYMERS AND SWITCHABLE ADHESIVES.

CIRCULAR ECONOMY – A CLOSED LOOP, AT THE END OF LIFE, THINGS CAN BE MADE INTO SOMETHING NEW.

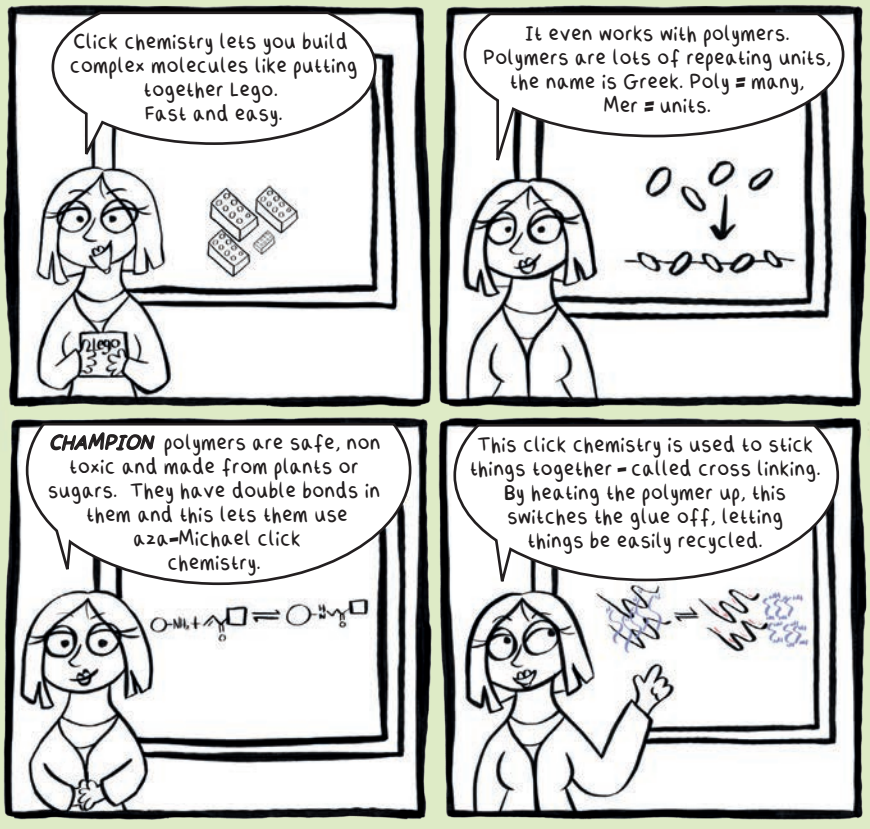
ECO WIND TURBINE – A WIND TURBINE THAT HAS BEEN DESIGNED FOR EASY REUSE/RECYCLING OF ITS COMPONENT PARTS AT THE END OF LIFE.

THERMOPLAST – A PLASTIC/POLYMER THAT IS HARD AT ROOM TEMPERATURE BUT CAN BE RESHAPED OR REMOULDED WHEN HOT. THESE TYPES OF POLYMER CAN BE EASILY RECYCLED.

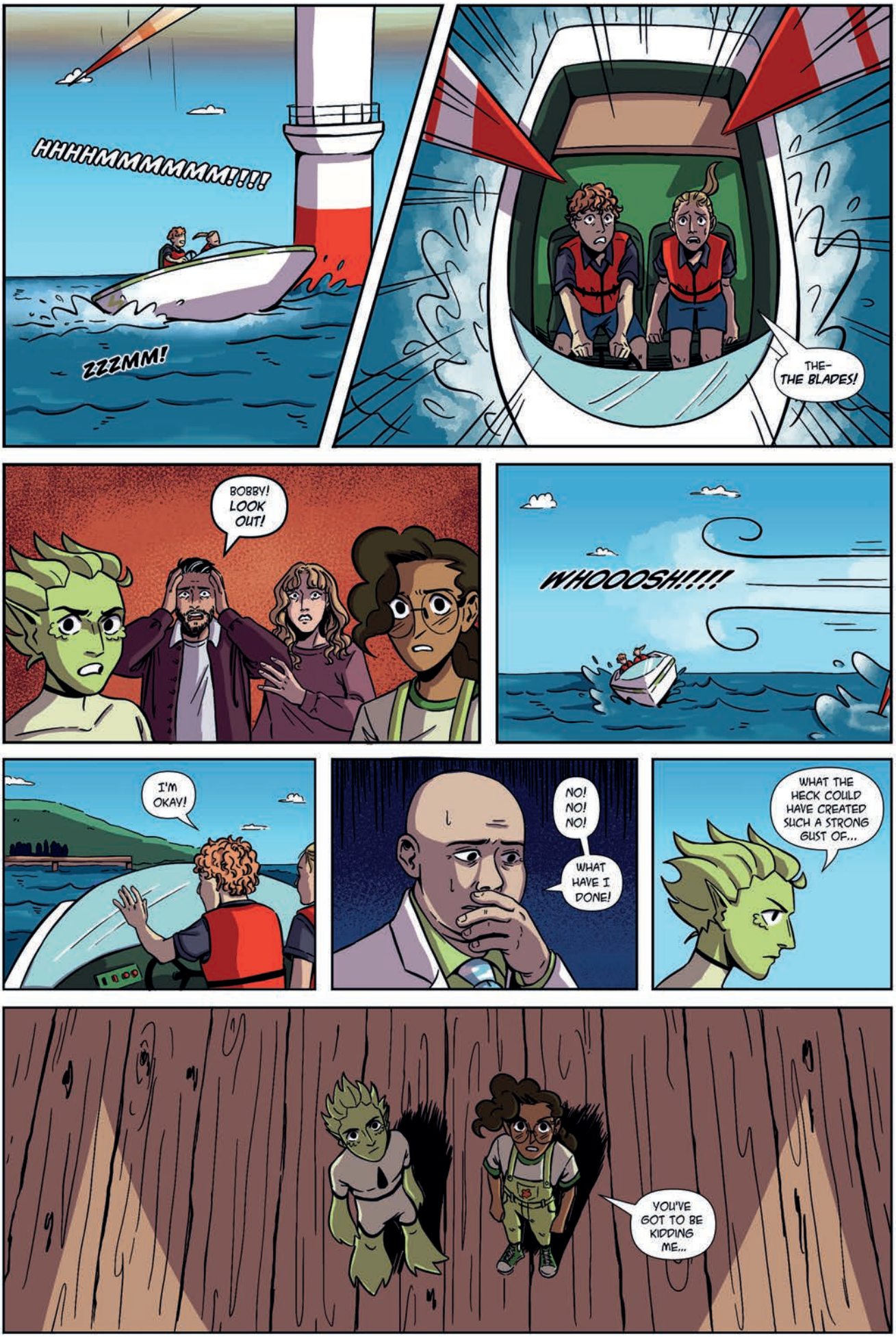
THERMOSET – A PLASTIC/POLYMER THAT WHEN REACTED WITH A CROSS-LINKER FORMS NEW BONDS BETWEEN THE POLYMER CHAINS, WE CALL THIS CURING. ONCE CURED, THIS TYPE OF POLYMER IS VERY TOUGH BUT USUALLY ALSO VERY HARD TO RECYCLE.

