No. 59

SCIENCE SPAZA

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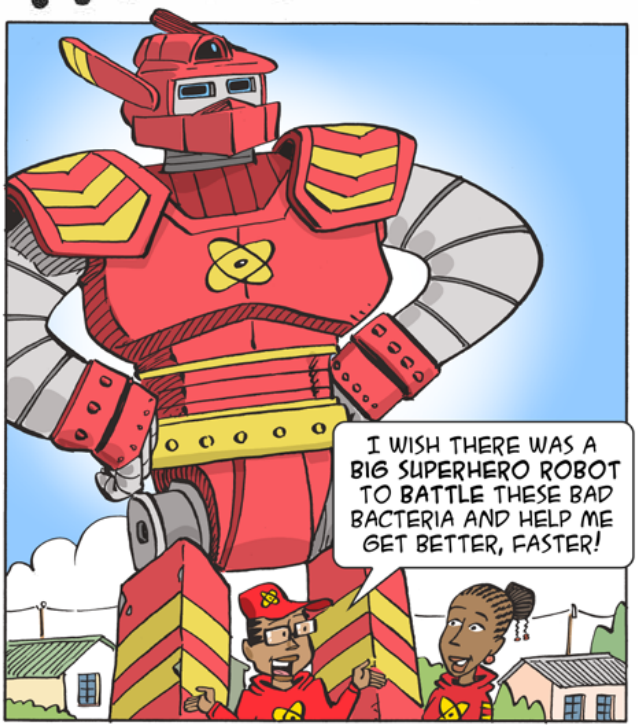
HITTING THE TARGET WITH NANOTECH!



WHAT IS NANOTECHNOLOGY?

NANOTECHNOLOGY IS THE ***SCIENCE OF VERY SMALL THINGS***. IMAGINE DIVIDING ONE MILLIMETRE INTO A MILLION EQUAL SLICES. EACH SLICE WOULD BE A NANOMETRE THICK. IT'S THE WORLD OF ATOMS AND MOLECULES AND HERE THINGS SOMETIMES BEHAVE IN A SURPRISING WAY. SOME MATERIALS BECOME SUPER STRONG, START TO CONDUCT ELECTRICITY OR HAVE EXCELLENT ANTIBACTERIAL PROPERTIES.

FILTERS WITH ***NANOPARTICLES*** CAN PURIFY WATER. GOLD NANOPARTICLES HELP TO QUICKLY DIAGNOSE DISEASES LIKE MALARIA. ***NANOMATERIALS*** CAN IMPROVE BATTERIES AND SOLAR PANELS. THESE ARE JUST SOME EXCITING USES OF NANOTECHNOLOGY RIGHT HERE IN OUR COUNTRY!

Nanomaterials are an important part of the fuel cell system that provides off grid electricity at Poelano Secondary School.

Ms Charity Maepa with a transmission electron microscope used to get information on the inner structure of nanoparticles.

NANOTECHNOLOGY USES ***TINY MATERIALS*** TO TRY AND SOLVE THE ***BIG CHALLENGES*** THE WORLD FACES TODAY.

TARGET PRACTICE!

ARE YOU READY FOR SOME FUN? MAKE YOUR OWN WATER BALLOON TO TRY TO HIT THE TARGET!

YOU WILL NEED:

- A SQUARE PIECE OF PAPER. AN OLD PAMPHLET OR MAGAZINE WILL WORK.
- A BUCKET. THIS WILL BE YOUR TARGET.
- A JUG OR BOTTLE OF WATER.

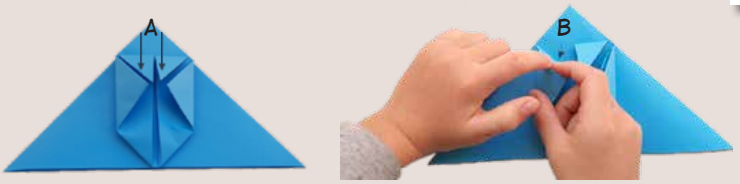
1 FOLD YOUR SQUARE PAPER IN HALF TO FORM A RECTANGLE. UNFOLD, TURN THE PAGE AROUND AND FOLD THE TOP RIGHT CORNER DOWN TO THE BOTTOM LEFT AND VICE VERSA TO MAKE THE TWO DIAGONAL LINES. UNFOLD AGAIN.

2 BRING THE MIDDLE OF THE SIDES TO THE BOTTOM CENTRE TO FORM A TRIANGLE AS SHOWN IN THE PHOTO.

3 LAY THE TRIANGLE DOWN WITH THE OPEN SIDE FACING YOU. FOLD THE BOTTOM TWO CORNERS UP TO THE TOP CORNER TO GET A DIAMOND SHAPE.

