

FREE  
#5

UNIVERSITY OF LINCOLN AND TEESIDE  
UNIVERSITY PRESENT



# 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.

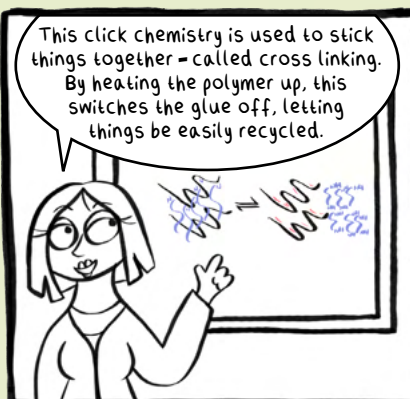
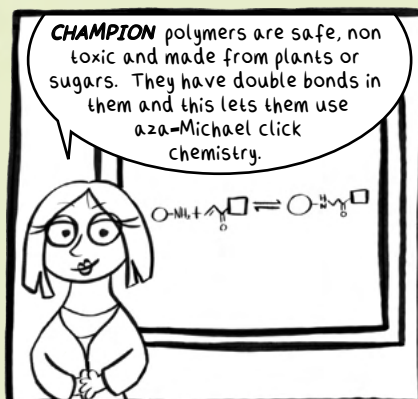
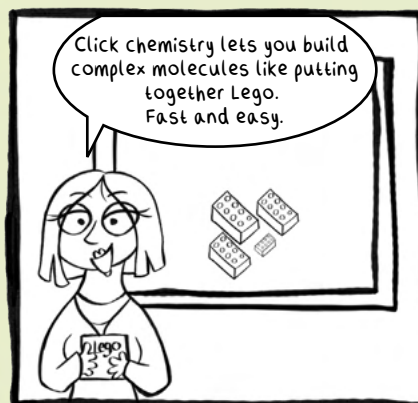
**THERMOPLAST** - A PLASTIC/POLYMER THAT IS HARD AT ROOM TEMPERATURE BUT CAN BE RESHAPED OR REMOULDED WHEN HOT. THESE TYPES OF POLYMER CAN BE EASILY RECYCLED.

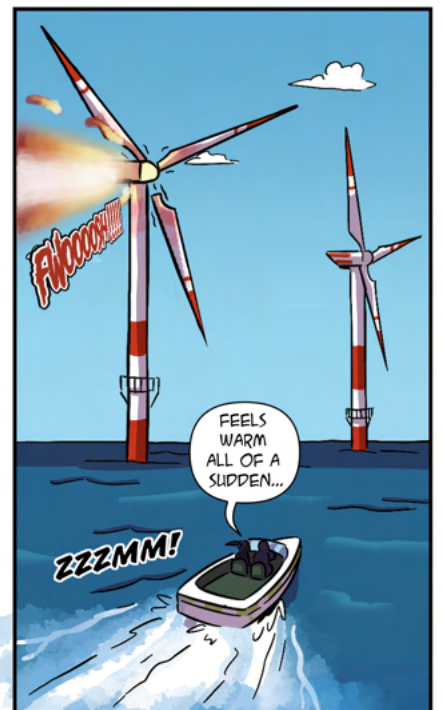
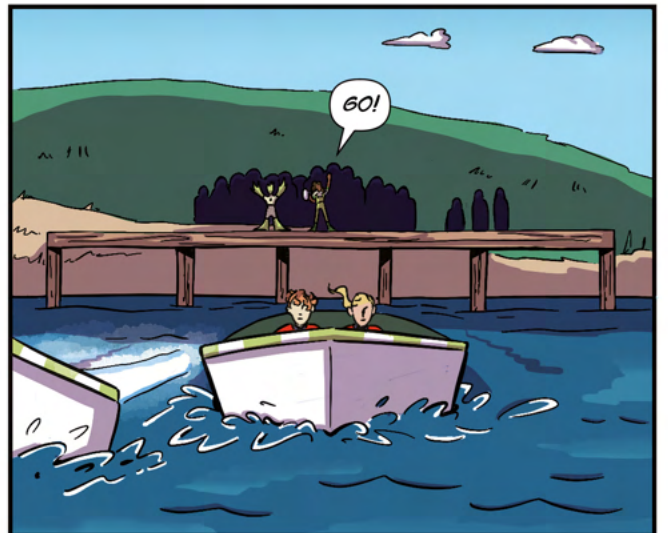
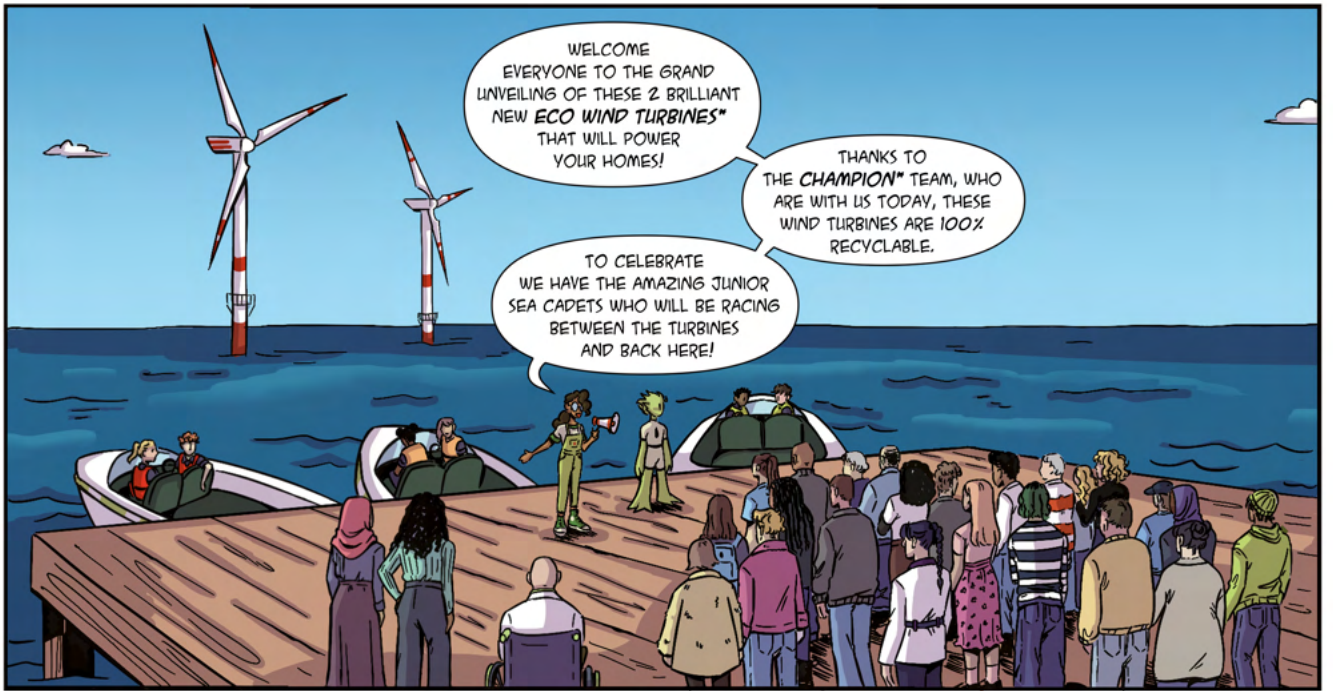
**THERMOSET** - A PLASTIC/POLYMER THAT WHEN REACTED WITH A CROSS-LINKER FORMS NEW BONDS BETWEEN THE POLYMER CHAINS, WE CALL THIS CURING. ONCE CURED, THIS TYPE OF POLYMER IS VERY TOUGH BUT USUALLY ALSO VERY HARD TO RECYCLE.