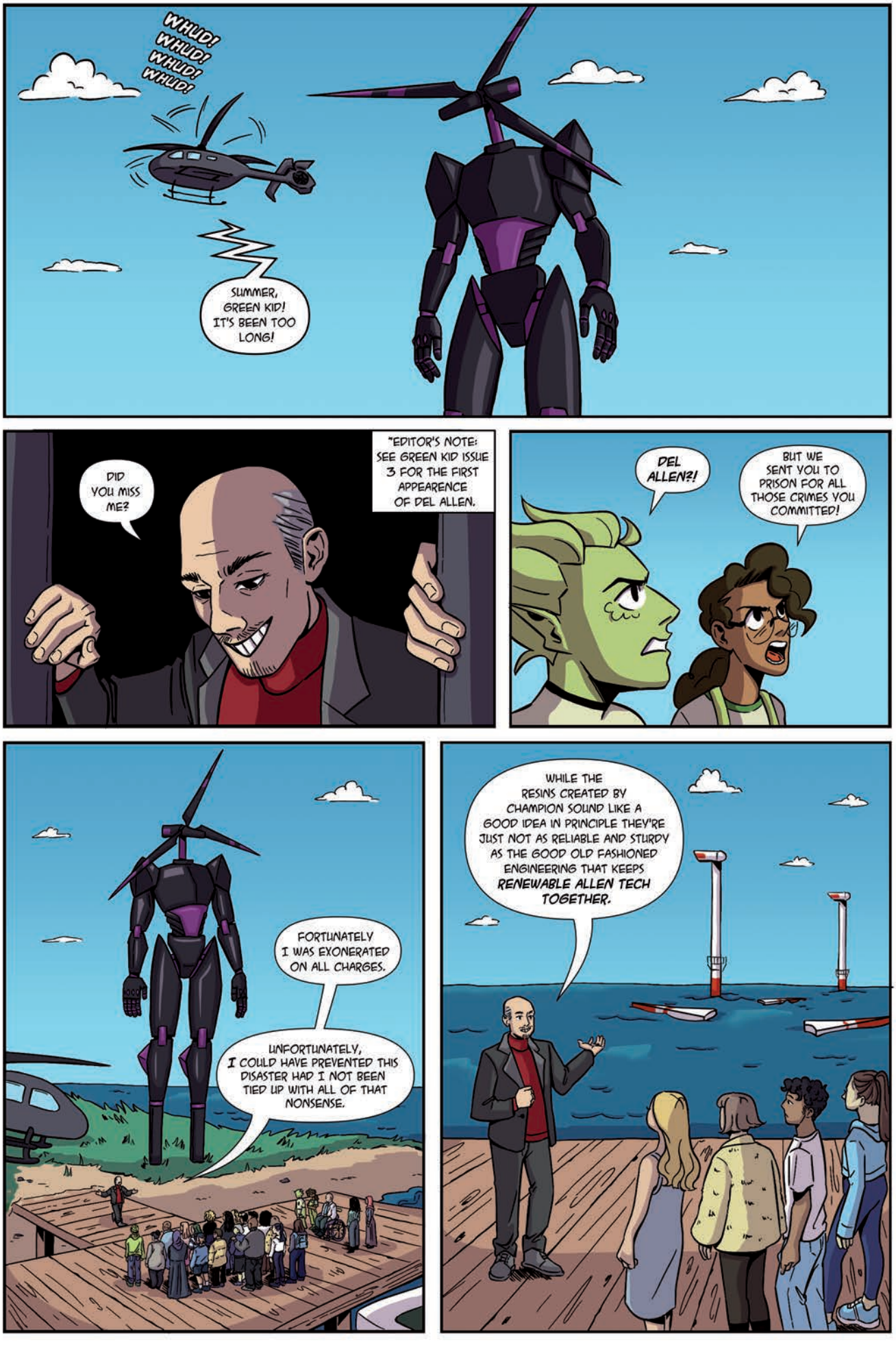
science! with Dr. Science!

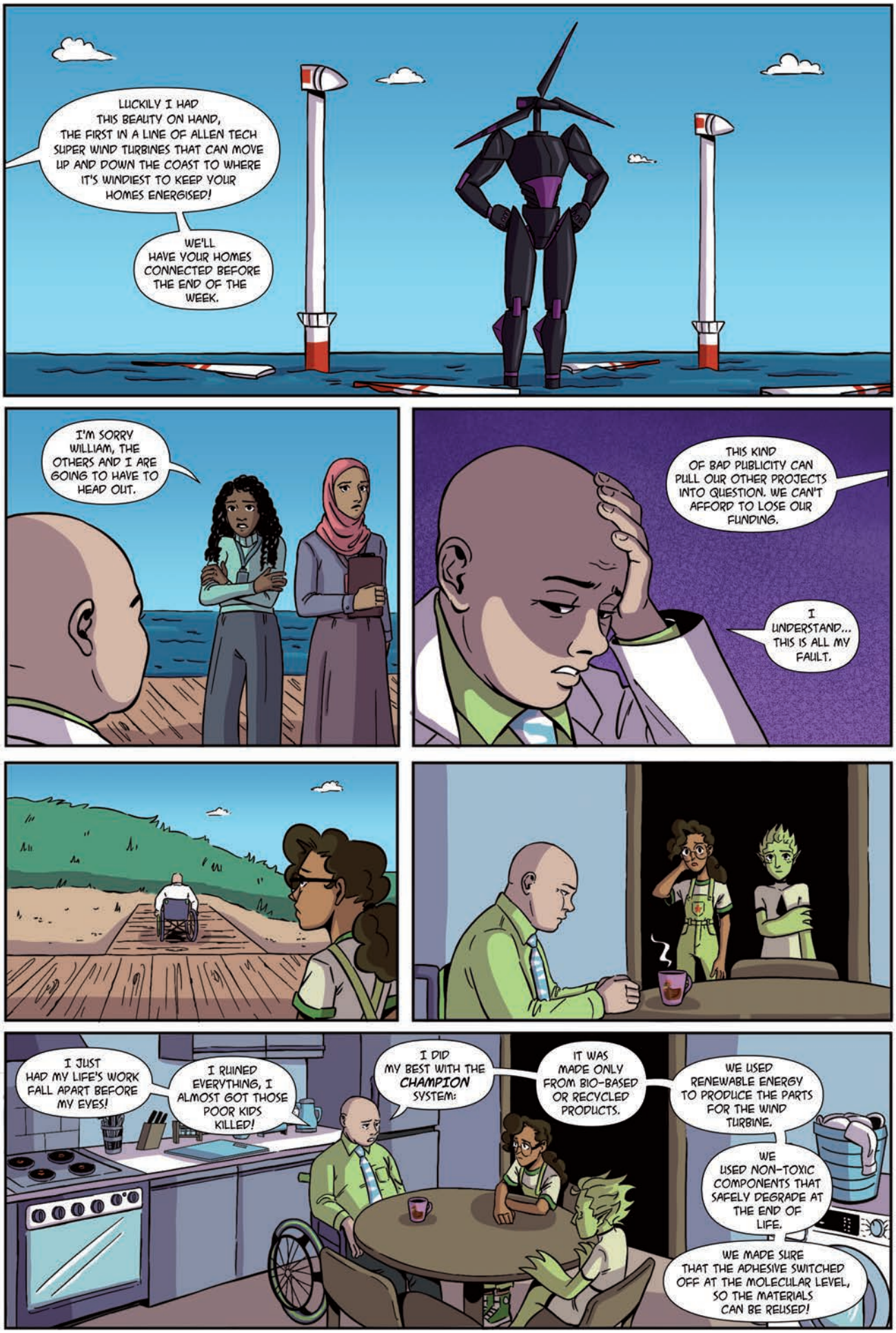
COLOUR THE COMIC!

