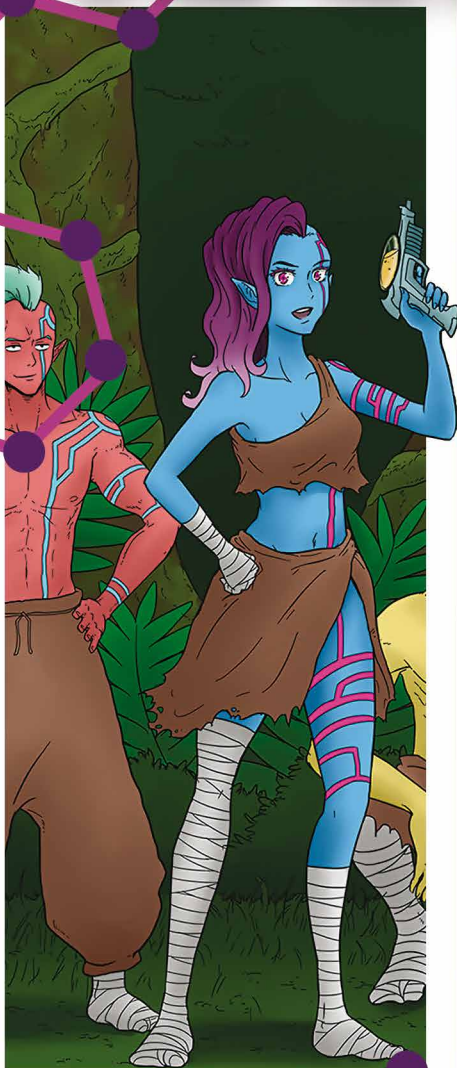


PARTICIPATIVE NANOFICTION COMIC

NANO KOMIK

#2



GOBIERNO DE ESPAÑA

MINISTERIO DE ECONOMÍA, INDUSTRIA Y COMPETITIVIDAD



FUNDACIÓN ESPAÑOLA PARA LA CIENCIA Y LA TECNOLOGÍA



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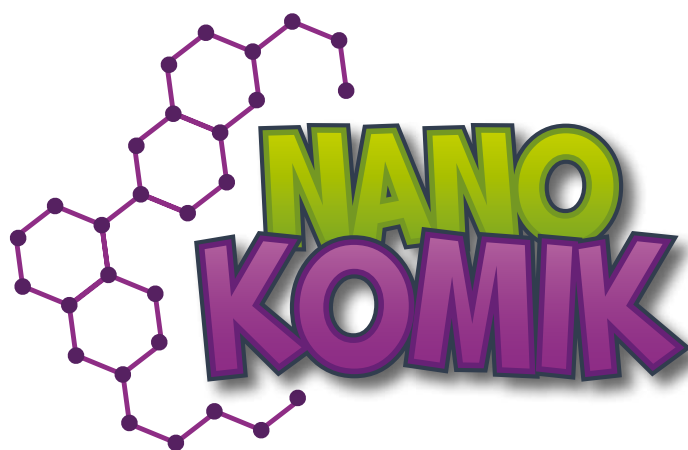
The great scientific advances of the last century have made nanoscience a reality. Thanks to quantum mechanics, we now understand the properties and phenomena relating to matter at the nanoscale, and large microscopes manipulate individual atoms. The possibilities opened up by this new field of science are endless and will have great repercussions in various sectors, ranging from medicine to construction, generating important changes in our lifestyle.

Conscious of this reality, in 2016 the research centers CIC nanoGUNE and the Donostia International Physics Center (DIPC) launched the nanoKOMIK project to create the first participative nanofiction comic. This multidisciplinary and international participative science dissemination initiative aims to communicate with society about the transformative power of advances in the fields of nanoscience and nanotechnology.

This book is the final result of the second edition of the nanoKOMIK project. The nanoKOMIK challenge was launched in early 2017, and has engaged more than 240 people in an open creative process leading to the production of the book. Throughout the challenge, participants brought their own comic superheroines or superheroes to life, endowing them with nanopowers which draw on the surprising properties that matter acquires through nanotechnology. 70 pieces of artistic work in Basque, Spanish and English were submitted to the challenge.

We have created three new comic stories based on the best ideas from the competition entries, in collaboration with the winners of the adult category of the nanoKOMIK 2017 challenge: **World Domi(nano)tion**, **Mister Flames** and **Among Plants**. These stories can be read on the following pages and are also available in Basque, Spanish, French and English at www.nanokomik.com.

The nanoKOMIK project is co-funded by the Spanish Foundation for Science and Technology - Ministry of Economy, Industry and Competitiveness.