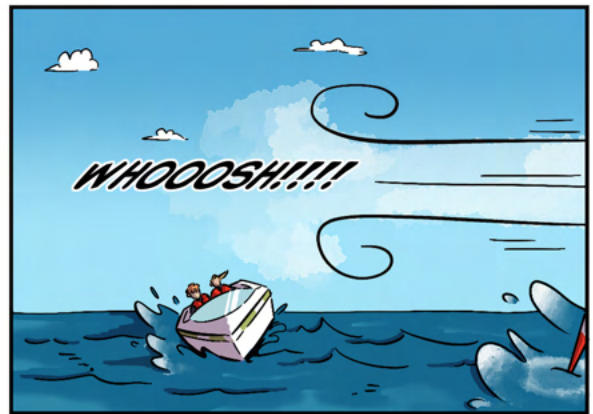
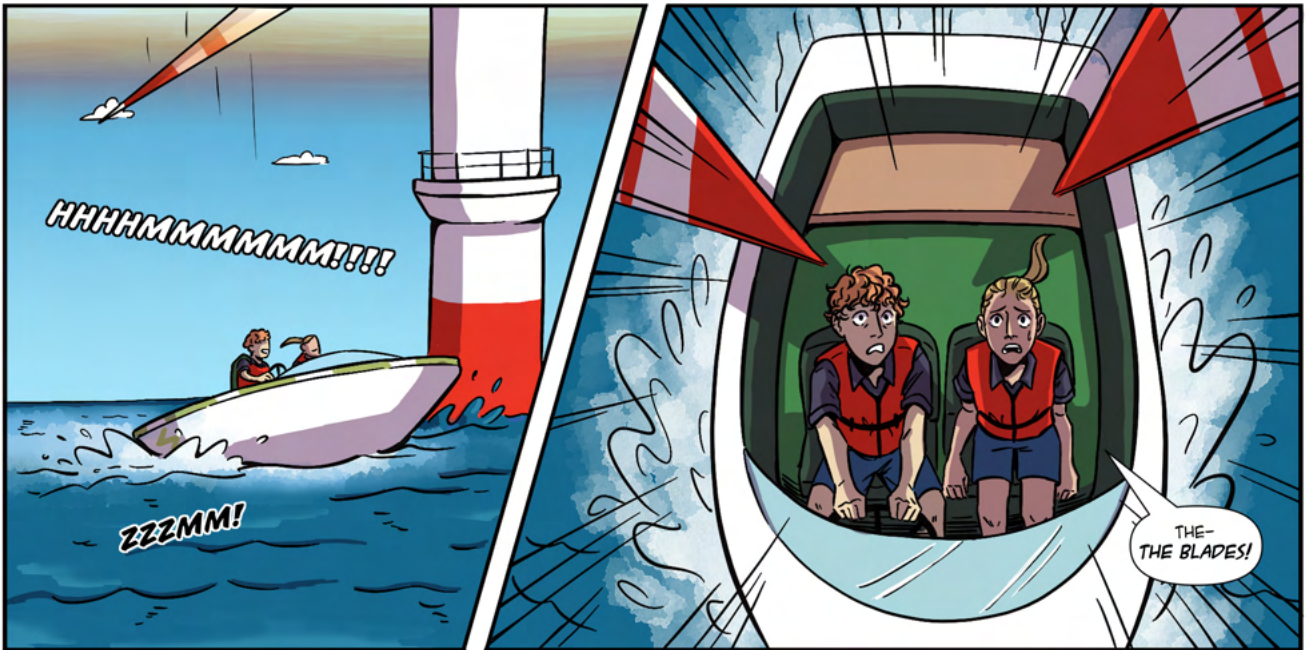
science!  
with  
Dr. Science!  
COLOUR THE COMIC!

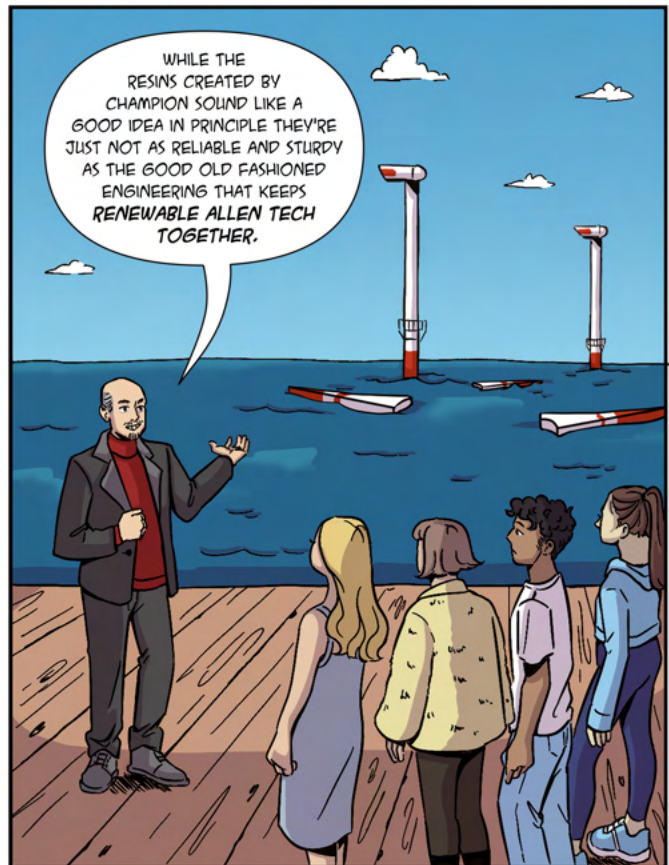
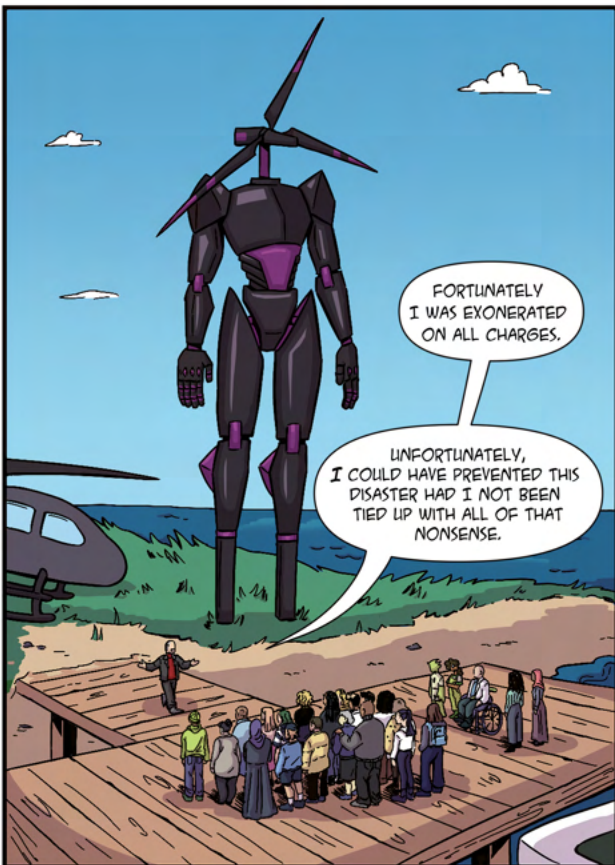
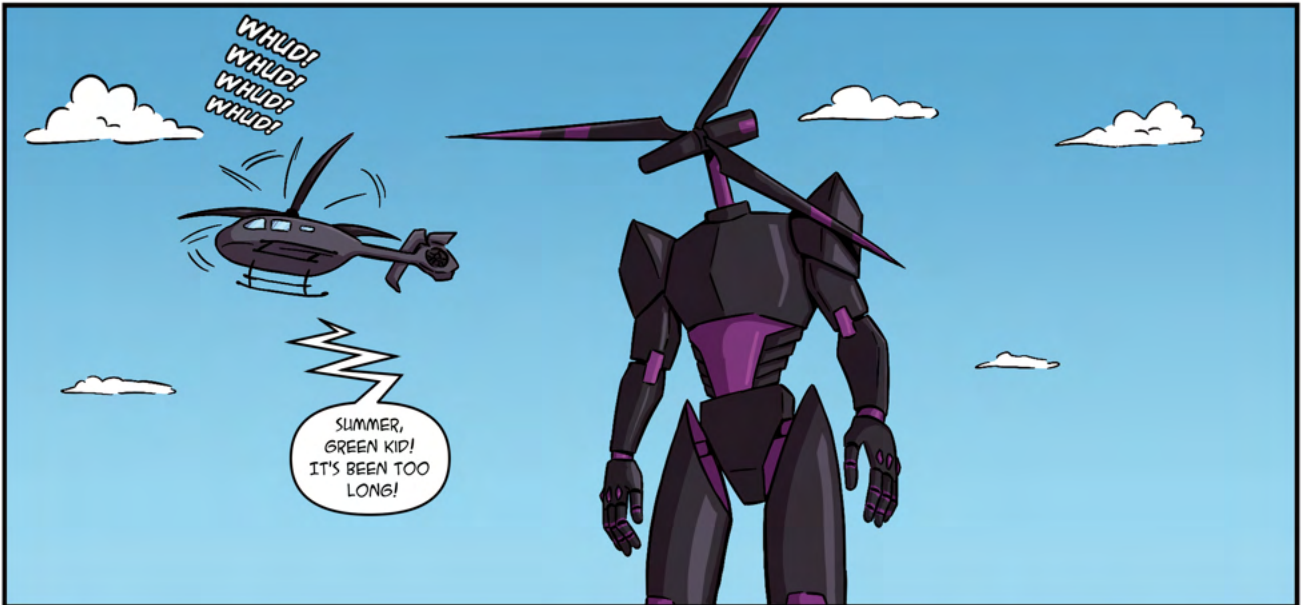


