

Narinder Singh Kapany — The Indian Physicist who Bent Light

Very few people have the luck to live long enough to see how their work revolutionises the world. The Indian physicist Narinder Singh Kapany is one of those fortunate people. In 1953, he designed and manufactured a glass wire capable of transporting light, which he later coined fibre optics, an invention that has transformed all our lives. Without it, the Internet and modern telecommunications would not be possible, nor the most advanced biomedical instrumentation, nor the efficient use of solar energy. With fibre optics, this genius of physics-in addition to being an entrepreneur and inventor-achieved what his teachers had told him was impossible: to bend light.

Narinder Kapany was born on 31 October 1926 in Moga, Punjab (north India) to a wealthy Sikh family. He studied physics at the University of Agra while working in a factory for the design and manufacture of optical instruments, where he began to be interested in the technological applications of the theories he studied. After graduating in 1952, he moved to London to study for a doctorate at the Imperial College in London with the prestigious British physicist Harold Hopkins, a researcher in the field of optics. Kapany sought to achieve a system that would allow the use of light as a means of transmitting information, picking up the baton from earlier celebrated scientists. One of these was the Frenchman Claude Chappe, who in the 18th century developed a kind of optical telegraph, considered the first attempt to use light as a vehicle for the exchange of information. His idea was to position towers facing each other but separated by dozens of kilometres and to use mirrors to reflect messages encoded in the form of light.

A beam of light through glass wires

Almost a century before, the Irishman John Tyndall discovered that light could travel within a jet of water. Starting from these earlier ideas, Kapany undertook the task of developing a material through which light could travel, adapting itself to its shape and curvature. In 1953, while working on his thesis, he achieved his goal in a nascent form.

In 1954, he published his breakthrough in the journal Nature, where he explained how he had directed a beam of light through a set of 75-centimetre-long glass wires while hardly losing any signal in the transmission. However, those first fibres had a problem: the light dissipated and could not cover distances greater than nine metres. But even so, Kapany had opened the door for many other researchers to work in that field and perfect his invention, which he later dubbed "fibre optics" in an article in Scientific American.

Optical fibre is one of the most used materials in telecommunications because of its lightness, flexibility and resistance.

An optical fibre is a very long and flexible glass filament with a thickness that is only twice that of a human hair. Encoded laser light signals can travel along this very fine wire, which upon reaching their destination are decoded, thereby reconstructing a message. In general, these fibres are gathered into wider bundles surrounded by a plastic sheath. Nowadays, it is one of the most used materials in telecommunications because of its lightness, flexibility and resistance and because of the economics of the raw material from which it is produced: sand.

A revolution in telecommunications

Kapany had laid the foundations for a veritable revolution in the world of telecommunications. After obtaining his Doctorate in 1955, he continued his career in the United States, where he has lived ever since. The explosion of research related to fibre optics led Kapany to publish in 1967 the book Optical Fibres. Principles and applications, a world reference in the field of optics. The applications of his invention increased exponentially and in 1977 the first telephone connection by optical fibre was achieved.

With the contributions of other scientists, Kapany's glass filaments evolved to be able to transport a huge flow of data at great speeds and over enormous distances: today, 95per cent of Internet traffic travels along thick submarine cables, composed of an infinity of optical fibres. But fibre optics has also transformed other disciplines. In medicine it has allowed the development of laryngoscopes, bronchoscopes and laparoscopes with which to explore the interior of the human body. It is also used in sensors to measure voltage, temperature or pressure, and one of its latest and varied applications makes it possible to capture solar energy with high efficiency.

Narinder Kapany was part of the National Inventors Council in United States, a Department of Commerce Advisory Board, consisted of prominent scientists and engineers.

Kapany, considered the father of fibre optics, devoted much of his career to teaching at the University of California and at Stanford University. The author of numerous patents and scientific articles, he has founded several companies focused on the technological transfer of this knowledge.

True to his origins, he has been a leading promoter in the US of Sikhism, a monotheistic religion whose male practitioners are easily recognised by always covering their hair with a turban, which they never cut. In 1967, Kapany created the Sikh Foundation and also treasures an important personal collection of Sikh art. Fortune magazine recognised Kapany in 1999 as one of seven anonymous heroes in its Twentieth Century Businessmen special.