WORLD DOMINATION

by Aska 2017

This is Mia Arbend, a politician motivated by just three things: money, power and more money.

Lately things have not been going to plan for Mia. Her scheme to log a National Park for profit has met with public opposition.



This is Prof. Kiara Burnheart, a nano and neuro-scientist without equal. Brilliant but unemployed.

She has an offer she thinks may interest Mia. And she'll happily share it if Mia keeps buying the drinks..



Imagine this olive is a quantum particle.

Before I measure its location again, it exists in all places AT ONCE,

with some probability.

The description of the probability of the olive in different locations is called its wavefunction.

Yes... and?

I believe if we feed such a wavefunction into a brain's neuro-network, it could be possible to make the brain's owner essentially appear in all places at once.

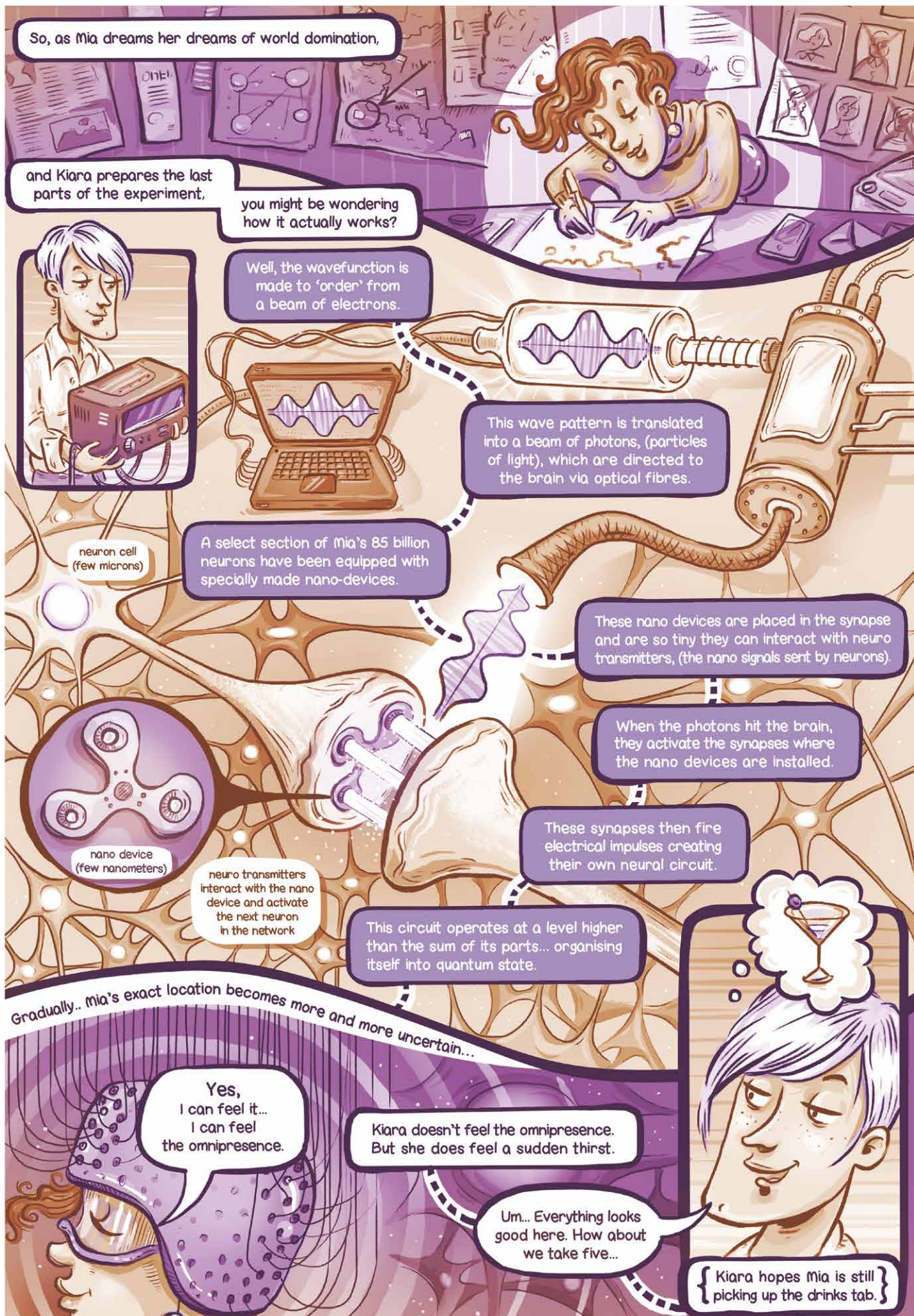
Wait... What?!