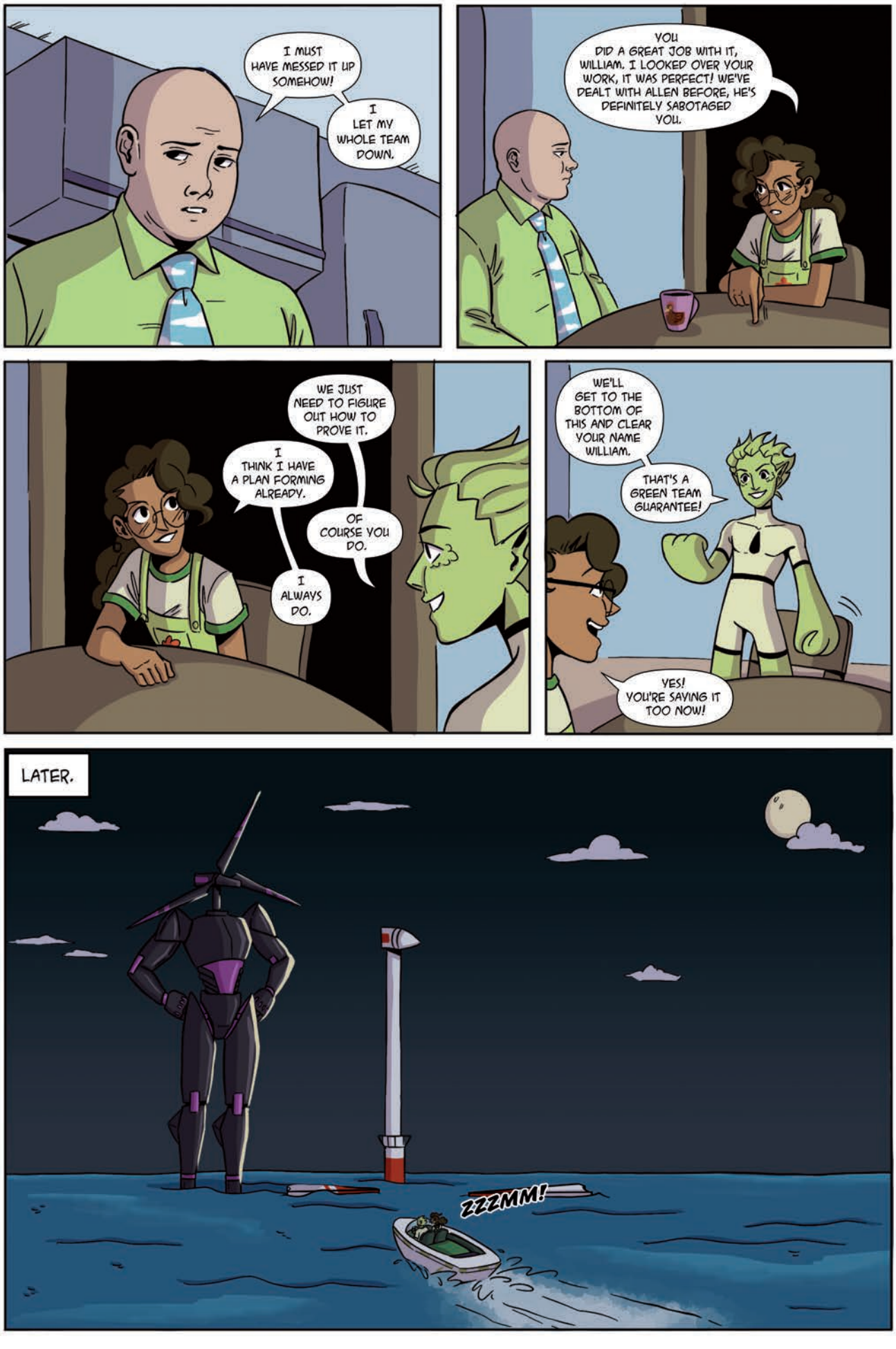


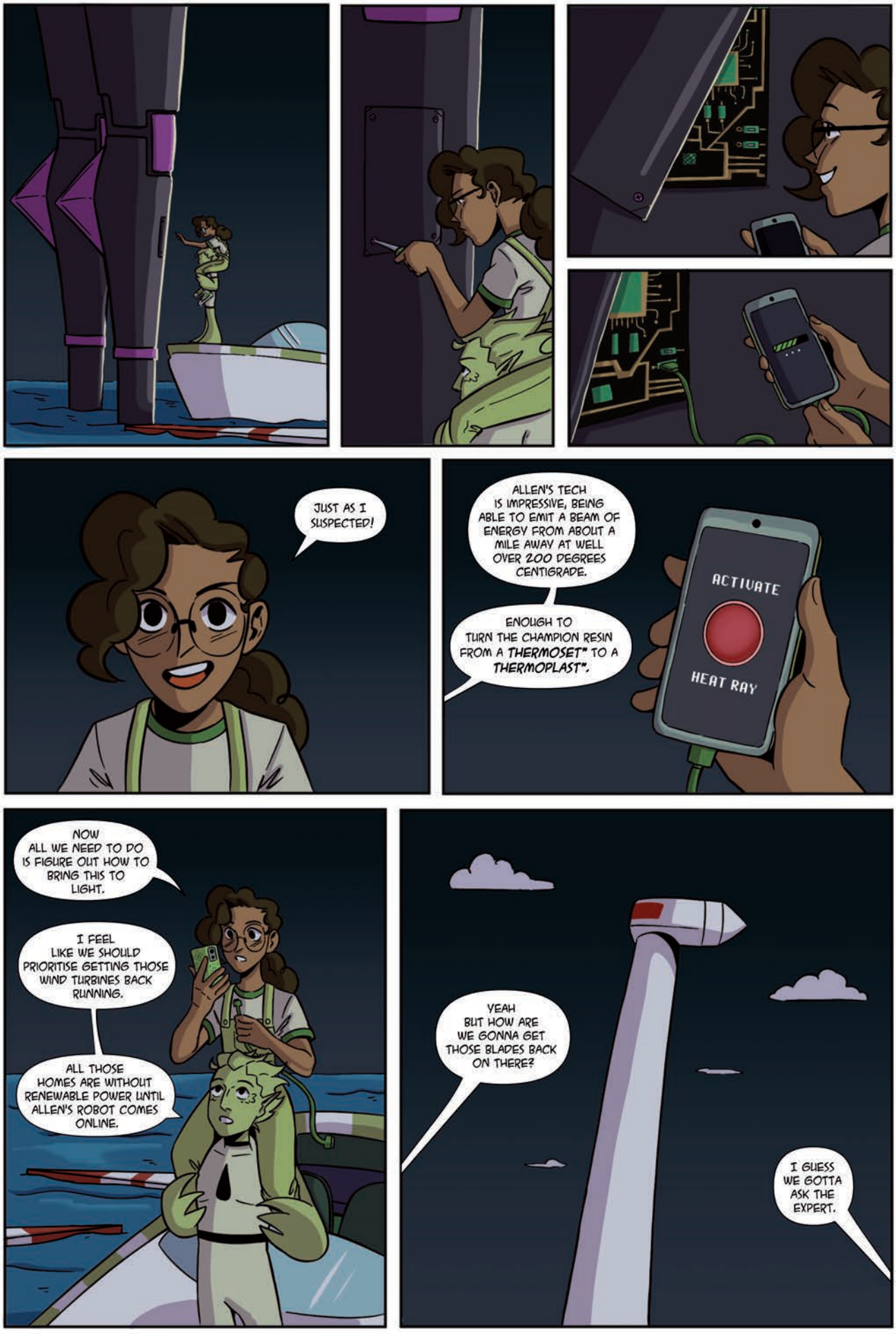

WELCOME EVERYONE TO THE GRAND UNVEILING OF THESE 2 BRILLIANT NEW ECO WIND TURBINES" THAT WILL POWER YOUR HOMES!
THANKS TO THE CHAMPION" TEAM, WHO ARE WITH US TODAY, THESE WIND TURBINES ARE 100% RECYCLABLE.
TO CELEBRATE WE HAVE THE AMAZING JUNIOR SEA CADETS WHO WILL BE RACING BETWEEN THE TURBINES AND BACK HERE!
ON YOUR MARKS....
GET SET...
GO!
OH WILLIAM, I WISH YOU'D STOP WORRYING FOR ONE DAY.
IT'S TIME TO TAKE PRIDE IN OUR ACHIEVEMENT. WE WOULDN'T HAVE BEEN ABLE TO COMPLETE IT WITHOUT YOUR GUIDANCE.
Awoooo!!!!
FEELS WARM ALL OF A SUDDEN...
ZZZMM!