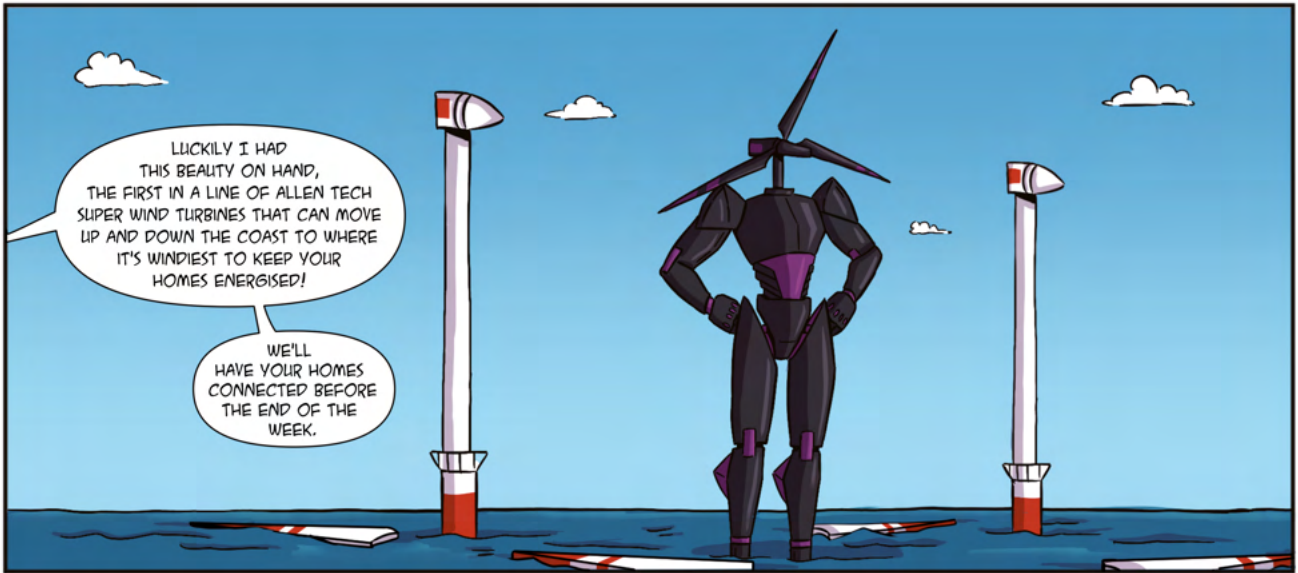
Hello!  
I'm Dr  
Science!





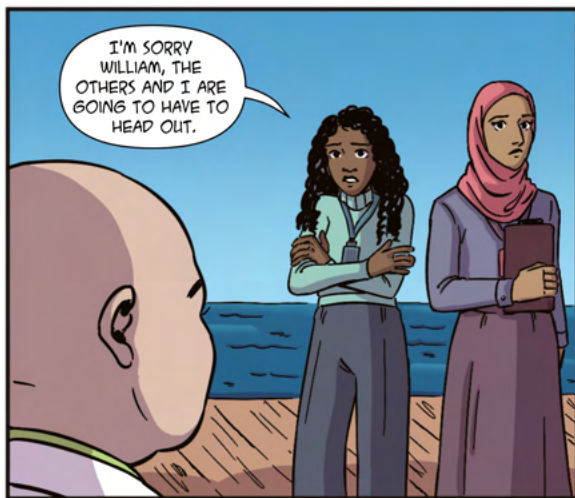




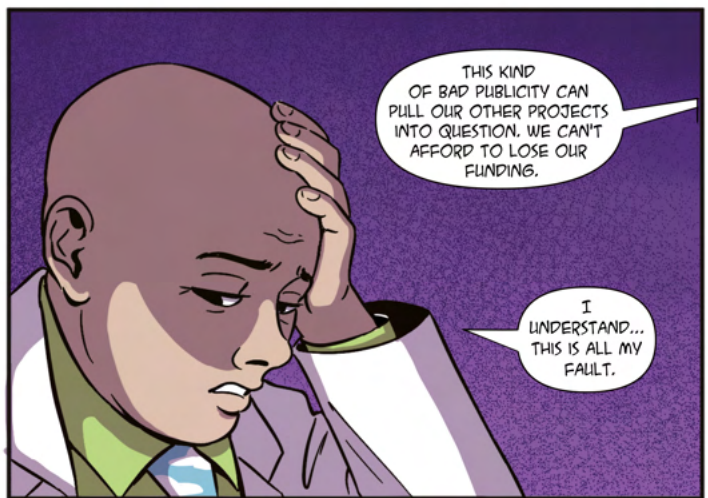


LUCKILY I HAD THIS BEAUTY ON HAND, THE FIRST IN A LINE OF ALLEN TECH SUPER WIND TURBINES THAT CAN MOVE UP AND DOWN THE COAST TO WHERE IT'S WINDIEST TO KEEP YOUR HOMES ENERGISED!

WE'LL HAVE YOUR HOMES CONNECTED BEFORE THE END OF THE WEEK.

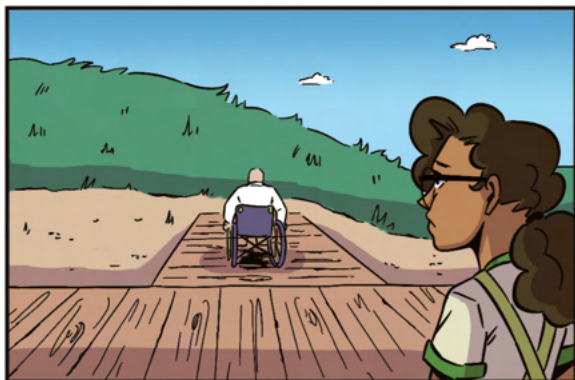


I'M SORRY WILLIAM, THE OTHERS AND I ARE GOING TO HAVE TO HEAD OUT.