As in... omnipresent?!

Yes. A superpower of sorts.

I'm starting tests on rats next week...





So, as Mia dreams her dreams of world domination,

and Kiara prepares the last parts of the experiment,

you might be wondering how it actually works?

Well, the wavefunction is made to 'order' from a beam of electrons.

This wave pattern is translated into a beam of photons, (particles of light), which are directed to the brain via optical fibres.

A select section of Mia's 85 billion neurons have been equipped with specially made nano-devices.

These nano devices are placed in the synapse and are so tiny they can interact with neuro transmitters, (the nano signals sent by neurons).

When the photons hit the brain, they activate the synapses where the nano devices are installed.

These synapses then fire electrical impulses creating their own neural circuit.

This circuit operates at a level higher than the sum of its parts... organising itself into quantum state.

Gradually.. Mia's exact location becomes more and more uncertain...

Yes, I can feel it... I can feel the omnipresence.

Kiara doesn't feel the omnipresence. But she does feel a sudden thirst.

Um... Everything looks good here. How about we take five...

{ Kiara hopes Mia is still picking up the drinks tab. }

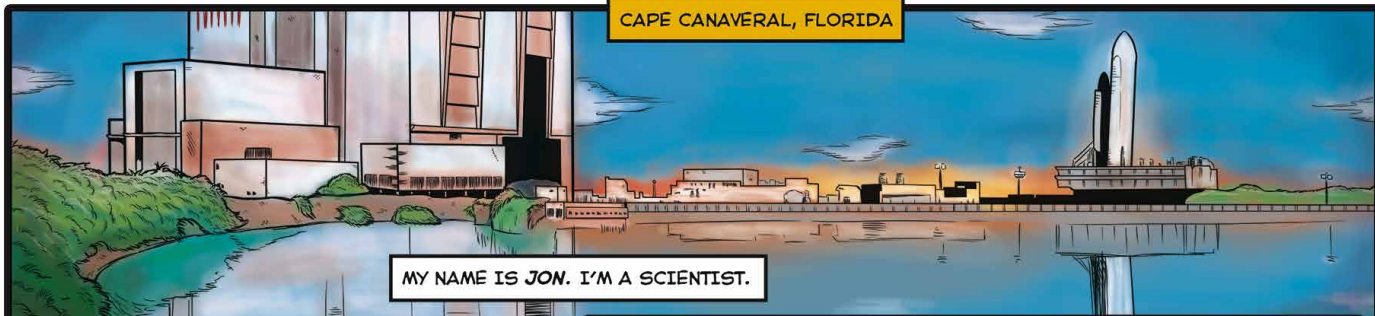


Mia is returned from all of the possible places in the world...
 ...to here. To this one... particular... location.



Inspired by Nanotools for Neuroscience and brain Activity Mapping, A. Paul Alivisatos et al. (2013), ACS Nano, VOL.7 No. 3, 1850-1866

CAPE CANAVERAL, FLORIDA



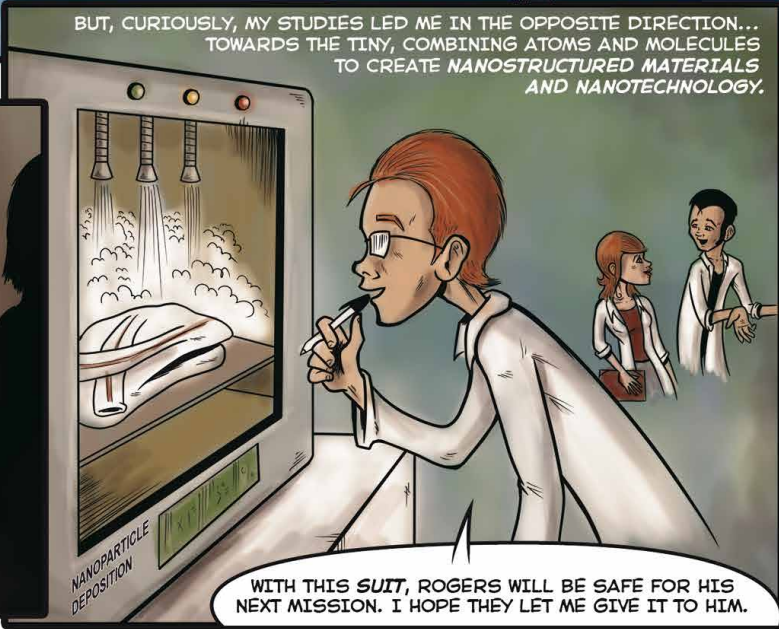
MY NAME IS JON. I'M A SCIENTIST.