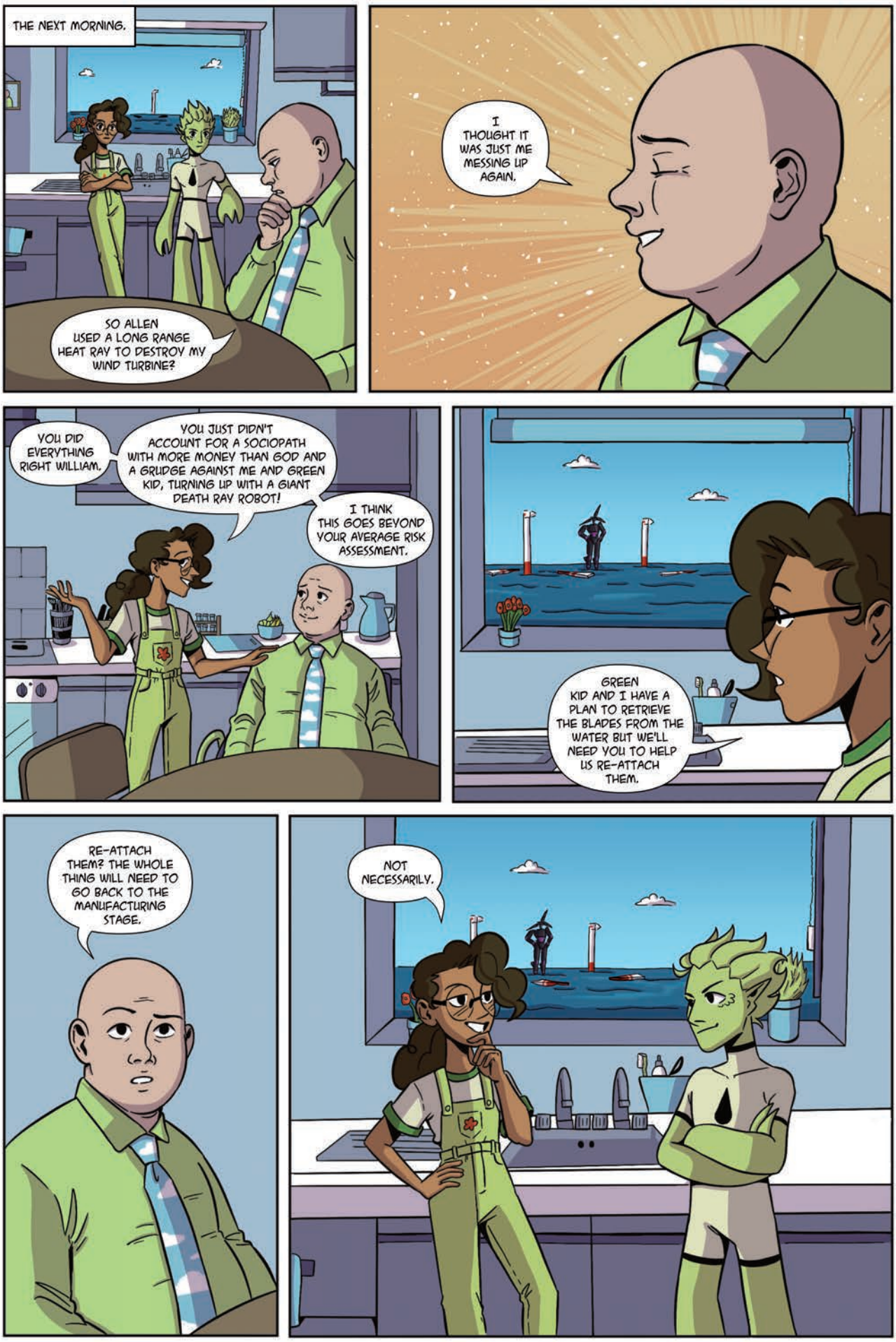

HHHHMMMMMMM!!!!
ZZZMM!
THE– THE BLADES!
BOBBY! LOOK OUT!
WHOOOSH!!!!
I'M OKAY!
NO! NO! NO!
WHAT HAVE I DONE!
WHAT THE HECK COULD HAVE CREATED SUCH A STRONG GUST OF...
YOU'VE GOT TO BE KIDDING ME...

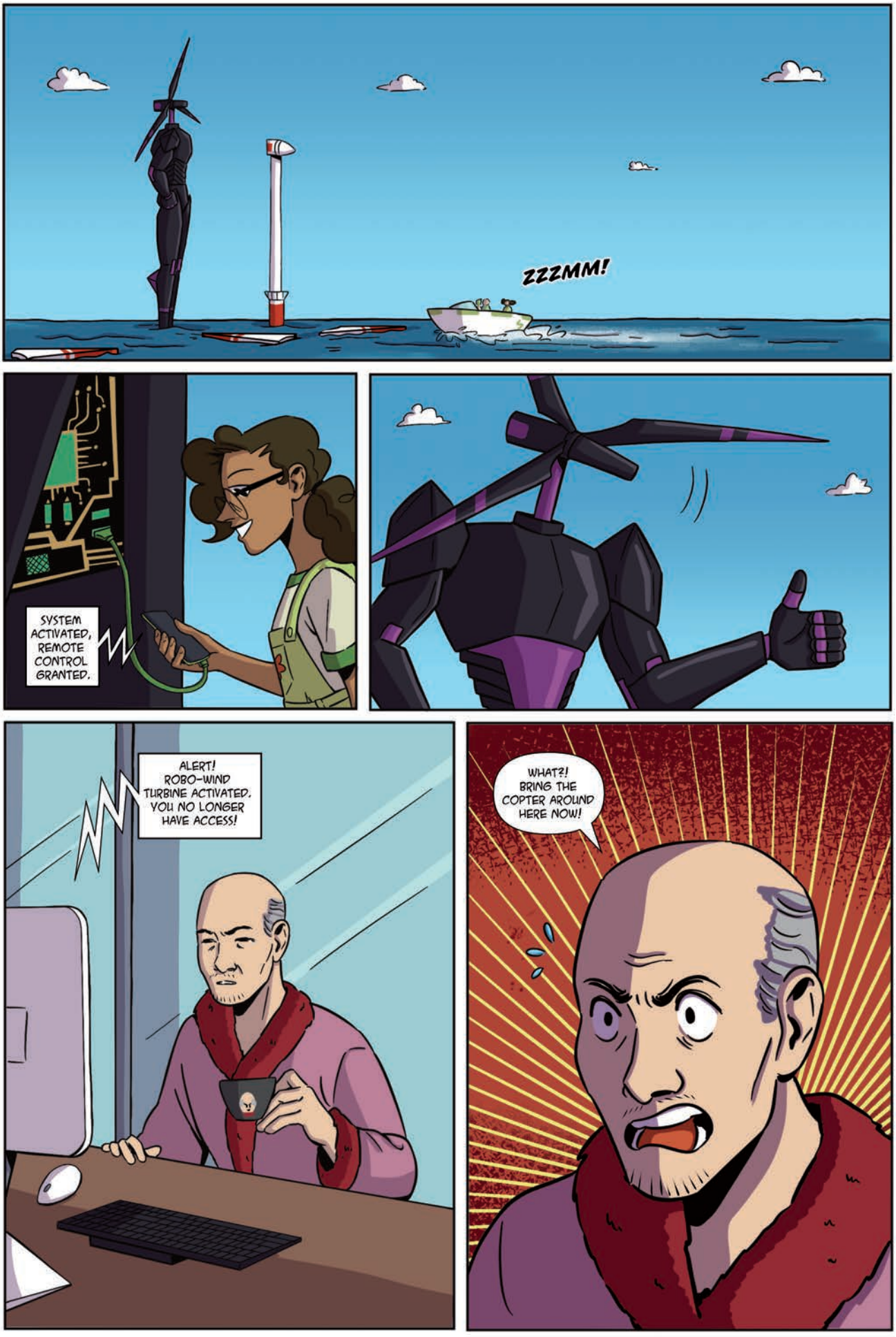

WHUD! WHUD! WHUD! WHUD!
SUMMER, GREEN KID! IT'S BEEN TOO LONG!
DID YOU MISS ME?
"EDITOR'S NOTE: SEE GREEN KID ISSUE 3 FOR THE FIRST APPEARENCE OF DEL ALLEN.
DEL ALLEN?!
BUT WE SENT YOU TO PRISON FOR ALL THOSE CRIMES YOU COMMITTED!
FORTUNATELY I WAS EXONERATED ON ALL CHARGES.
UNFORTUNATELY, I COULD HAVE PREVENTED THIS DISASTER HAD I NOT BEEN TIED UP WITH ALL OF THAT NONSENSE.
WHILE THE RESINS CREATED BY CHAMPION SOUND LIKE A GOOD IDEA IN PRINCIPLE THEY'RE JUST NOT AS RELIABLE AND STURDY AS THE GOOD OLD FASHIONED ENGINEERING THAT KEEPS RENEWABLE ALLEN TECH TOGETHER.

