science & technology
Department: Science and Technology
REPUBLIC OF SOUTH AFRICA

SCIENCE SPAZA

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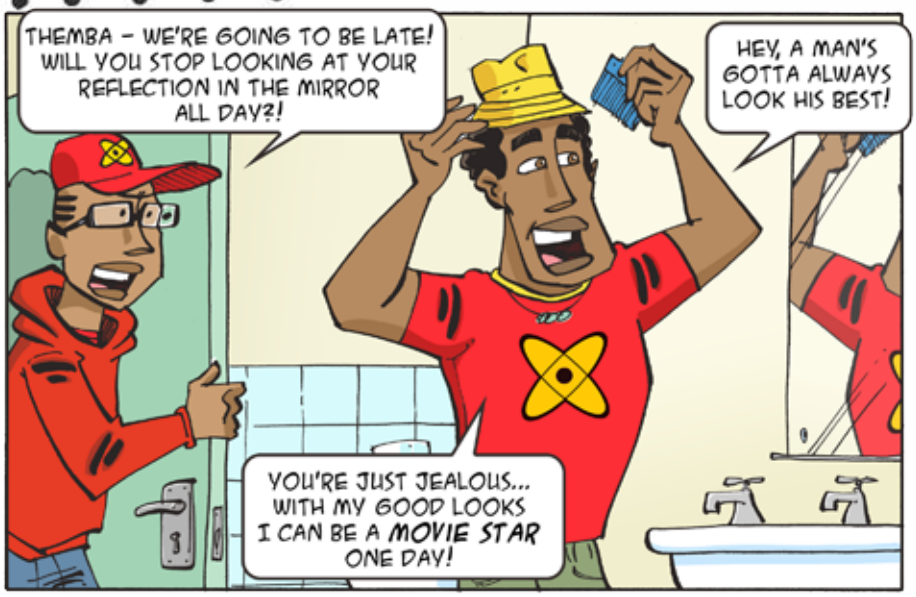
BOUNCING LIGHT!



ACTIVITY: BUILD A PERISCOPE TO SPY AROUND CORNERS

YOU WILL NEED:

- 2 RECTANGULAR CARDBOARD BOXES, E.G. MILK CARTONS
- 2 SMALL POCKET MIRRORS
- PROTRACTOR
- SCISSORS OR SHARP KNIFE
- PENCIL OR PEN
- RULER
- SELLOTAPE OR MASKING TAPE

WHAT TO DO:

1. CUT THE TOP OFF EACH MILK CARTON.CUT OUT WINDOWS NEAR THE BOTTOM.

2. DRAW A LINE AT 45° TO THE EDGE OF THE CARTON. CUT A SLOT ALONG THAT LINE FOR YOUR MIRROR TO FIT IN.

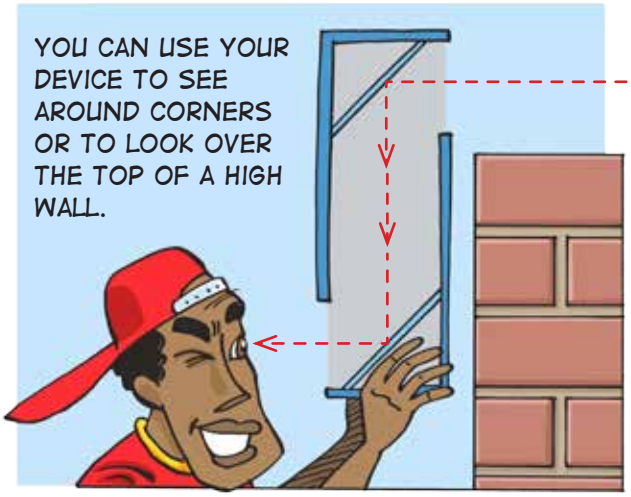
3. SLIDE THE MIRROR INTO THE SLOT SO THAT THE REFLECTING SIDE FACES THE HOLE IN THE OPEN TOP OF THE CARTON. TAPE THE MIRROR IN PLACE.

Knowledge is Ncah!

4 HOLD THE CARTON UP TO YOUR EYE AND LOOK THROUGH THE WINDOW THAT YOU CUT. YOU SHOULD SEE THE CEILING THROUGH THE TOP OF THE CARTON. IF WHAT YOU SEE LOOKS TILTED, MOVE THE MIRROR AND TAPE IT AGAIN.