I SPENT MY CHILDHOOD THINKING OF THE UNIVERSE AND HOW INFINITELY LARGE IT IS.

BUT, CURIOUSLY, MY STUDIES LED ME IN THE OPPOSITE DIRECTION... TOWARDS THE TINY, COMBINING ATOMS AND MOLECULES TO CREATE NANOSTRUCTURED MATERIALS AND NANOTECHNOLOGY.



MOM, DO YOU THINK I'LL BE AN ASTRONAUT ONE DAY?



WITH THIS SUIT, ROGERS WILL BE SAFE FOR HIS NEXT MISSION. I HOPE THEY LET ME GIVE IT TO HIM.



HOW COOL! IT TOOK MY BLOOD, SWEAT AND TEARS TO GET A TICKET TO SEE THE LAUNCH, BUT IT WAS WORTH IT. I'VE ALWAYS DREAMT ABOUT BEING HERE AND MEETING MY IDOL!

OH, HOW NICE.



CAPTAIN CHRIS ROGERS!



ROGERS! I'M JON! I'VE WRITTEN YOU HUNDREDS OF LETTERS! I HAVE THE SUIT I WAS TELLING YOU ABOUT...

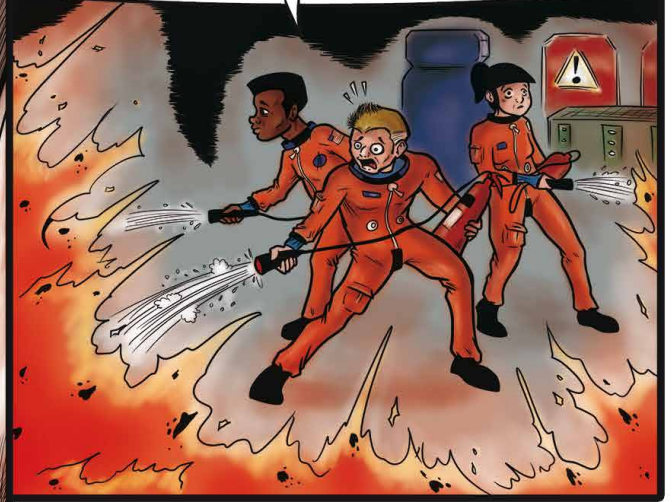
?

MISTER FLAMES SCRIPT: AMAIA ARREGI & ITZIAR OTEGUI DRAWINGS: JOSÉ SÉNDER

THE AUTOMATIC SEQUENCE HAS BEGUN. T MINUS 15 SECONDS. HEY, WAIT A MOMENT... IT SEEMS THAT ONE OF THE REACTORS IS OVERHEATING... OH, NO!



CONTROL! THE CONTROL ROOM IS ON FIRE! THE FIRE EXTINGUISHERS ARE NOT ENOUGH, AND WE CAN'T MAKE IT TO THE DOOR! IF THE FIRE MAKES ITS WAY TO THE FUELTANKS... HELP!



THE LAUNCH SEQUENCE HAS ALREADY STARTED, WE CAN'T STOP IT! CLEAR THE STANDS!

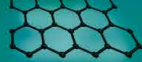


IF HE HAD MY SUIT WITH HIM, HE'D BE ABLE TO GET OUT EASILY.

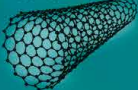


SOME NANOSTRUCTURES

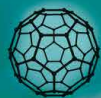
GRAPHENE



A NANOTUBE



FULLERENE



MY SUIT IS COVERED IN NANOPARTICLES THAT EMIT NITROGEN WHEN THEY HEAT UP AND DISPLACE OXYGEN FROM THE ENVIRONMENT, KEEPING ME FROM GETTING BURNED.

HIGH TEMPERATURES

FLAMMABLE AREA



LAYER WITH NANOPARTICLES

N_2

NON-FLAMMABLE AREA

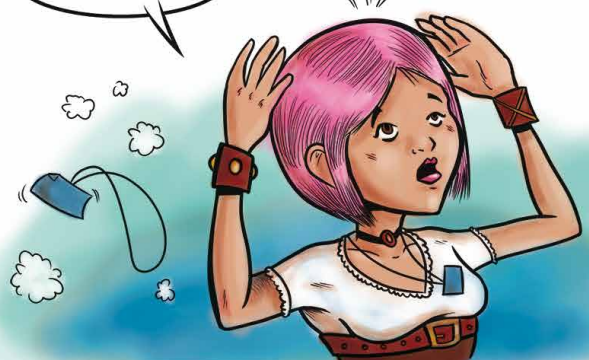


SUIT SURFACE

SO, IF YOUR SUIT IS SO COOL, WHY DON'T YOU PUT IT ON AND GIVE THEM A HAND?