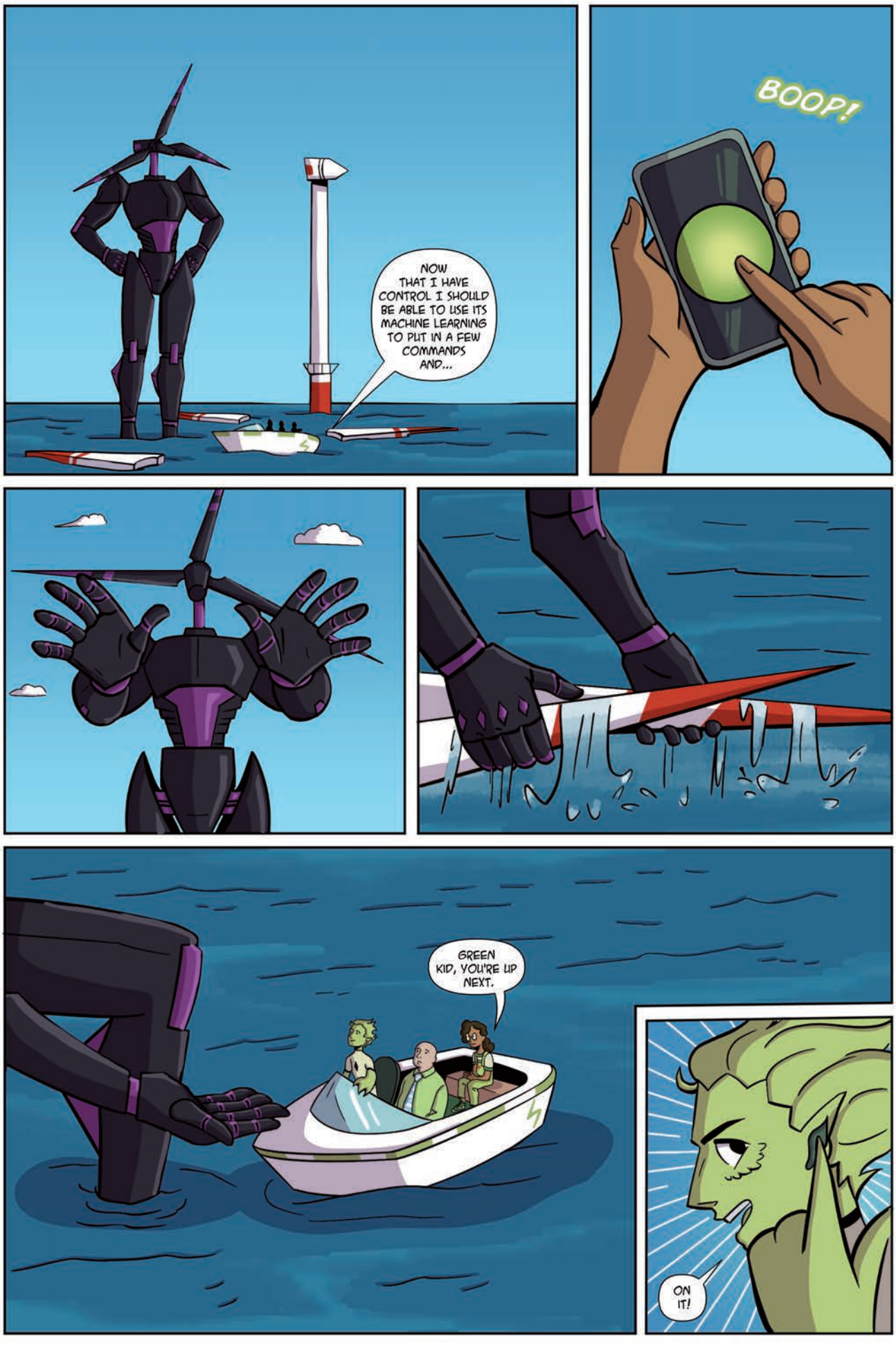

LUCKILY I HAD THIS BEAUTY ON HAND, THE FIRST IN A LINE OF ALLEN TECH SUPER WIND TURBINES THAT CAN MOVE UP AND DOWN THE COAST TO WHERE IT'S WINDIEST TO KEEP YOUR HOMES ENERGISED!
WE'LL HAVE YOUR HOMES CONNECTED BEFORE THE END OF THE WEEK.
I'M SORRY WILLIAM, THE OTHERS AND I ARE GOING TO HAVE TO HEAD OUT.
THIS KIND OF BAD PUBLICITY CAN PULL OUR OTHER PROJECTS INTO QUESTION. WE CAN'T AFFORD TO LOSE OUR FUNDING.
I UNDERSTAND... THIS IS ALL MY FAULT.
I JUST HAD MY LIFE'S WORK FALL APART BEFORE MY EYES!
I RUINED EVERYTHING, I ALMOST GOT THOSE POOR KIDS KILLED!
I DID MY BEST WITH THE CHAMPION SYSTEM:
IT WAS MADE ONLY FROM BIO-BASED OR RECYCLED PRODUCTS.
WE USED RENEWABLE ENERGY TO PRODUCE THE PARTS FOR THE WIND TURBINE.
WE USED NON-TOXIC COMPONENTS THAT SAFELY DEGRADE AT THE END OF LIFE.
WE MADE SURE THAT THE ADHESIVE SWITCHED OFF AT THE MOLECULAR LEVEL, SO THE MATERIALS CAN BE REUSED!

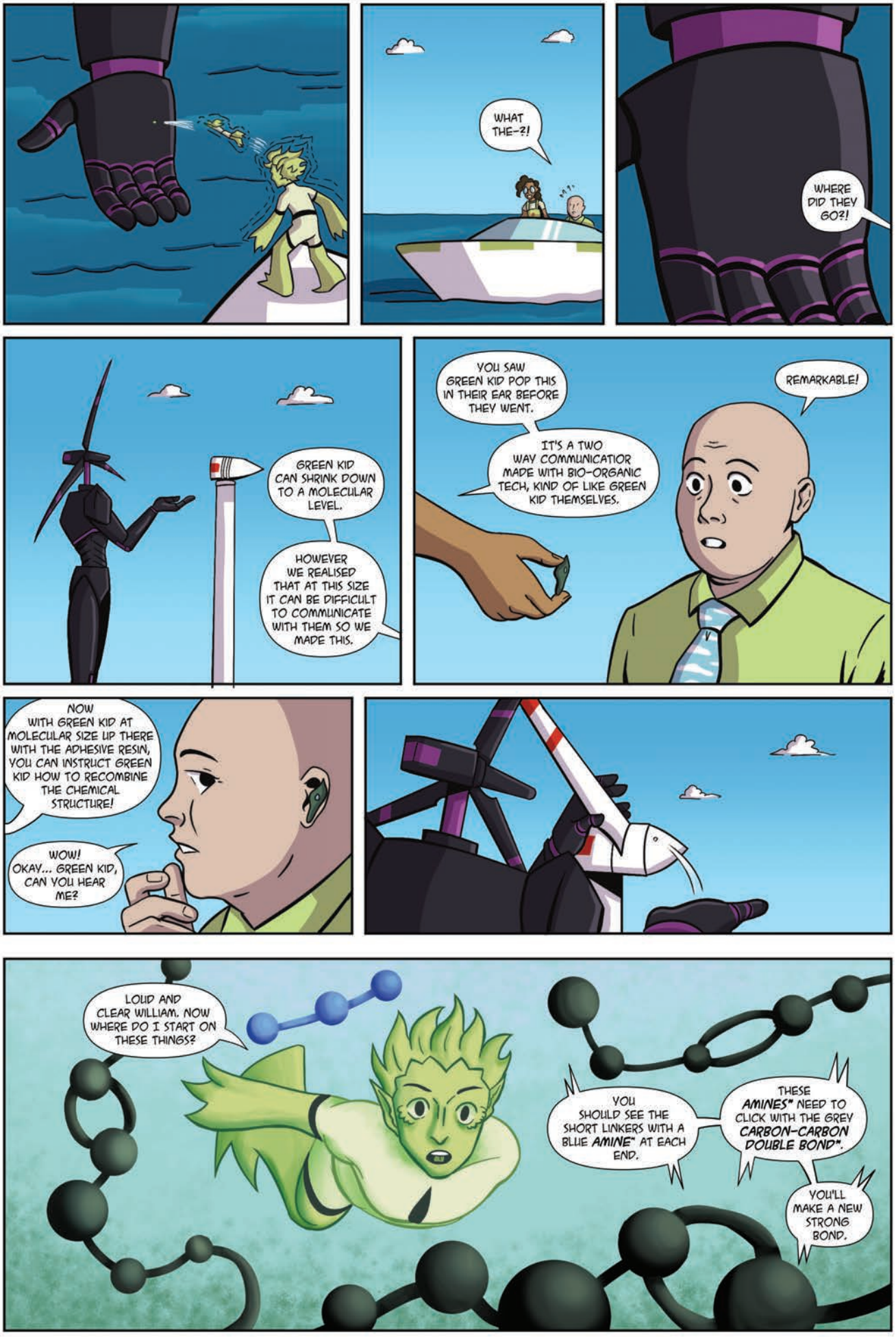

I MUST HAVE MESSED IT UP SOMEHOW!
I LET MY WHOLE TEAM DOWN.
YOU DID A GREAT JOB WITH IT, WILLIAM. I LOOKED OVER YOUR WORK, IT WAS PERFECT! WE'VE DEALT WITH ALLEN BEFORE, HE'S DEFINITELY SABOTAGED YOU.
WE JUST NEED TO FIGURE OUT HOW TO PROVE IT.
I THINK I HAVE A PLAN FORMING ALREADY.
OF COURSE YOU DO.
I ALWAYS DO.
WE'LL GET TO THE BOTTOM OF THIS AND CLEAR YOUR NAME WILLIAM.
THAT'S A GREEN TEAM GUARANTEE!
YES! YOU'RE SAYING IT TOO NOW!
LATER.
ZZZMM!