5 REPEAT STEPS 2 TO 4 FOR THE OTHER CARTON.

6 HOLD ONE CARTON WITH THE WINDOW HOLE FACING YOU. PLACE THE OTHER CARTON UPSIDE-DOWN, WITH THE MIRROR AT THE TOP AND THE HOLE FACING AWAY FROM YOU. NOW SLIDE THE TOP CARTON OVER THE BOTTOM ONE TO MAKE ONE LONG DEVICE. TAPE THE TWO CARTONS TOGETHER.



YOU CAN USE YOUR DEVICE TO SEE AROUND CORNERS OR TO LOOK OVER THE TOP OF A HIGH WALL.

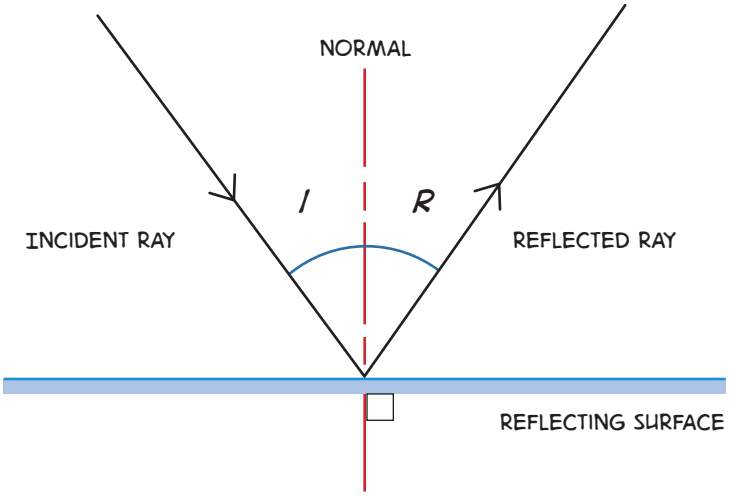
LIGHT FROM THE OBJECT THAT YOU ARE LOOKING AT ENTERS THE WINDOW AT THE TOP OF YOUR DEVICE.

THIS LIGHT IS REFLECTED FROM THE FIRST MIRROR, TRAVELS DOWN THROUGH THE DEVICE, AND IS REFLECTED AGAIN AT THE SECOND MIRROR SO THAT IT ENTERS YOUR EYE.

WHAT'S HAPPENING HERE?

WHEN LIGHT IS REFLECTED OFF A SURFACE, THE ANGLE OF INCIDENCE IS EQUAL TO THE ANGLE OF REFLECTION. THIS IS CALLED THE ***LAW OF REFLECTION***: *ANGLE I = ANGLE R.*

WE MEASURE THE ANGLES OF INCIDENCE AND REFLECTION FROM THE ***NORMAL***, WHICH IS A LINE THAT WE CAN DRAW AT RIGHT ANGLES TO THE REFLECTING SURFACE.

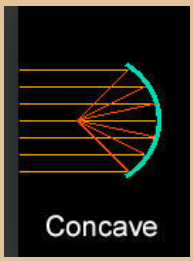


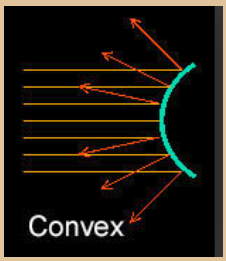
CURVED SURFACES

SOME MIRRORS ARE DESIGNEAD TO HAVE A CURVED SHAPE, SO THAT LIGHT CAN BE FOCUSED IN USEFUL WAYS.

CONCAVE MIRRORS REFLECT LIGHT RAYS SO THAT THEY ***CONVERGE*** (COME TOGETHER).