HEY! MY GLASSES!



OK, IT'S TIME TO SHOW THEM WHAT I CAN DO!



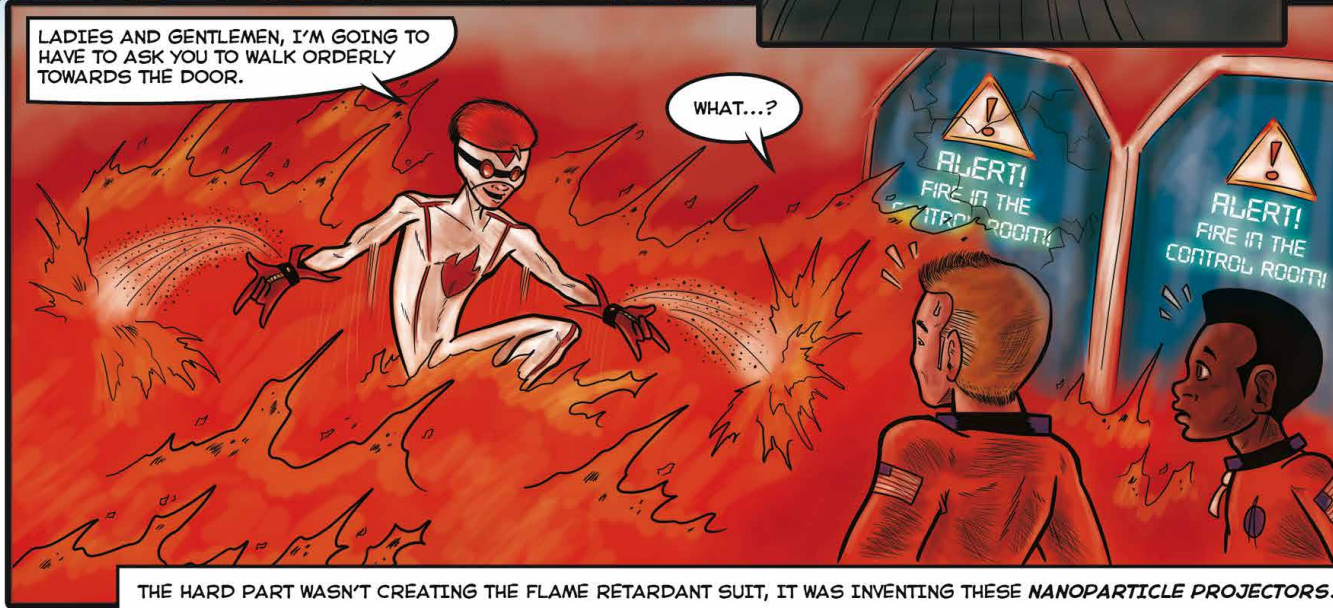
HEY! GET OUT OF THE WAY, KID! IT'S DANGEROUS!



I'M SORRY FRIEND! I HAVE NO TIME TO ARGUE!



PLEASE! MAKE THIS WORK!



LADIES AND GENTLEMEN, I'M GOING TO HAVE TO ASK YOU TO WALK ORDERLY TOWARDS THE DOOR.

WHAT...?

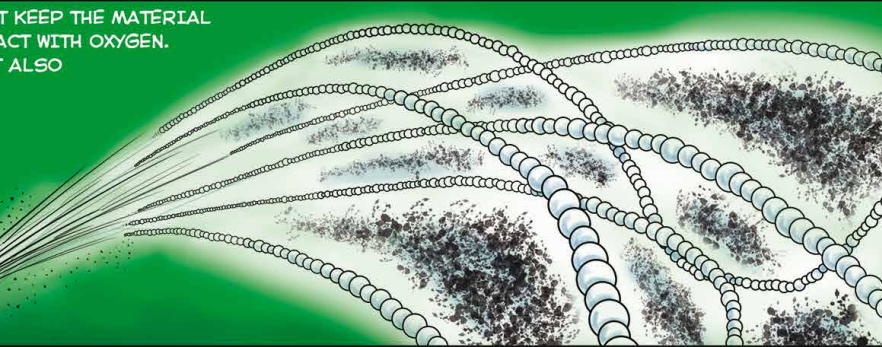
THE HARD PART WASN'T CREATING THE FLAME RETARDANT SUIT, IT WAS INVENTING THESE *NANOPARTICLE PROJECTORS*.