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!

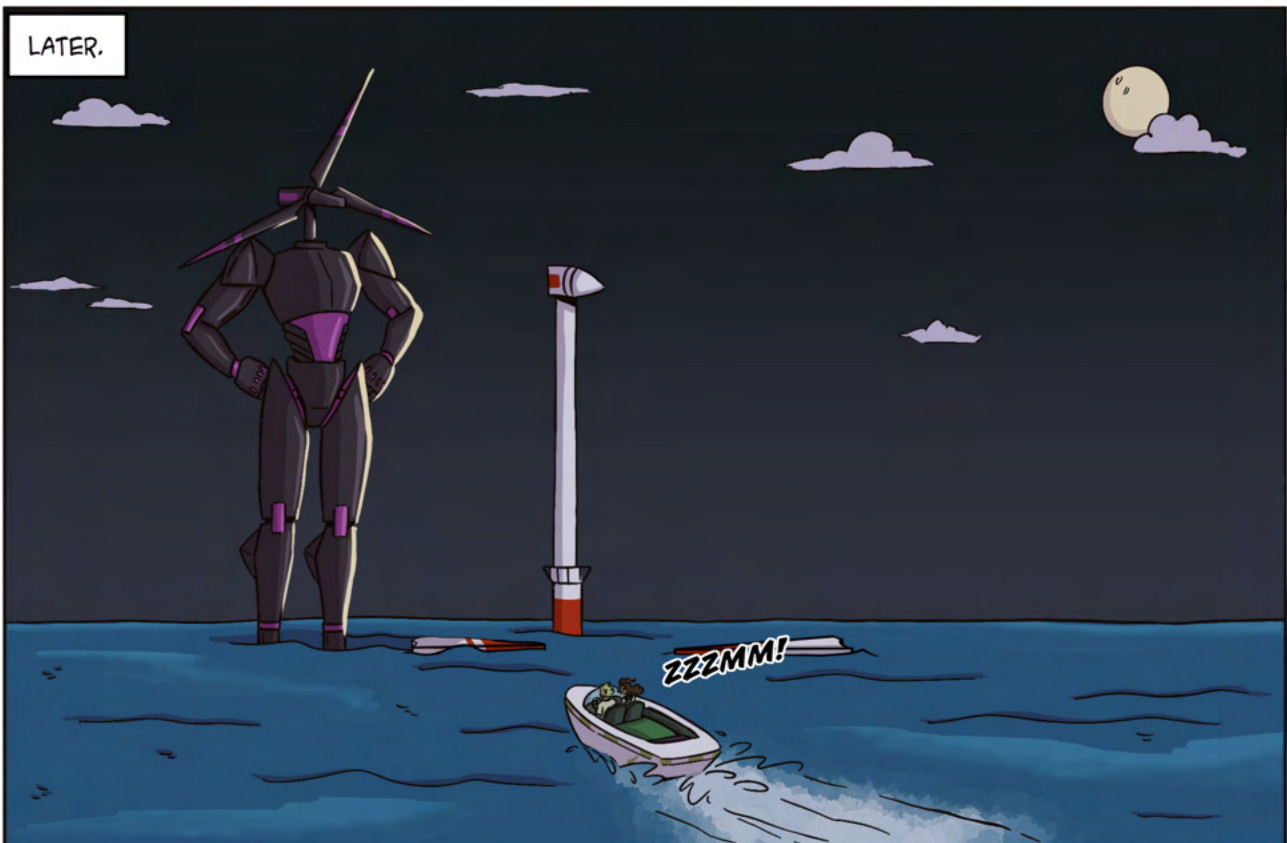
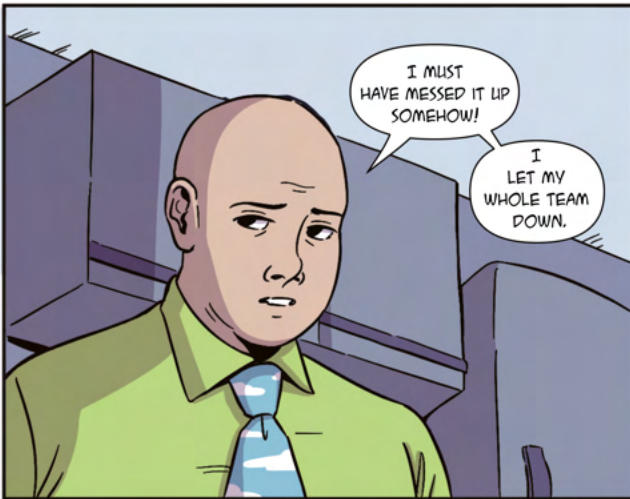
I DID MY BEST WITH THE CHAMPION SYSTEM:

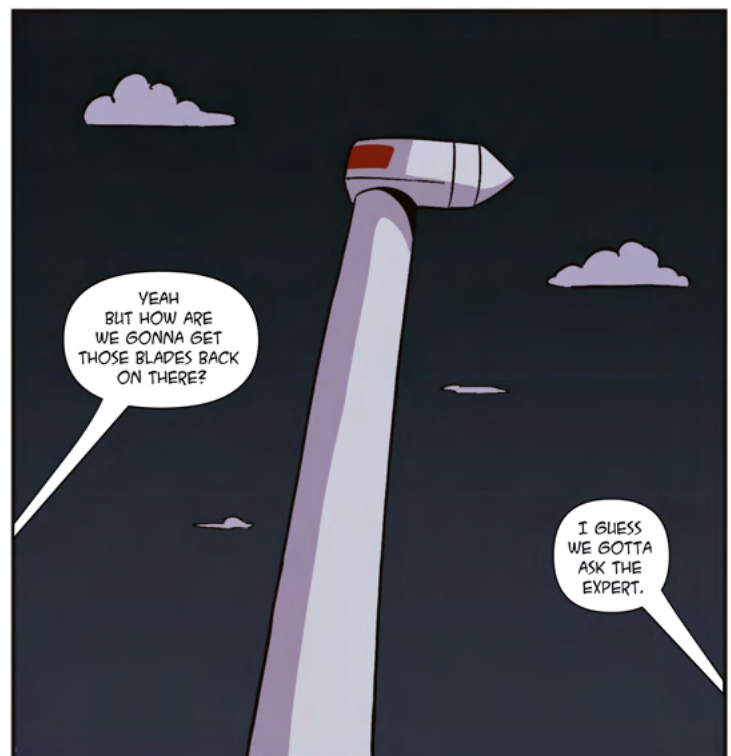
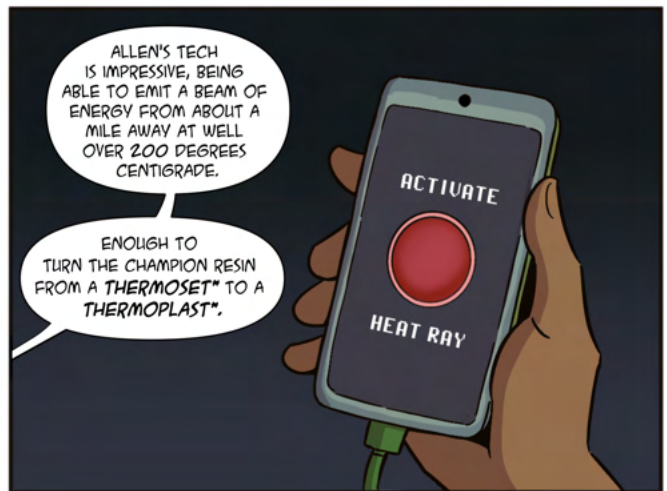
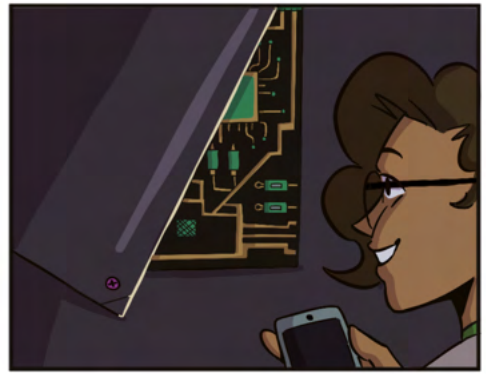
IT WAS MADE ONLY FROM BIO-BASED OR RECYCLED PRODUCTS.