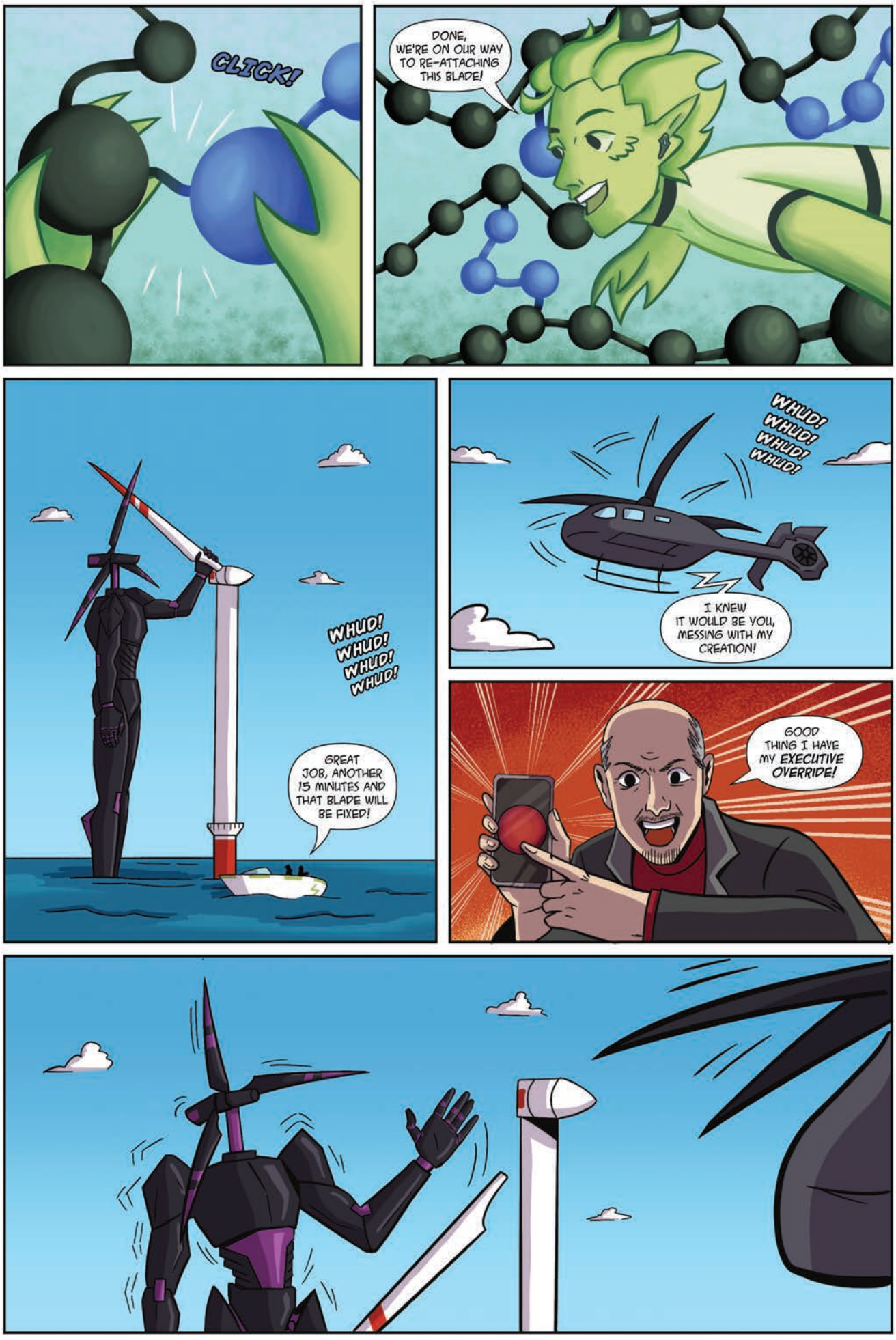

JUST AS I SUSPECTED!
ALLEN'S TECH IS IMPRESSIVE, BEING ABLE TO EMIT A BEAM OF ENERGY FROM ABOUT A MILE AWAY AT WELL OVER 200 DEGREES CENTIGRADE.
ENOUGH TO TURN THE CHAMPION RESIN FROM A THERMOSET* TO A THERMOPLAST*.
ACTIVATE
HEAT RAY
NOW ALL WE NEED TO DO IS FIGURE OUT HOW TO BRING THIS TO LIGHT.
I FEEL LIKE WE SHOULD PRIORITISE GETTING THOSE WIND TURBINES BACK RUNNING.
ALL THOSE HOMES ARE WITHOUT RENEWABLE POWER UNTIL ALLEN'S ROBOT COMES ONLINE.
YEAH BUT HOW ARE WE GONNA GET THOSE BLADES BACK ON THERE?
I GUESS WE GOTTA ASK THE EXPERT.


THE NEXT MORNING.
SO ALLEN USED A LONG RANGE HEAT RAY TO DESTROY MY WIND TURBINE?
I THOUGHT IT WAS JUST ME MESSING UP AGAIN.
YOU DID EVERYTHING RIGHT WILLIAM.
YOU JUST DIDN'T ACCOUNT FOR A SOCIOPATH WITH MORE MONEY THAN GOD AND A GRUDGE AGAINST ME AND GREEN KID, TURNING UP WITH A GIANT DEATH RAY ROBOT!
I THINK THIS GOES BEYOND YOUR AVERAGE RISK ASSESSMENT.
GREEN KID AND I HAVE A PLAN TO RETRIEVE THE BLADES FROM THE WATER BUT WE'LL NEED YOU TO HELP US RE-ATTACH THEM.
RE-ATTACH THEM? THE WHOLE THING WILL NEED TO GO BACK TO THE MANUFACTURING STAGE.
NOT NECESSARILY.


ZZZMM!
SYSTEM ACTIVATED, REMOTE CONTROL GRANTED.
ALERT! ROBO-WIND TURBINE ACTIVATED. YOU NO LONGER HAVE ACCESS!
WHAT?! BRING THE COPTER AROUND HERE NOW!