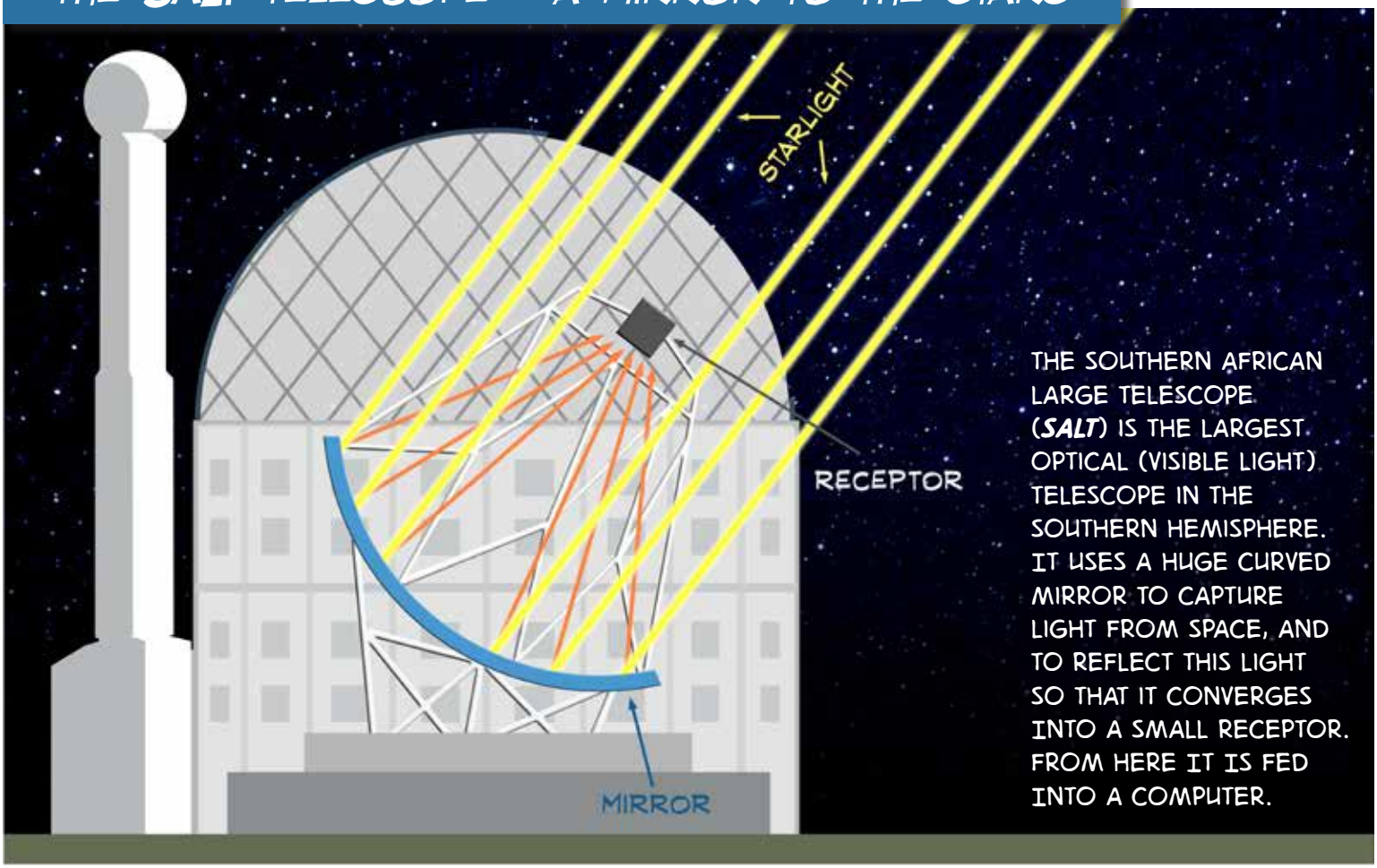
CONVEX MIRRORS REFLECT LIGHT RAYS SO THAT THEY ***DIVERGE*** (SPREAD OUT).





LOOK AT THE KINDS OF IMAGES THAT ARE FORMED USING THE FRONT AND BACK OF A SPOON.

THE SALT TELESCOPE - A MIRROR TO THE STARS



THE SOUTHERN AFRICAN LARGE TELESCOPE (***SALT***) IS THE LARGEST OPTICAL (VISIBLE LIGHT) TELESCOPE IN THE SOUTHERN HEMISPHERE. IT USES A HUGE CURVED MIRROR TO CAPTURE LIGHT FROM SPACE, AND TO REFLECT THIS LIGHT SO THAT IT CONVERGES INTO A SMALL RECEPTOR. FROM HERE IT IS FED INTO A COMPUTER.

PUZZLE YOUR MIND!!!