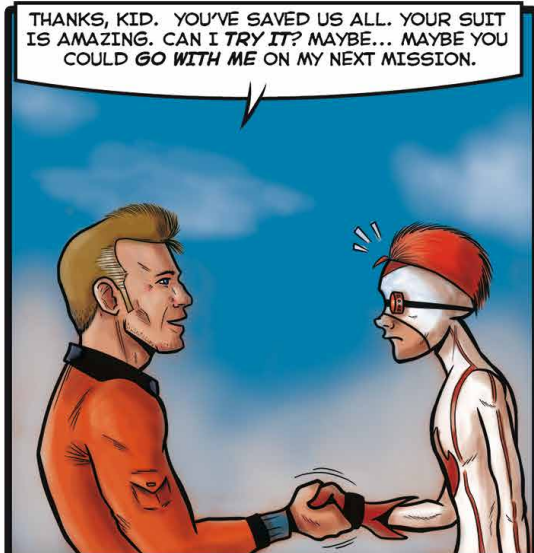
HOW DID YOU DO THAT?

IT'S A SECRET OF THE TRADE.

THE FOAM HAS SILICA NANOPARTICLES THAT KEEP THE MATERIAL THAT IS BURNING FROM COMING INTO CONTACT WITH OXYGEN. IT NOT ONLY EXTINGUISHES THE FIRE, BUT IT ALSO PREVENTS IT FROM SPREADING AGAIN THANKS TO THE HEAT RESISTANCE (UP TO 1000°C) OF THE CERAMIC LAYER THAT IS FORMED ON THE SURFACE.



SAVED!



THANKS, KID. YOU'VE SAVED US ALL. YOUR SUIT IS AMAZING. CAN I TRY IT? MAYBE... MAYBE YOU COULD GO WITH ME ON MY NEXT MISSION.



I'LL TAKE YOUR WORD, CAPTAIN. SOME DAY I'LL BE UP THERE. BUT RIGHT NOW, WE NEED A LOT MORE...

MISTER FLAMES

HMMM. I THINK I SHOULD WORK MORE ON THE NAME.

JS
2017

Among Plants

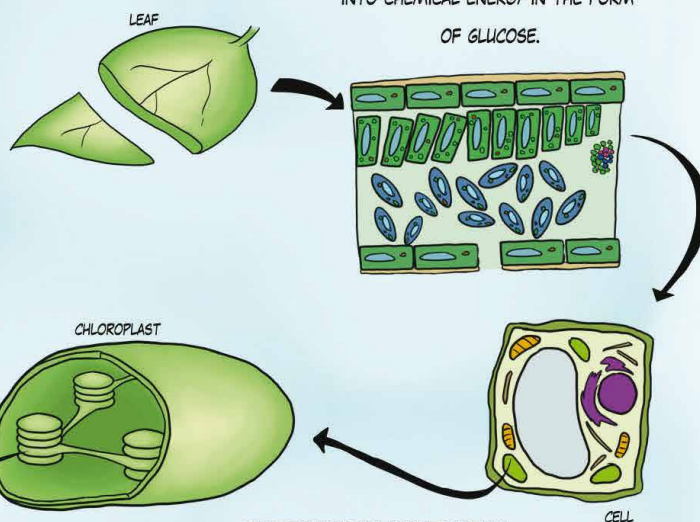
Script: Amaia Arregi, Rubén Molina & Itziar Otegui.
Drawings: Rubén Molina.

IN THE DEPTHS OF THE JUNGLE,
A SCIENTIST HAS SPENT YEARS
RESEARCHING THE PHOTOSYNTHETIC
PROCESS OF PLANTS.

HE WANTS TO CREATE A NANOHYBRID
THAT IS ABLE TO REPRODUCE
THE SAME PROCESS ARTIFICIALLY.

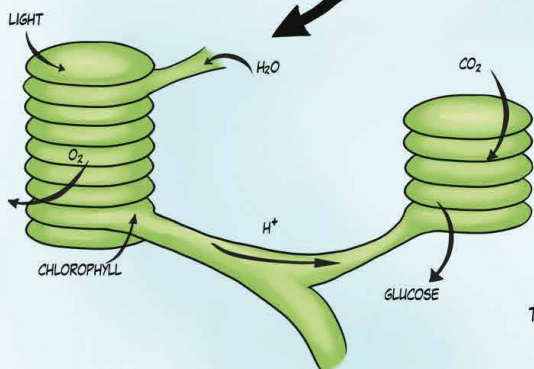


DURING PHOTOSYNTHESIS, PLANTS
CONVERT THE SUN'S ENERGY
INTO CHEMICAL ENERGY IN THE FORM
OF GLUCOSE.