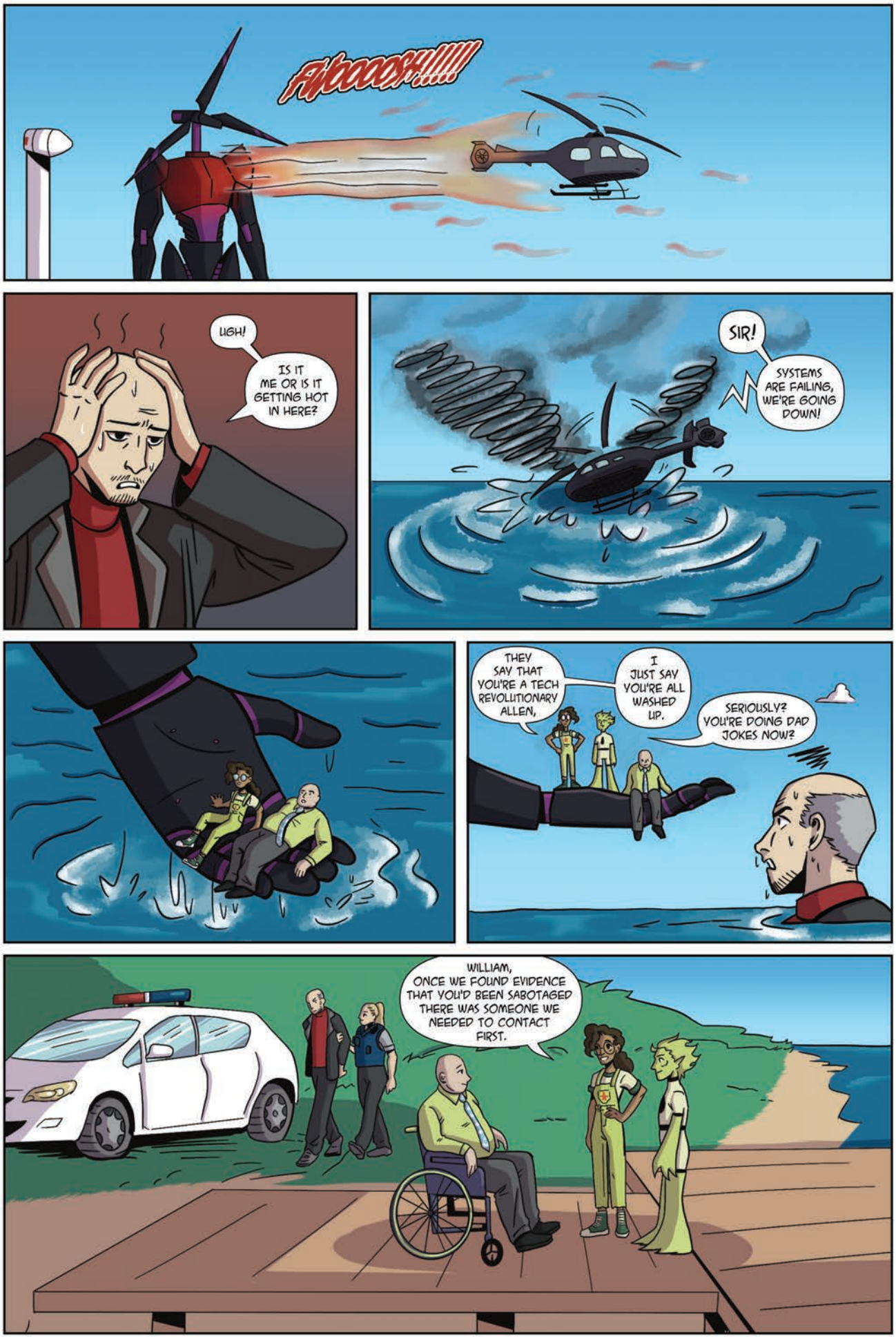

NOW THAT I HAVE CONTROL I SHOULD BE ABLE TO USE ITS MACHINE LEARNING TO PUT IN A FEW COMMANDS AND...
BOOP!
GREEN KID, YOU'RE UP NEXT.
ON IT!


WHAT THE-?!
WHERE DID THEY GO?!
GREEN KID CAN SHRINK DOWN TO A MOLECULAR LEVEL.
HOWEVER WE REALISED THAT AT THIS SIZE IT CAN BE DIFFICULT TO COMMUNICATE WITH THEM SO WE MADE THIS.
YOU SAW GREEN KID POP THIS IN THEIR EAR BEFORE THEY WENT.
IT'S A TWO WAY COMMUNICATIOR MADE WITH BIO-ORGANIC TECH, KIND OF LIKE GREEN KID THEMSELVES.
REMARKABLE!
NOW WITH GREEN KID AT MOLECULAR SIZE UP THERE WITH THE ADHESIVE RESIN, YOU CAN INSTRUCT GREEN KID HOW TO RECOMBINE THE CHEMICAL STRUCTURE!
WOW! OKAY... GREEN KID, CAN YOU HEAR ME?
LOUD AND CLEAR WILLIAM. NOW WHERE DO I START ON THESE THINGS?
YOU SHOULD SEE THE SHORT LINKERS WITH A BLUE AMINE" AT EACH END.
THESE AMINES" NEED TO CLICK WITH THE GREY CARBON-CARBON DOUBLE BOND".
YOU'LL MAKE A NEW STRONG BOND.

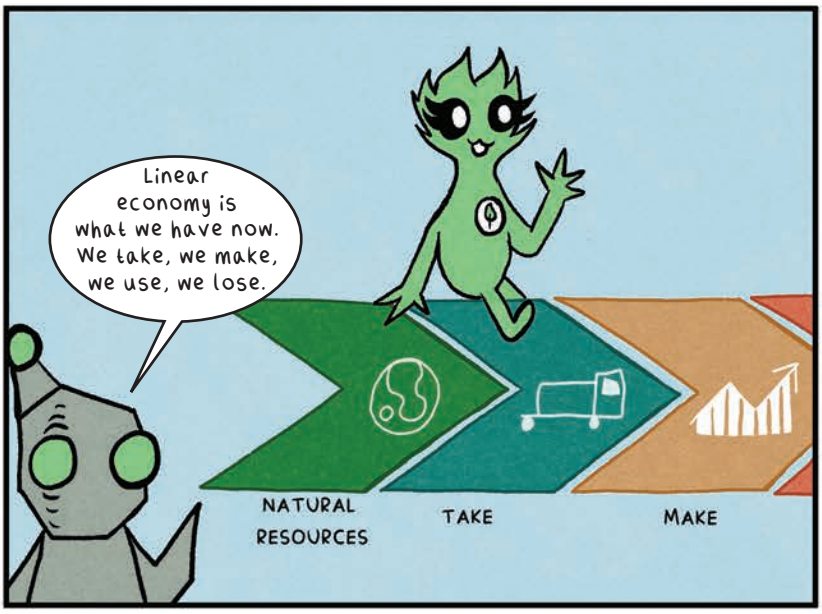

CLICK!
DONE, WE'RE ON OUR WAY TO RE-ATTACHING THIS BLADE!
WHUD! WHUD! WHUD! WHUD!
GREAT JOB, ANOTHER 15 MINUTES AND THAT BLADE WILL BE FIXED!
WHUD! WHUD! WHUD! WHUD!
I KNEW IT WOULD BE YOU, MESSING WITH MY CREATION!
GOOD THING I HAVE MY EXECUTIVE OVERRIDE!

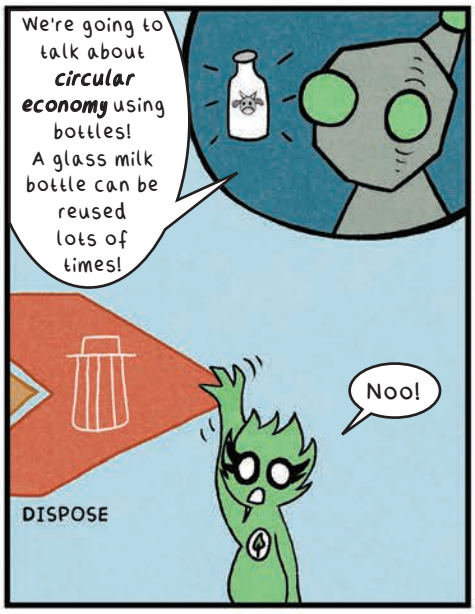

!
CAN'T!
HOLD ON!
MUCH!
LONGER!
SORRY SUMMER!
CRASH!

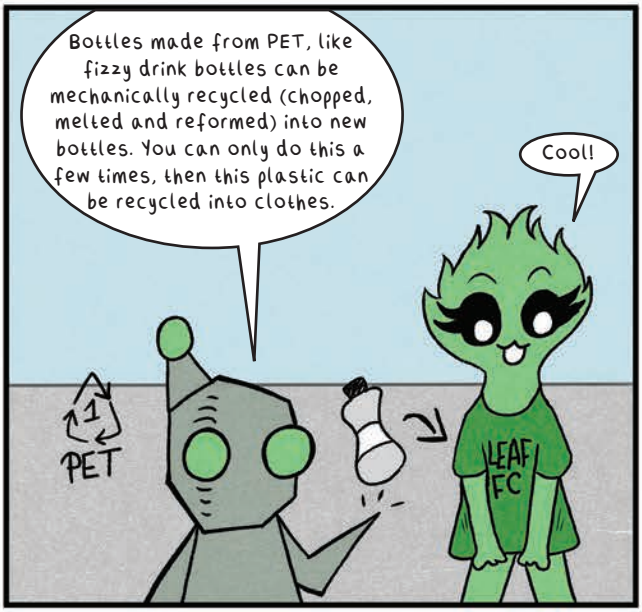

"COUGH COUGH!" GREEN KID!
KICK HIS BUTT!
YOU ALMOST HURT MY FRIENDS!
CRACK!
YOU LITTLE--!!
GET ME THE HECK OUT OF HERE!
SUMMER!
ARE YOU AND WILLIAM OKAY?!
YES! ESPECIALLY NOW YOU GAVE ME THE CHANCE TO DO THIS!