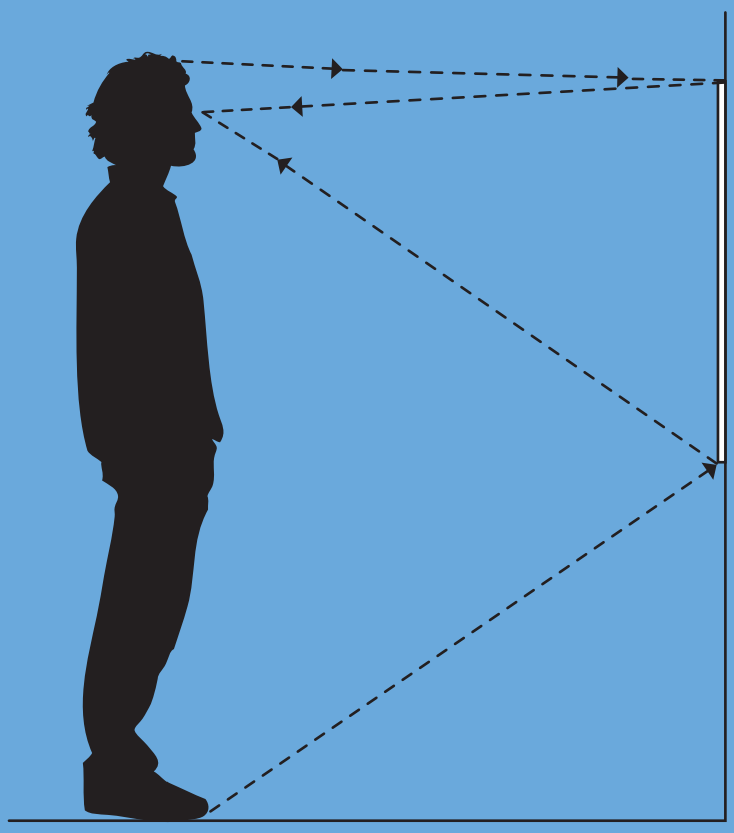
TOM'S HEIGHT IS 1 600 MM. HE IS LOOKING AT HIMSELF IN THE MIRROR ON THE WALL. THE MIRROR IS JUST TALL ENOUGH FOR HIM TO SEE HIS WHOLE BODY IN IT FROM HEAD TO TOE.

A RAY OF LIGHT FROM THE TOP OF HIS HEAD IS REFLECTED IN THE TOP OF THE MIRROR AND ENTERS HIS EYE.

ANOTHER RAY OF LIGHT FROM HIS FOOT IS REFLECTED INTO HIS EYE FROM THE BOTTOM OF THE MIRROR.

1. WHAT IS THE HEIGHT OF THE MIRROR?
   HINT: DRAW THE NORMAL FOR EACH REFLECTION.

2. WHAT HEIGHT IS THE SMALLEST MIRROR YOU WOULD NEED TO SEE YOUR WHOLE FACE?



CAREERS:

- ASTRONOMER
- MECHANICAL DESIGN ENGINEER
- ELECTRONICS TECHNICIAN

Dr Thebe Rodney Medupe is a South African astrophysicist and founding director of Astronomy Africa. He is a professor at North-West University, Mafikeng and is actively involved in encouraging young South Africans to take up astronomy.

CURRICULUM LINKS

- GRADE 8: ***ENERGY & CHANGE*** (VISIBLE LIGHT)
- GRADE 11: ***WAVES, SOUND & LIGHT*** (GEOMETRICAL OPTICS)

THINK AND DISCUSS ...

1. WHEN YOU ARE DRIVING AND YOU WANT TO OVERTAKE A CAR, YOU LOOK IN THE SIDE MIRROR TO SEE IF THERE IS ANOTHER VEHICLE BEHIND YOU OR OVERTAKING YOU. WHICH KIND OF MIRROR WILL BE THE BEST TO USE FOR A SIDE MIRROR (CONCAVE, CONVEX OR FLAT)? DISCUSS YOUR ANSWERS.

2. IF YOU PUT A MIRROR IN A ROOM WITH A DIM LIGHT, DOES THE MIRROR MAKE THE ROOM BRIGHTER? WHY?

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School: _____ Name: _____

Telephone number: _____ Email 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

ANSWER TO PUZZLE: 1: 800 mm; 2. half the height of your head

This Science Spaza resource was produced for the National Science Week celebrations of the International Year of Light. National Science Week is an initiative of the Department of Science and Technology, implemented by the South African Agency for Science and Technology Advancement (SAASTA), a business unit of the National Research Foundation. For more information visit www.saasta.ac.za