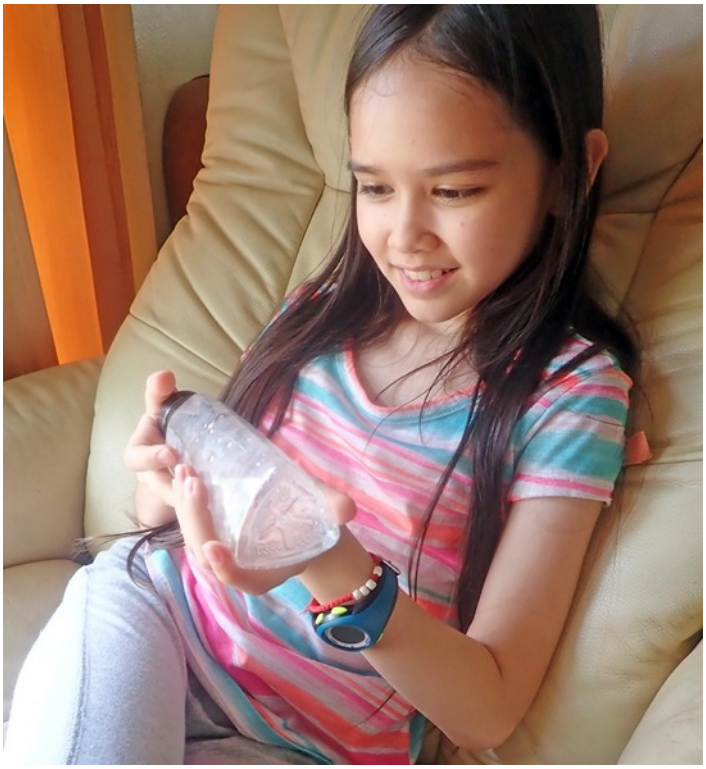
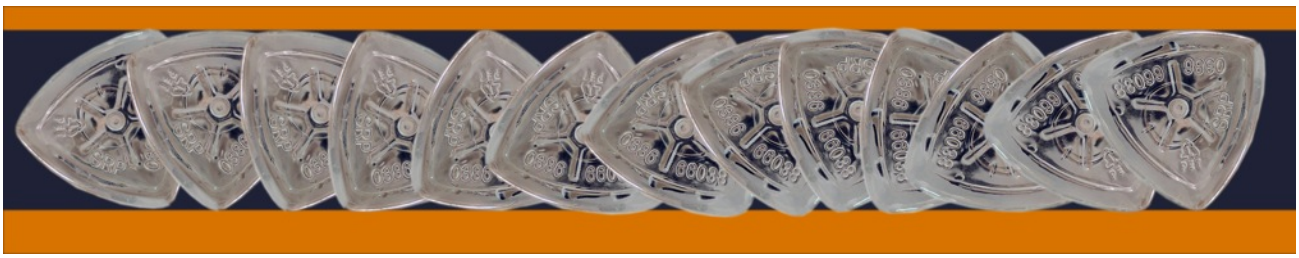
Non-round rollers