4 FOLD THE OUTER CORNERS OF THE DIAMOND IN TOWARDS THE CENTRE LINE.

5 FOLD (A) DOWN AND TUCK (B) THE LITTLE TABS AS SHOWN.



6 FOLD THE PAPER OVER AND REPEAT THE STEPS 3 TO 5.

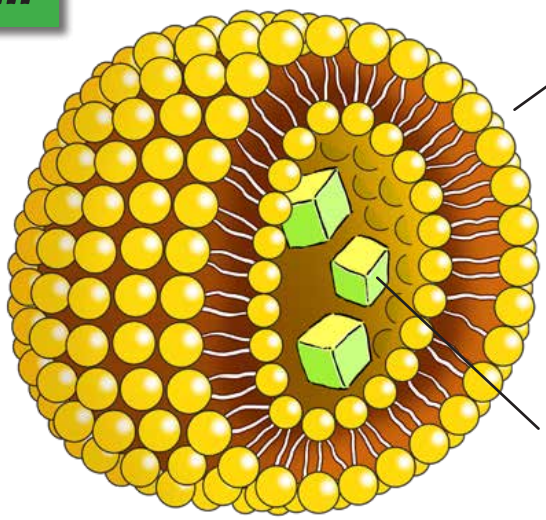
7 BLOW INTO THE HOLE TO INFLATE YOUR WATER BALLOON.

8 USE YOUR JUG OR BOTTLE TO FILL THE PAPER WATER BALLOON, AIM AND THROW! THIS COULD GET MESSY, BEST TO PLAY OUTSIDE!

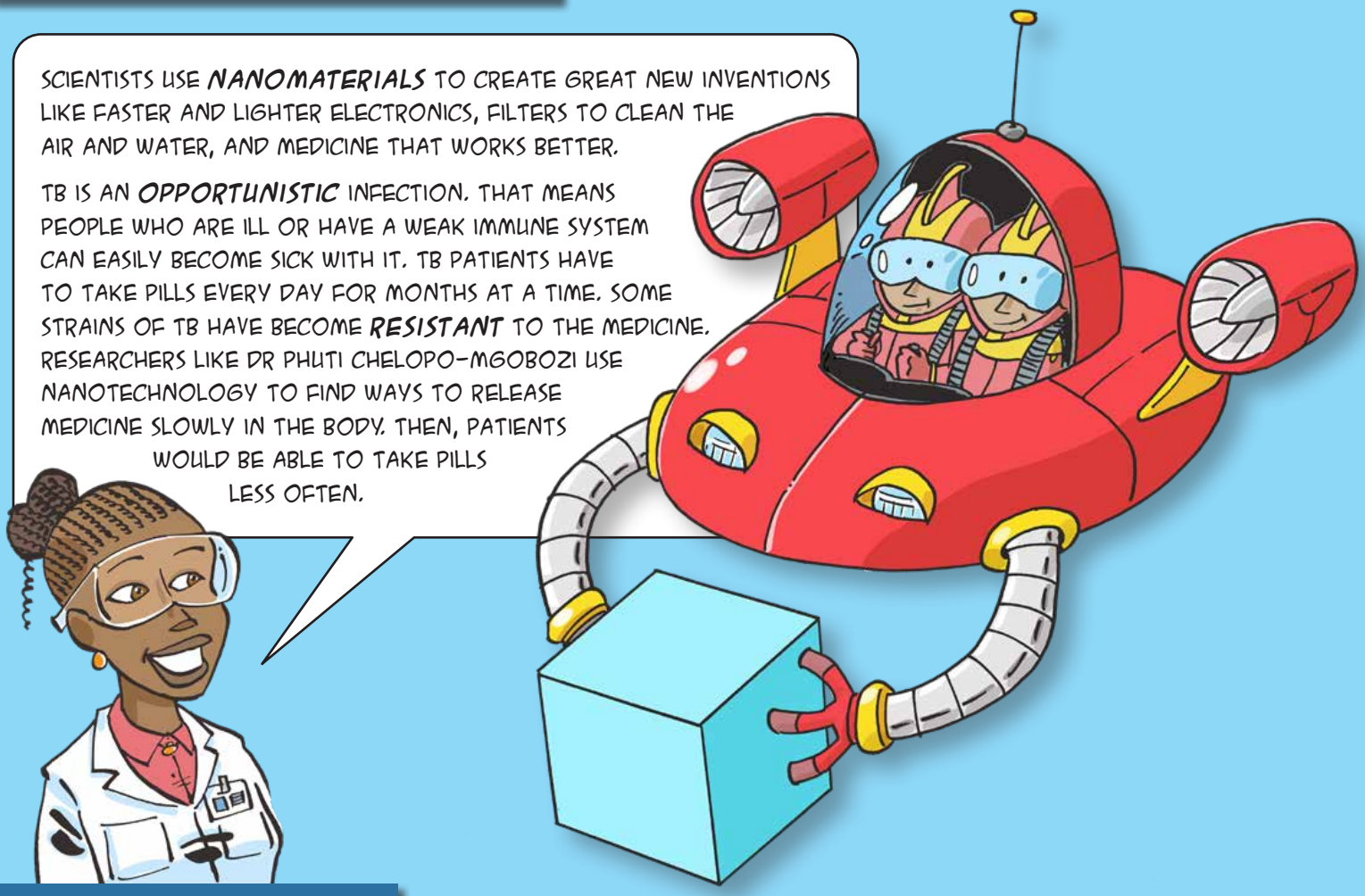
TINY TOOLS TO MAKE LIFE BETTER ...