WE USED RENEWABLE ENERGY TO PRODUCE THE PARTS FOR THE WIND TURBINE.

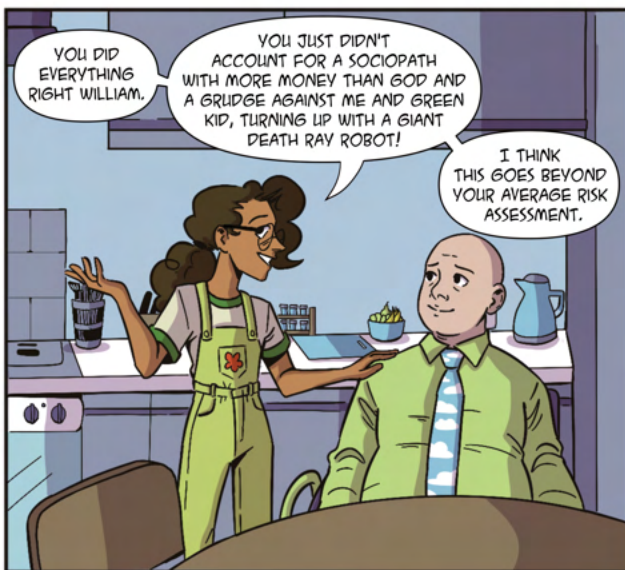
WE USED NON-TOXIC COMPONENTS THAT SAFELY DEGRADE AT THE END OF LIFE.

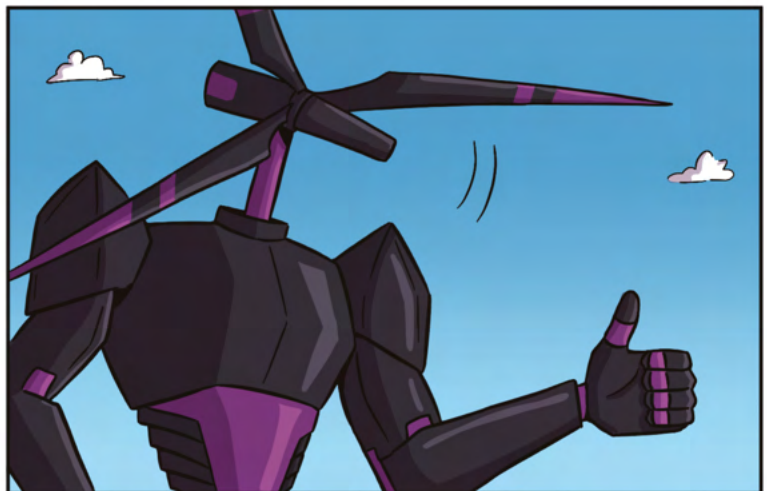
WE MADE SURE THAT THE ADHESIVE SWITCHED OFF AT THE MOLECULAR LEVEL, SO THE MATERIALS CAN BE REUSED!

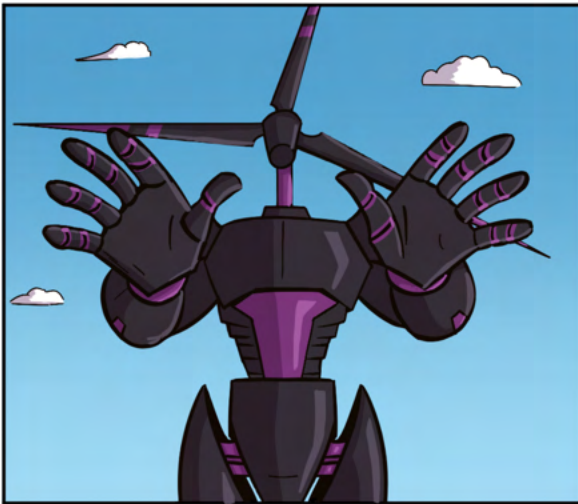
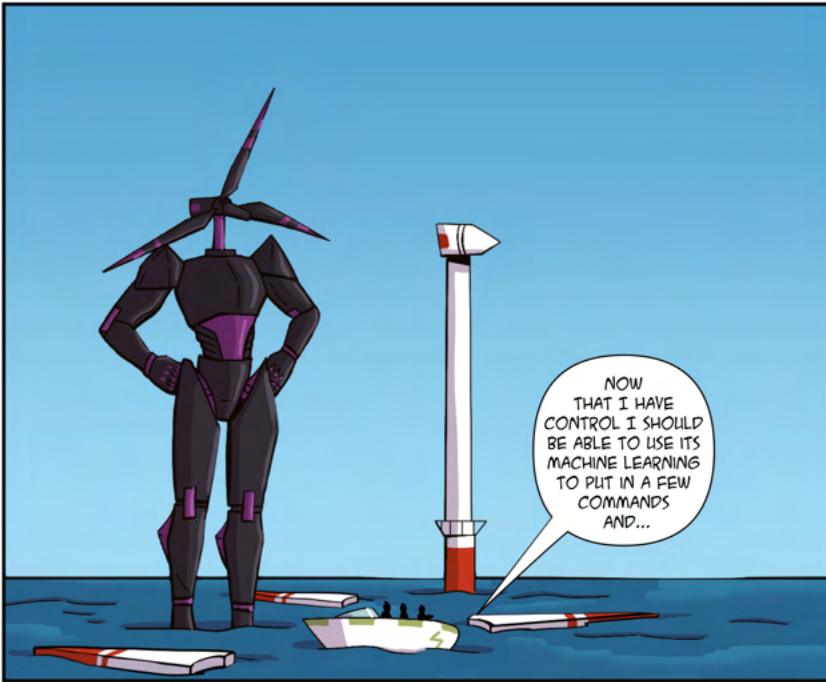