Shannon and Ian Jacobs

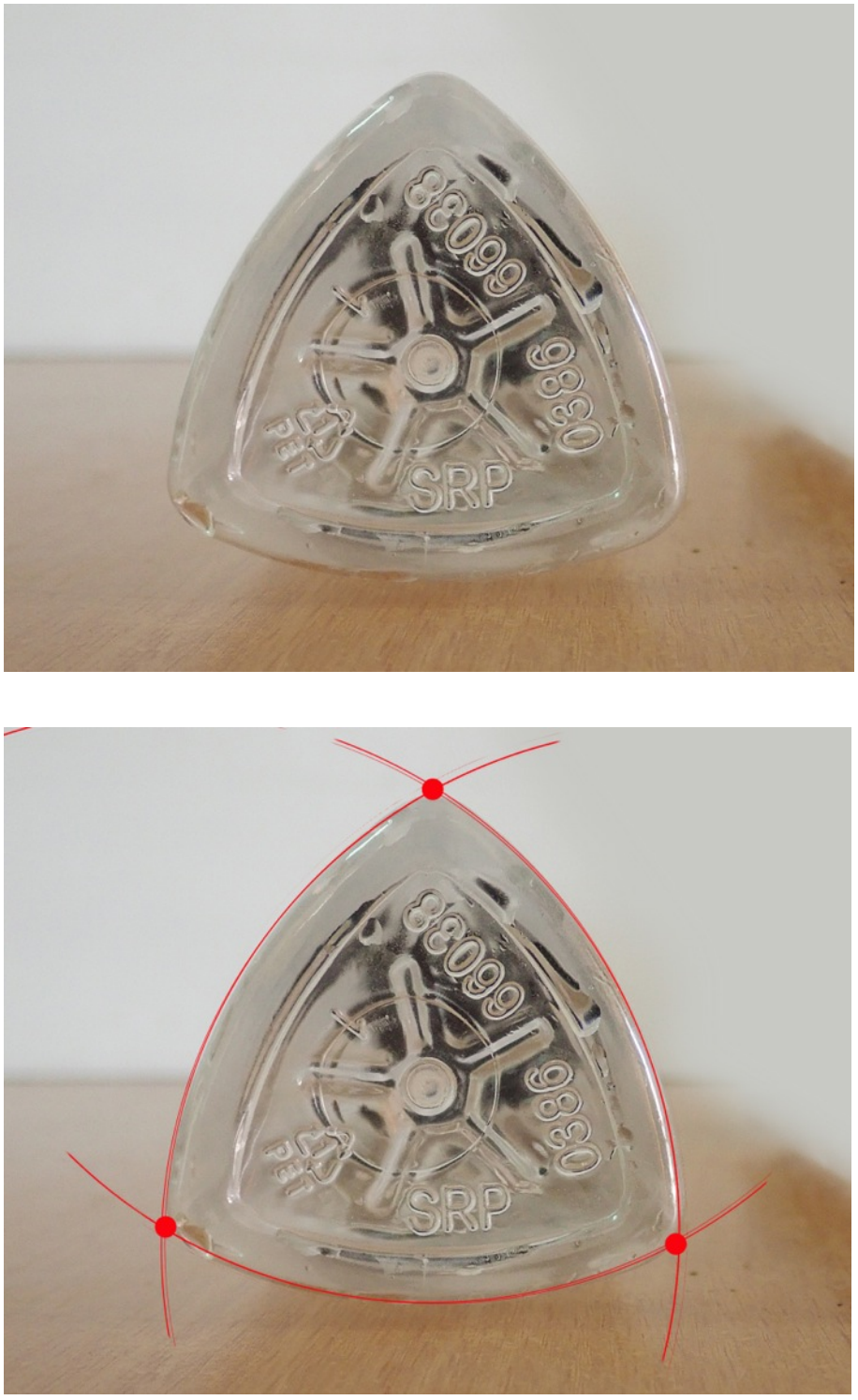
We make fruit-juice for teachers and friends so there are big bags of plastic bottles in the house. The bottles that I like have an odd shape.



Dad asked me what I thought would happen if I lined up two of them on the table and rolled a book on them. When I said, *that would be super bumpy*, he grinned a little bit and gave me two bottles and a book.



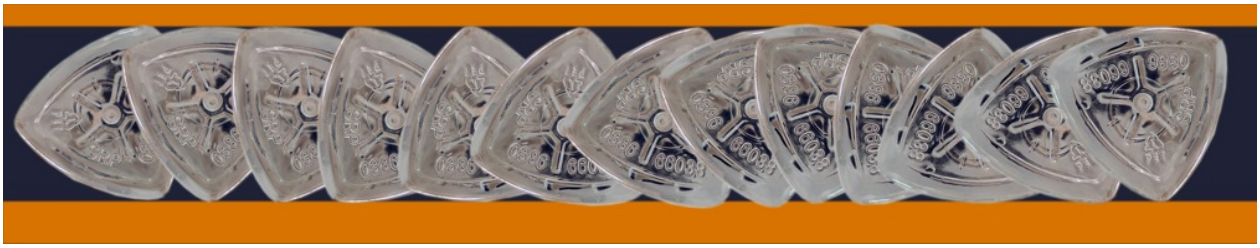
We pushed the book backwards and forwards on the triangular bottles. *I didn't believe it at first*. The bottles rolled along nicely and the book didn't bounce. How is that possible? I photographed a bottle bottom with my phone and looked at it carefully.



Circular arcs centred on the dots.