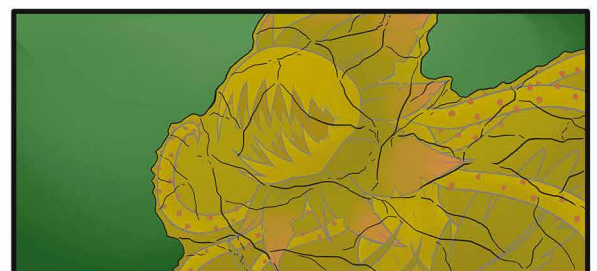
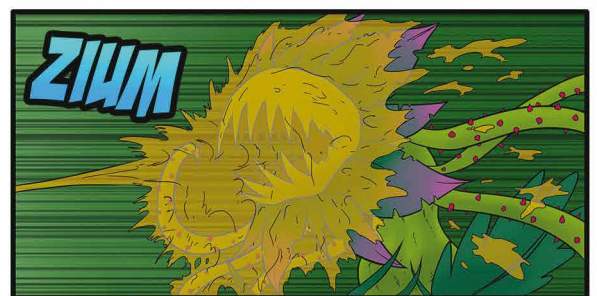
IN THE FIRST PHASE, THE CHLOROPHYLL
(A PHOTOSENSITIVE MOLECULE) ABSORBS
LIGHT AND USES IT TO BREAK DOWN
THE WATER MOLECULES COLLECTED BY THE
ROOTS. THUS, THE OXYGEN WE BREATHE IS
GIVEN OFF AND HYDROGEN IS STORED.

PHOTOSYNTHESIS OCCURS WITHIN
THE CELLS, IN AN ORGANELLE
CALLED THE CHLOROPLAST.



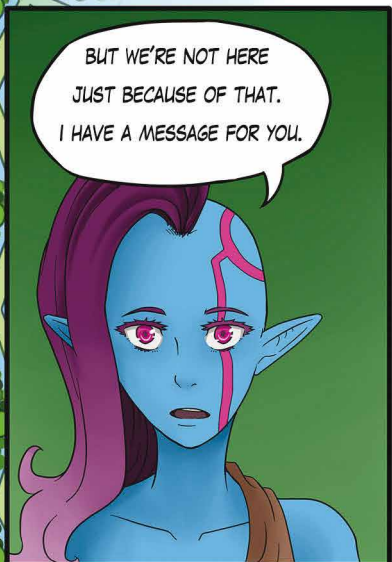
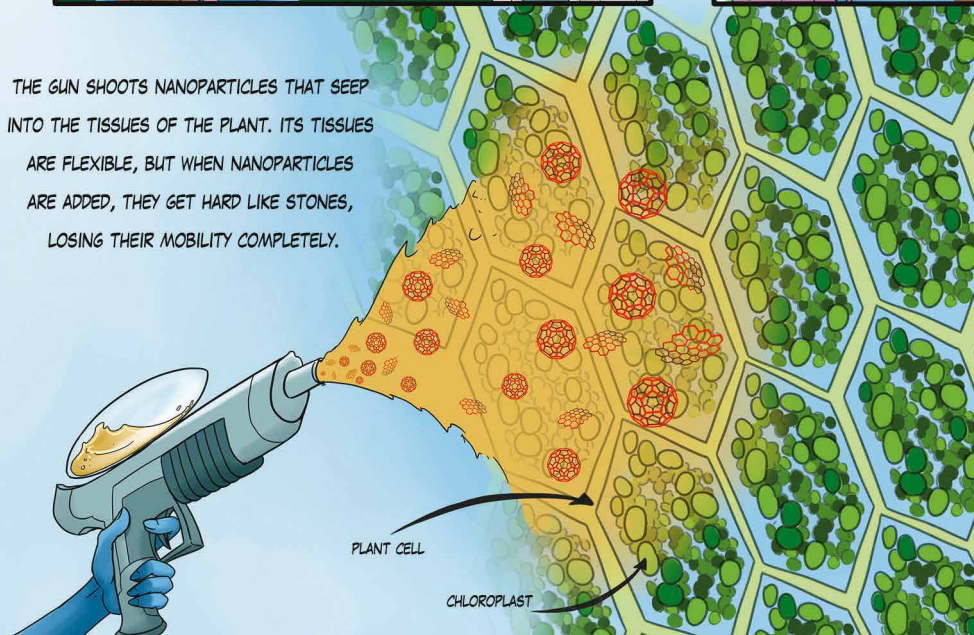
IN THE SECOND PHASE, THE
HYDROGEN COMBINES WITH
THE CARBON DIOXIDE THAT
THE PLANT CAPTURES FROM THE
ENVIRONMENT SYNTHESIZING
GLUCOSE. THANKS TO PLANT
PHOTOSYNTHESIS, WE HAVE
OXYGEN AND FOOD.