JUST LIKE YOU CHANGED THE SHAPE OF THE PAPER TO HOLD WATER, NANOPARTICLES CAN BE ENGINEERED IN ***DIFFERENT SHAPES, SIZES AND FORMS*** TO PERFORM TASKS. NANOPARTICLES ARE SO SMALL, THEY CAN EASILY ENTER LIVING CELLS TO DELIVER MEDICINE WHERE NEEDED. THIS IS CALLED ***TARGETED DRUG DELIVERY***. NANOPARTICLES LIKE ***LIPOSOMES**** CAN BE LOADED WITH MEDICINE TO TREAT DISEASES SUCH AS CANCER AND TUBERCULOSIS (TB).

*A LIPOSOME IS A NANO-SIZED BALL MADE FROM FATTY MOLECULES SIMILAR TO THOSE YOUR CELL MEMBRANES ARE MADE OF.



BETTER MEDS FOR MZANZI



CAREERS

A career in nanotechnology puts you at the frontier of scientific discovery!

Pharmaceutical chemists use nanotechnology to better diagnose and treat diseases.

Material scientists: New materials make new inventions possible. Scientists, like physicists, chemists and biologists, design and discover new nanostructures and processes.

Nano-entrepreneurs take new inventions to the market!

Scientists have to make sure nanotech is safe for us and the environment.

In her doctoral research, **Dr Phuti Chelopo-Mgobozi** looked at how nanotechnology can deliver TB medicine to patients more effectively. Her research, along with ongoing studies about this subject, will benefit the thousands of South Africans living with TB. To work in the field of nanotechnology you need a degree in science such as physics, chemistry or biology and then specialise in nanotechnology during your postgraduate studies.

CURRICULUM LINKS

- ***Grade 4-6 Mathematics:*** Numbers, operations and relationships - Relative size of numbers; Space and shape (geometry) - Properties of 3D objects.
- ***Grade 6 Life skills:*** Communicable diseases
- ***Grade 7-9 Mathematics:*** Select and convert between appropriate units of measurement. ***Natural Science:*** Energy and change - sources of energy; Matter and material - atoms, physical properties of materials.

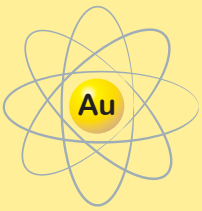
FROM BIG TO SMALL

ARE YOU READY TO PEEP INTO THE NANOWORLD? TAKE A LOOK AT THE OBJECTS BELOW. CAN YOU ARRANGE THEM FROM THE BIGGEST TO THE SMALLEST DIAMETER?

A) Red blood cell

8 µm

B) A gold atom



0.3 nm

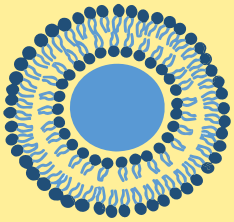
C) Human hair

80 µm

D) Apple

8 cm

E) Liposome



80 nm

F) Sugar grain

0.8 mm

WRITE DOWN THE LETTERS OF THE OBJECTS FROM BIGGEST TO SMALLEST.

_____ _____ _____ _____ _____ _____

WHY DO YOU THINK NANOPARTICLES ARE PARTICULARLY USEFUL IN MEDICINE?

_____

TIP:

Don't compare apples with oranges. Convert all measurements to the same unit to compare them!

- 1 cm = $1x10^{-2}$ m = 0.01 m
- 1 mm = $1x10^{-3}$ m = 0.001 m
- 1 µm = $1x10^{-6}$ m = 0.000001 m
- 1 nm = 1×10^{-9} m = 0.000000001 m

START YOUR OWN SCIENCE SPAZA

Do you want to start a science club at your school? Send us the following information, and Science Spaza will contact you.

School: _____

Name: _____

Telephone number: _____

Email address: _____

Physical address: _____

_____

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Visit www.sciencespaza.org, email info@sciencespaza.org, sms or WhatsApp us on 076 173 7130 or write to us at PO Box 22106, Mayor's Walk, 3208.

WE WANT YOUR FEEDBACK!

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The Nanotechnology Public Engagement Programme (NPEP) is an initiative funded by DSI and implemented by NRF|SAASTA. NPEP promotes a credible, fact-based understanding of nanotechnology through awareness, dialogue and education to enable informed decision making on nanotechnology innovations to improve the quality of life. For more information, please visit www.saasta.ac.za and www.npep.co.za.

NANOTECHNOLOGY PUBLIC ENGAGEMENT

NRF National Research Foundation | SAASTA South African Agency for Science and Technology Advancement

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