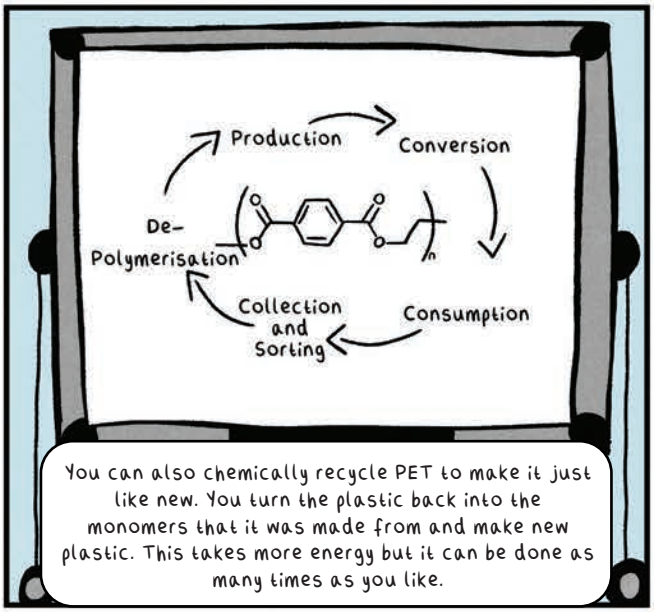

FWOOOSH!!!!!!
UGH!
IS IT ME OR IS IT GETTING HOT IN HERE?
SIR!
SYSTEMS ARE FAILING, WE'RE GOING DOWN!
THEY SAY THAT YOU'RE A TECH REVOLUTIONARY ALLEN,
I JUST SAY YOU'RE ALL WASHED UP.
SERIOUSLY? YOU'RE DOING DAD JOKES NOW?
WILLIAM, ONCE WE FOUND EVIDENCE THAT YOU'D BEEN SABOTAGED THERE WAS SOMEONE WE NEEDED TO CONTACT FIRST.

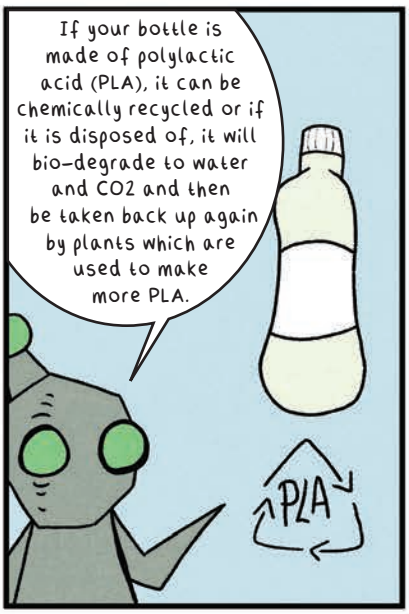

WILLIAM. HEY LISTEN, WE'RE REALLY SORRY.
WE SHOULD HAVE HAD MORE FAITH IN YOU.
WE SHOULDN'T HAVE DOUBTED YOU.
WELL I APPRECIATE THE APOLOGY.
I GUESS I'M NOT SUCH A LOSER AFTER ALL.
YOU'RE NOT A LOSER.
YOU'RE A CHAMPION.
THE END

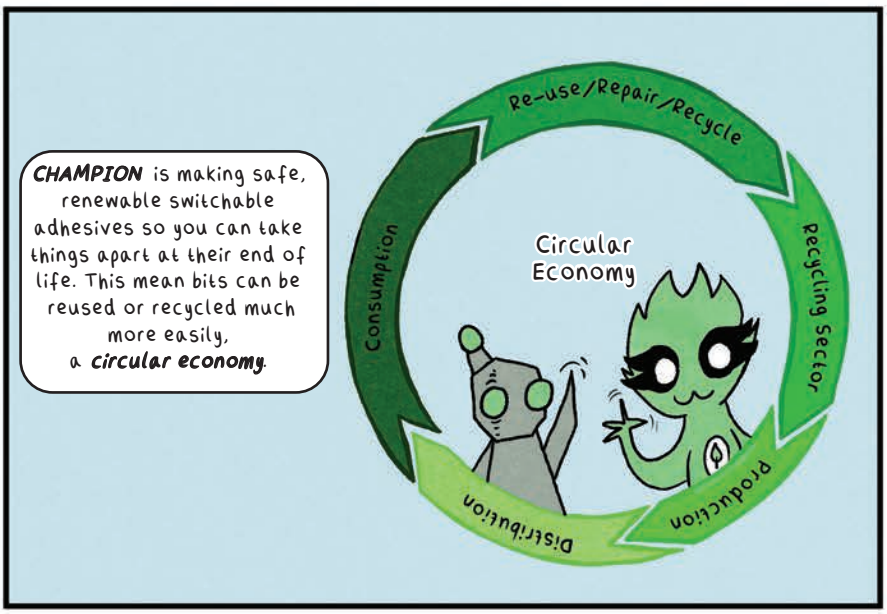

Linear economy is what we have now. We take, we make, we use, we lose.
NATURAL RESOURCES
TAKE
MAKE


We're going to talk about **circular economy** using bottles! A glass milk bottle can be reused lots of times!
DISPOSE
Noo!


Bottles made from PET, like fizzy drink bottles can be mechanically recycled (chopped, melted and reformed) into new bottles. You can only do this a few times, then this plastic can be recycled into clothes.
Cool!
1
PET
LEAF FC


Production
Conversion
De-Polymerisation
Collection and Sorting
Consumption
You can also chemically recycle PET to make it just like new. You turn the plastic back into the monomers that it was made from and make new plastic. This takes more energy but it can be done as many times as you like.


If your bottle is made of polylactic acid (PLA), it can be chemically recycled or if it is disposed of, it will bio-degrade to water and CO2 and then be taken back up again by plants which are used to make more PLA.
PLA


CHAMPION is making safe, renewable switchable adhesives so you can take things apart at their end of life. This mean bits can be reused or recycled much more easily, a ***circular economy***.
Re-use/Repair/Recycle
Recycling Sector
Production
Distribution
Consumption
Circular Economy

WORD SEARCH

D	T	A	I	B	N	T	T	U	R	B	I	N	E
N	A	O	R	S	A	L	C	A	S	H	A	R	C
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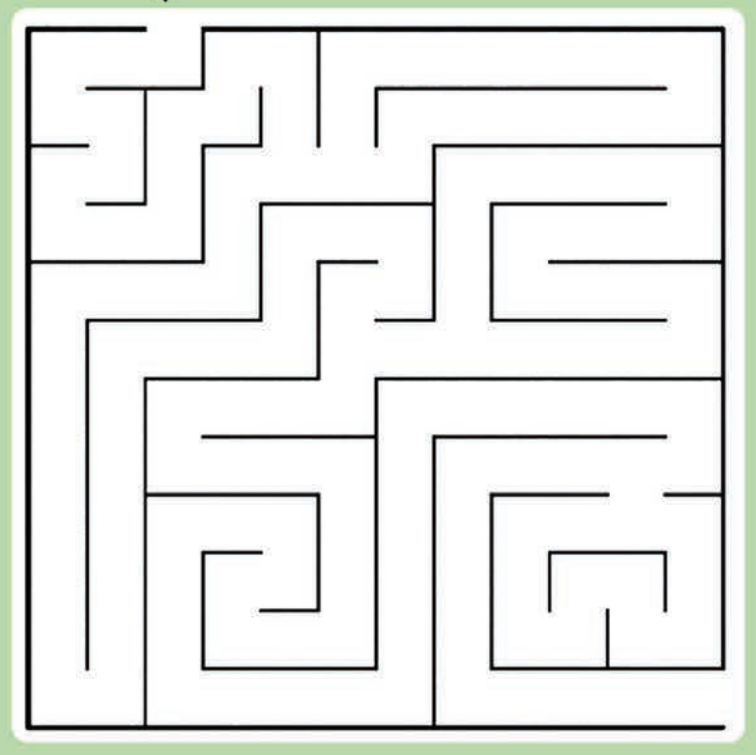
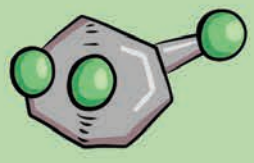
AMINES
BIODERIVED
CARBON CARBON
DOUBLE BOND
CHAMPION
CIRCULAR ECONOMY
ECO WIND
TURBINE
THERMOPLAST
THERMOSET

HELP SPROUT GET BACK TO CYRUS!





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BBI JU

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