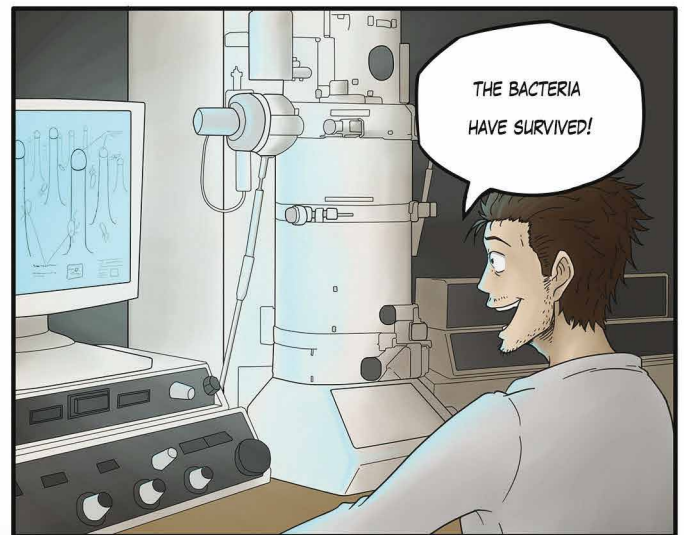






THE GUN SHOTS NANOPARTICLES THAT SEEP INTO THE TISSUES OF THE PLANT. ITS TISSUES ARE FLEXIBLE, BUT WHEN NANOPARTICLES ARE ADDED, THEY GET HARD LIKE STONES, LOSING THEIR MOBILITY COMPLETELY.





WILL THE NANOHYBRID BE ABLE TO BEHAVE LIKE A PLANT?

THE NANOHYBRID HAS TWO COMPONENTS:
 -SILICON NANOWIRES WITH A BIOCOMPATIBLE COATING.
 -A CULTURE OF BACTERIA.

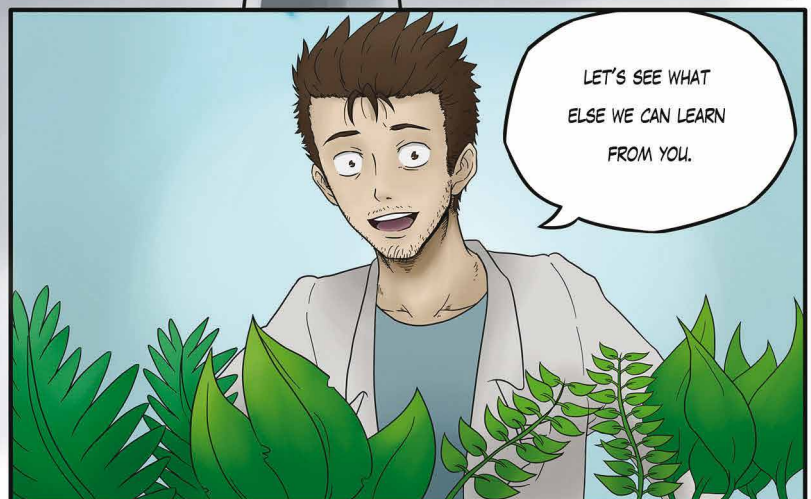
THE NANOWIRES SUPPLY ELECTRONS TO THE BACTERIA, AND THE BACTERIA COMBINE HYDROGEN AND CARBON DIOXIDE TO SYNTHESIZE ACETATE.

THE NANOWIRES ABSORB LIGHT AND BREAK UP WATER MOLECULES, RELEASING OXYGEN IN THE PROCESS (LIKE CHLOROPHYLL).

WITH ACETATE, WE CAN CREATE BIODEGRADABLE PLASTICS, LIQUID FUELS, AND EVEN MEDICINES.

THIS IS **ARTIFICIAL PHOTOSYNTHESIS:**

CONVERTING THE SUN'S ENERGY INTO CHEMICAL ENERGY THANKS TO A NANODEVICE.





**NANO
KOMIK**

www.nanokomik.com