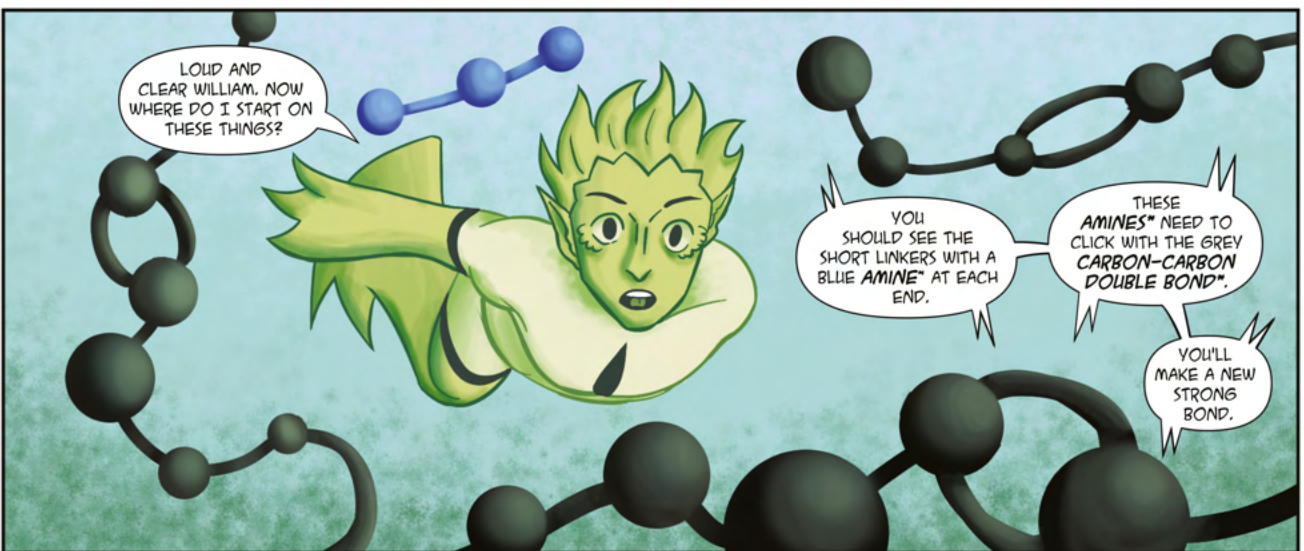
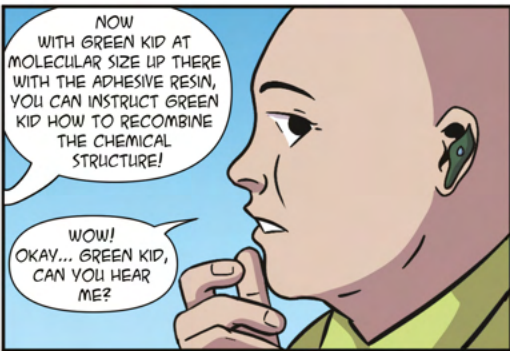
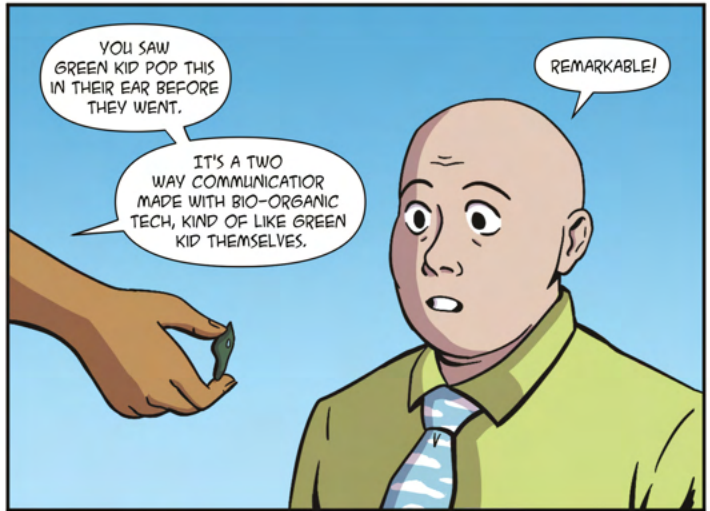
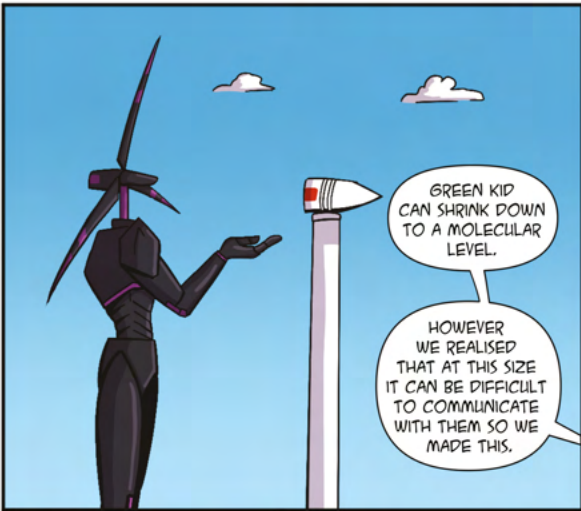


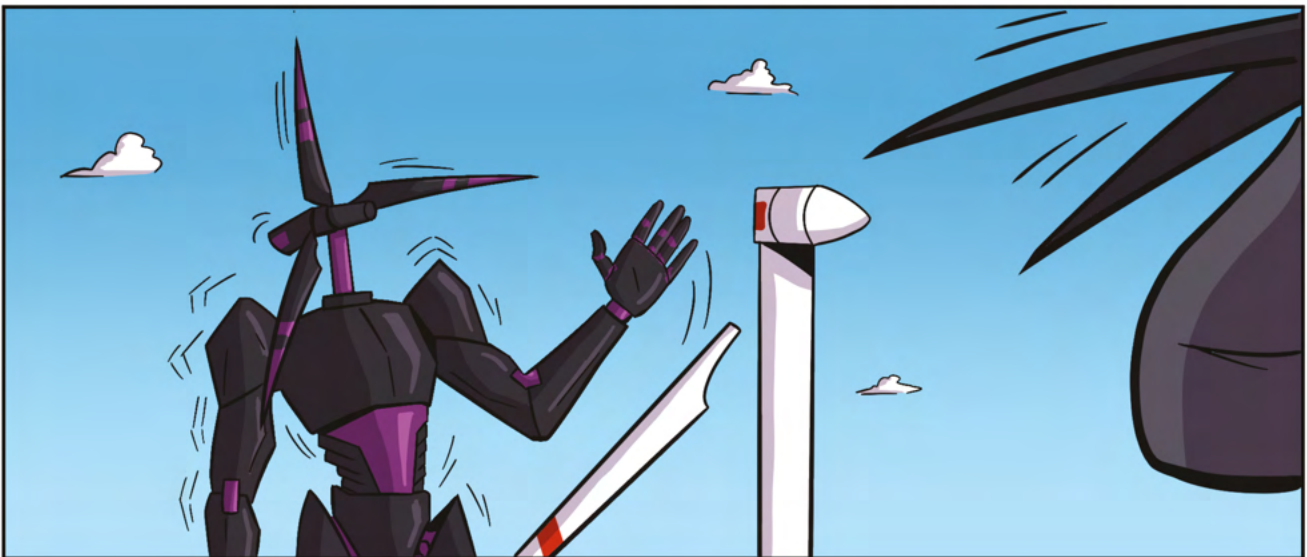
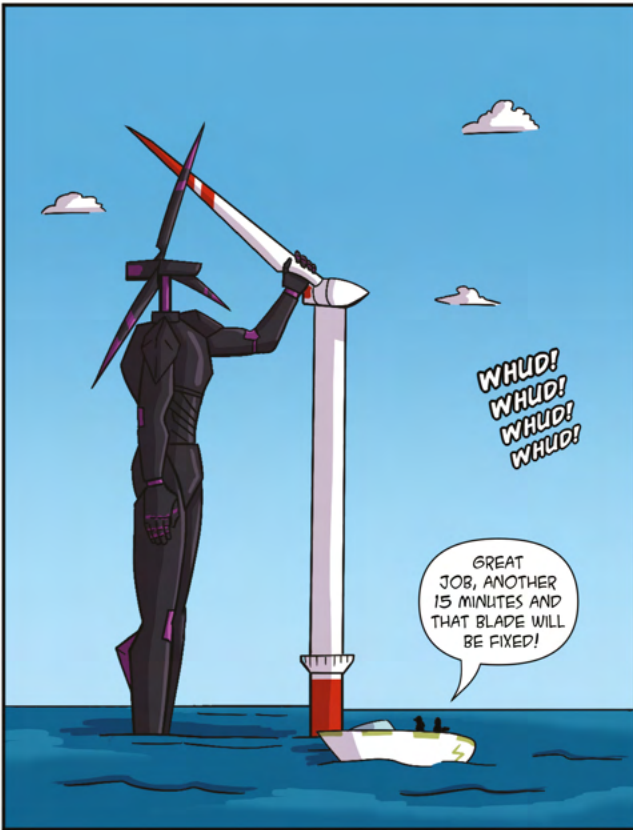
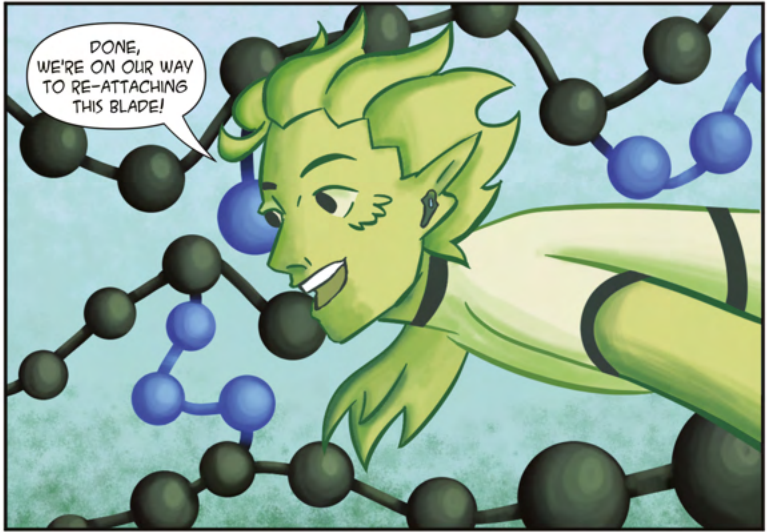
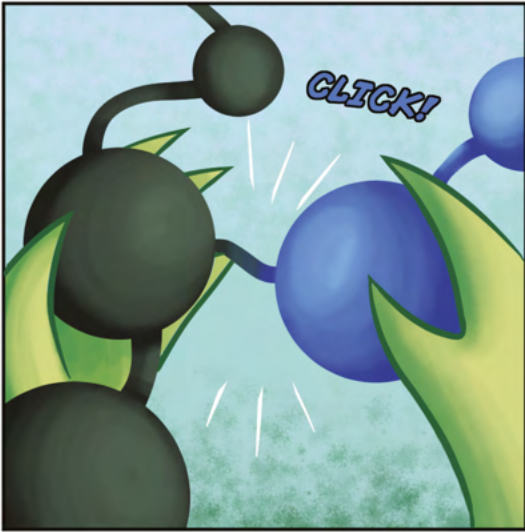