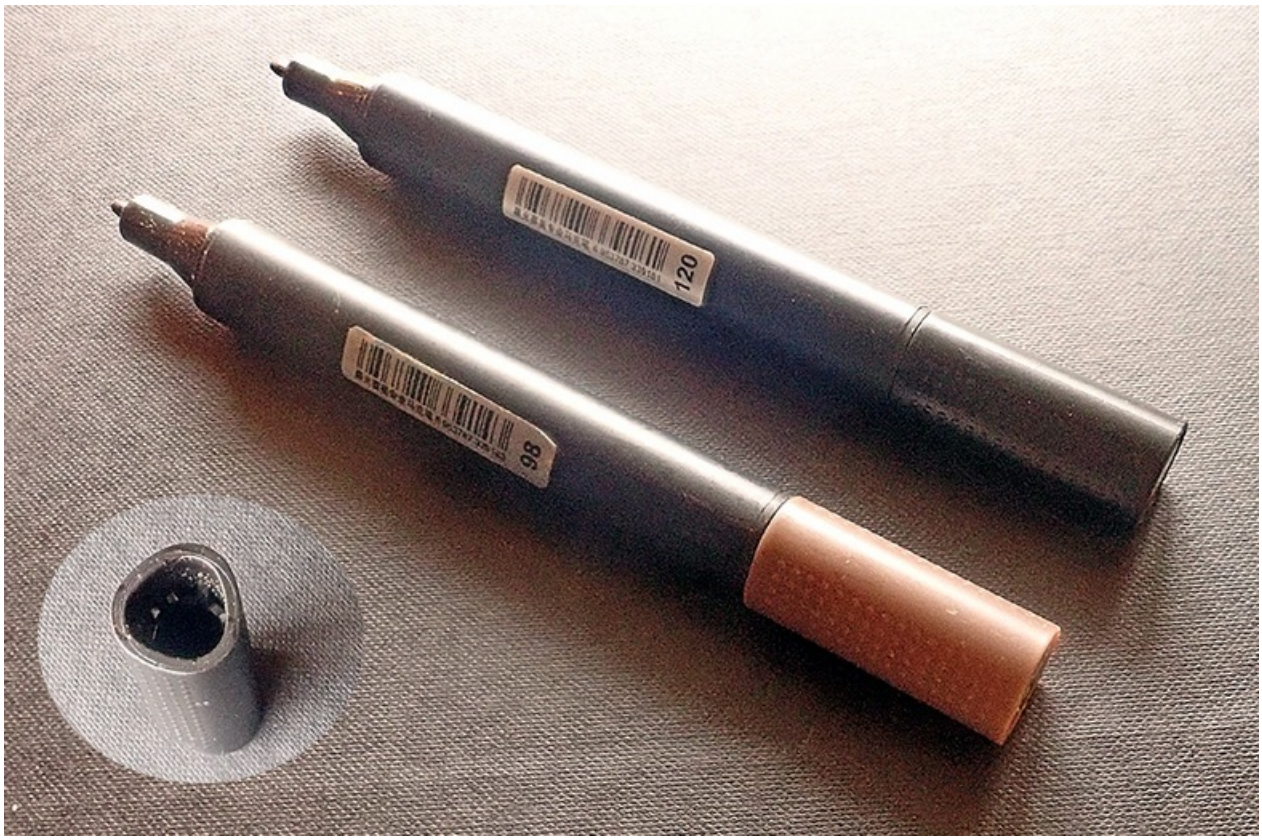
If you put a compass point just outside a rounded point on the upper photograph you can draw a circular arc that fits almost exactly along the curve on the opposite side. Three of these arcs have been drawn in the lower photograph. The sides of the bottle are circular arcs centred on the opposite vertex. The bottle fits into what is called a *Reuleaux triangle* (the figure made by the three red arcs on the photograph).

The width of a Reuleaux roller is the radius of a circle.



Look again carefully at the rolling bottle. The bottle fits between the two orange lines in any position as it rotates but there is nowhere to put an axle. You can't use this shape as a wheel because the centre doesn't stay at the same level as it rolls.

Another example.



These pens are not round. That stops them rolling away on sloping tables and they work nicely as Reuleaux rollers.

For more details on how to make non-round rollers see the web at …

https://www.exploratorium.edu/snacks/non-round-rollers