Kids Craft: Cereal Box Aquarium



You Will Need

1 large cereal box, Colored cardstock or Construction Paper
Shells, Kinetic Sand (We found ours at the Dollar Store for only \$3)
Light Green Pipe Cleaners, Googly Eyes
Turquoise Paint, Silver Paint
Stones, String, X-acto Knife
Hot glue,
Scissors

Steps:

First you need to trace a cut-out on your box. We used a sharpie to make our lines and then used an x-acto knife (adults only) to cut out the center of the box.

Cut out Cardboard Cereal Box

Now paint the inside of your box a turquoise blue color.

Paint the outside of your box silver (to make it look like an aquarium).

Now you can decorate your aquarium however you'd like!

Here are the elements we added:

Kinetic sand as a background on the bottom. We didn't try regular sand but regu-

lar sand would likely work too. The kinetic sand sticks together and holds in place so it's easy to work with. You could also use cereal like cheerios or a puff style cereal to make it look like seaweed.

Green Pipe Cleaners – cut some strips of green pipe cleaners and glue to the bottom of your box to make it look like seaweed.

Add Sand and Pipe Cleaners to Aquarium

Add Seashells to the Aquarium

Add Stones to bottom

Now it's time to add your fish!

Print off this fish template to make these adorable fish for your cereal box aquarium.

Now cut out your fish template and use it to trace your fish shapes onto your colored paper. We used orange, yellow and red cardstock.

Glue on googly eyes to your fish.

Take a small piece of string and tape it to the back of your fish.

Make Paper Fish for Aquarium

Now attach the strings to the top of your cereal box.

FUN RIDDLES

I add lots of flavor
and have many layers,
but if you get too close
I'll make you cry.
What am I?

English Proverbs and Meanings

* **Blood is thicker than water.**
Family relationships are stronger than relationship with other people.

* **Don't bark if you can't bite.**
Don't complain if you can't enforce your point of view.

* **Every man for himself.**
You must think of your own interests before the interests of others.

* **Fine words butter no parsnips.**
No amount of talking can replace action.

* **Half a loaf is better than none.**

You should be grateful for something, even if it's not as much as you wanted.

* **He who hesitates is lost.**
If you delay your decision too long, you may miss a good opportunity.

* **If you chase two rabbits, you will not catch either one.**
If you try to do two things at the same time, you won't succeed in doing either of them.

* **Kindness begets kindness.**
If you are kind to people, they will be kind to you.

Cereal balls



Ingredients:

1 cup muesli
4 tbsp wheatgerm
1 tbsp honey or sugar
1 tbsp peanut butter
1/4 cup raisins
1/4 cup almonds
1-2 tbsp milk
1/2 cup desiccated coconut

Method

In a food processor or blender, place the muesli and raisins and process for 30 seconds.

Roast almonds and grind it into powder.

Add the honey and peanut butter and process for a further 30 seconds.

Test by rolling into a ball, if it doesn't stay together slowly add a tablespoon or two of milk until you are able to roll it into a ball.

Roll in desiccated coconut.
Keep in an airtight container.
Serve and Enjoy!

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Chocolate Appa



Ingredients:

3/4 Cup rice
3 tbsp coconut, grated
1 tsp baking powder
1 tsp vanilla extract
1/2 tsp cinnamon powder
1/4 cup brown sugar
1/4 cup unsweetened cocoa powder

A pinch of salt
3 tbsp chocolate chips
2-3 tbsp butter

Method

Wash and soak the rice in water for 30 minutes to 1 hour. Drain the water of the rice completely and grind it.

Keep the grated coconut ready and add water to form a medium thick batter. Make sure the consistency of the batter is similar to any dosa / pancake batter.

Transfer this to a bowl and add vanilla extract, cinnamon powder, sugar, cocoa powder, salt and mix it well.

Keep this batter aside for 20 to 30 minutes. Before using it, add baking powder to the batter and mix well. Heat appam pan and add little butter / ghee / oil into all the moulds.

Pour a teaspoon of appo batter in each mold, add 3 to 4 chocolate chips and top it with another teaspoon of batter.

Cover the pan with a lid to allow it to cook on medium flame for 2 minutes. When the edges are cooked, flip the appos, add some butter and cook on the other side for another 2 minutes. Repeat the process for remaining batter.

Chocolate Appa is ready to serve.