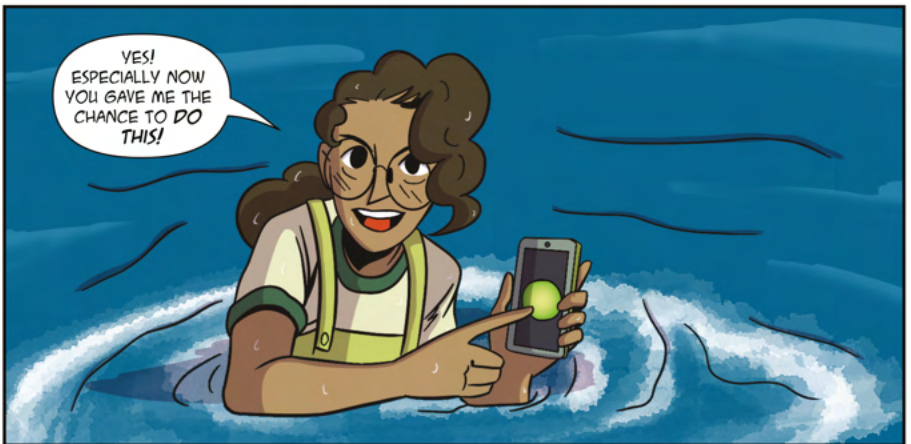
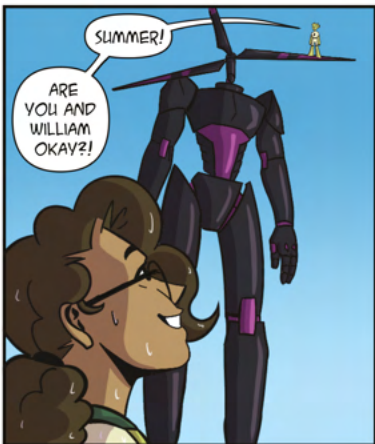
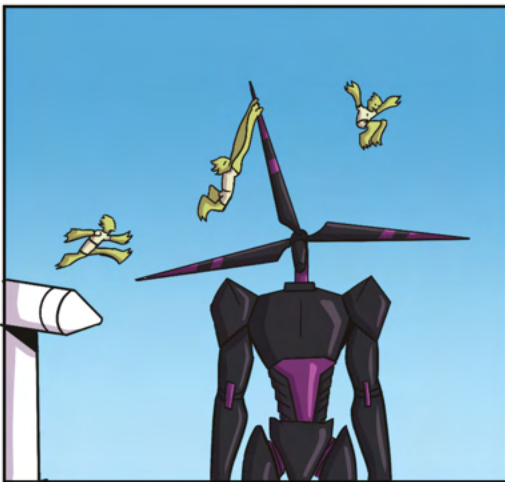


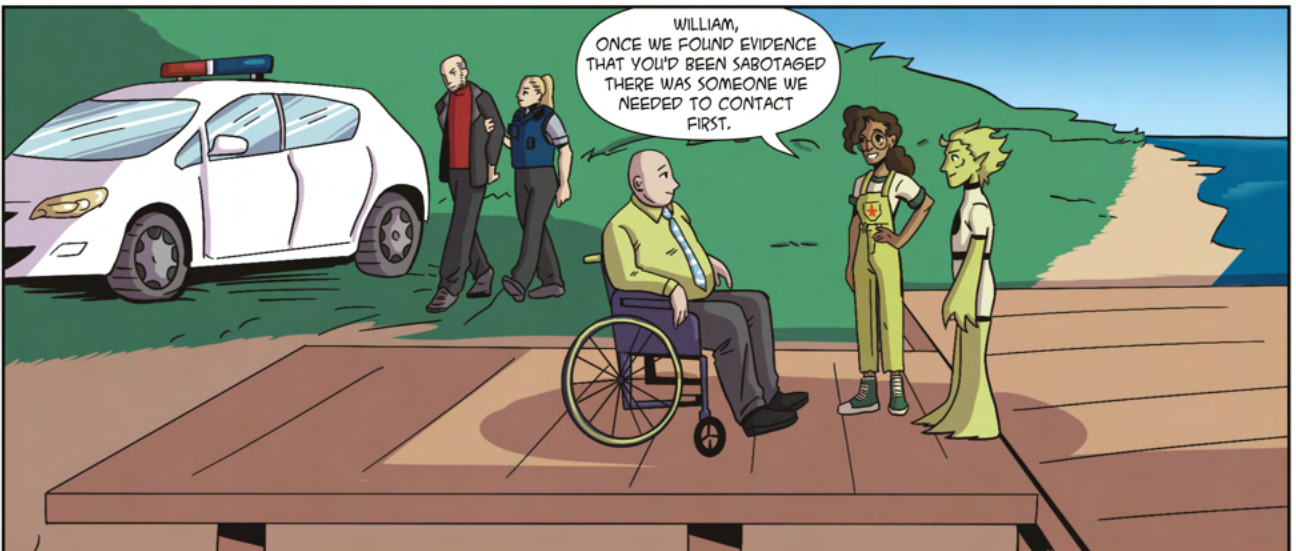
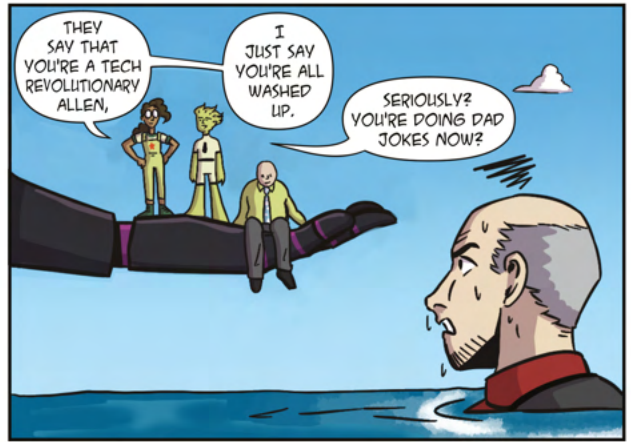
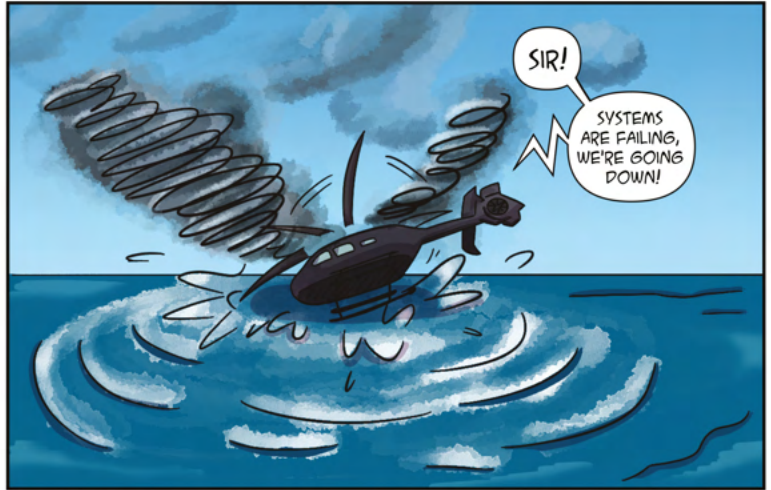
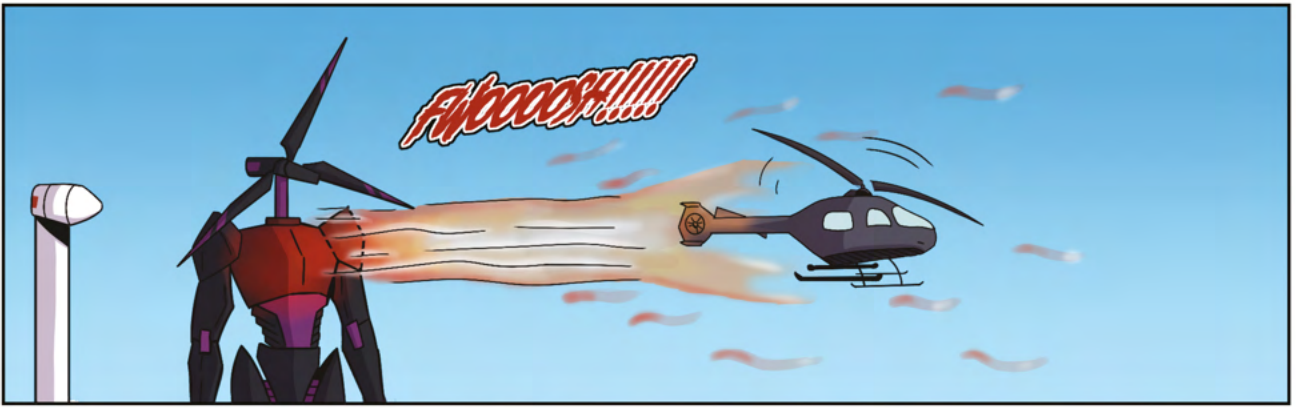
















Linear economy is what we have now. We take, we make, we use, we lose.

NATURAL RESOURCES TAKE MAKE

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

Noo!

DISPOSE

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!

PET

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 CO<sub>2</sub> 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 means bits can be reused or recycled much more easily, a **circular economy**.

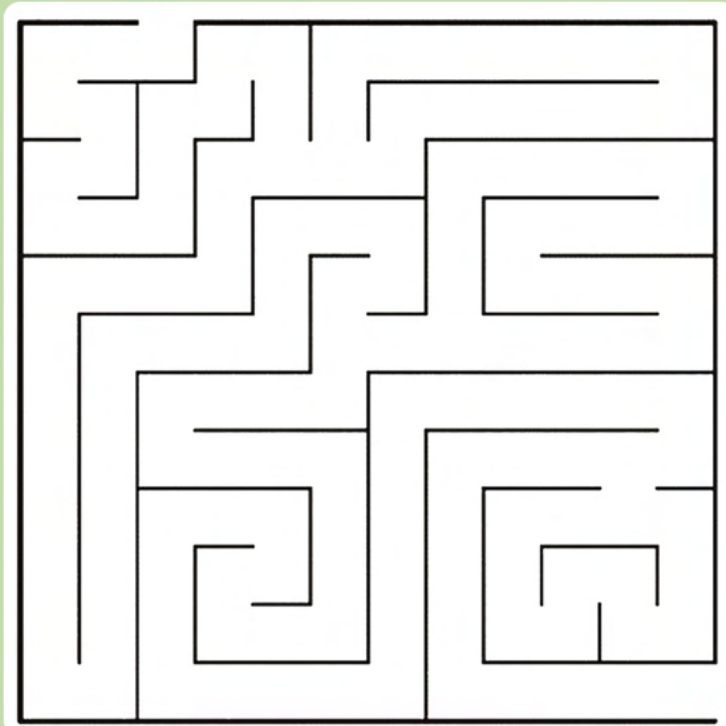
Re-use/Repair/Recycle  
Recycling Sector  
Production  
Distribution  
Consumption  
Circular Economy

# 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
I	T	H	E	R	M	O	P	L	A	S	T	A	D
W	B	E	O	C	T	B	L	I	E	O	R	T	N
O	S	N	D	E	A	E	A	E	N	B	E	H	O
C	C	A	N	E	O	E	I	C	O	S	E	N	B
E	H	O	N	O	V	B	V	N	O	R	H	W	E
B	A	I	O	M	T	I	C	M	C	B	T	R	L
A	M	W	H	N	C	A	R	I	E	B	R	O	B
M	P	R	V	E	R	E	O	E	S	P	N	B	U
I	I	N	D	B	H	D	M	E	D	A	H	T	O
N	O	R	O	T	N	M	A	E	N	O	B	I	D
E	N	N	R	W	A	I	U	N	U	O	I	I	I
S	R	E	E	N	B	O	C	M	T	D	R	B	A

AMINES  
 BIODERIVED  
 CARBON CARBON  
 DOUBLE BOND  
 CHAMPION  
 CIRCULAR ECONOMY  
 ECO WIND  
 TURBINE  
 THERMOPLAST  
 THERMOSET

HELP SPROUT GET BACK TO CYRUS!



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**TEESSIDE UNIVERSITY**

EDITOR: JULIAN LAWRENCE

SCRIPT: JAMES PATRICKS

ART AND PRODUCTION: JADE DORAN,

SOPHIE POOLE, ANTONY O'HALLORAN

LAYOUT AND GRAPHIC DESIGN: KIRSTY STEBBINGS

**UNIVERSITY OF LINCOLN**

GREEN CHEMISTRY CONSULTANT: ROB MCELROY

**WAGENINGEN UNIVERSITY & RESEARCH**

CHAMPION CHEMISTRY CONSULTANT: DAAN VAN ES

**SQ CONSULT**

SUSTAINABLE ENERGY CONSULTANT: MONIQUE VOOGT

**UNIVERSITY OF YORK**

CHAMPION PROJECT MANAGER: JANICE LOFTHOUSE

**School of  
Arts &  
Creative  
Industries**

MI  
MA

**U** Teesside  
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of York**



**Horizon 2020  
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sustainable quality | **consult**



**Bio-based Industries  
Consortium**



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