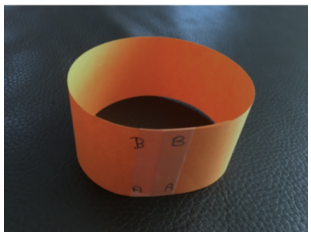
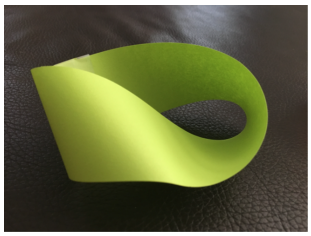
Mobius Bands

1. Task 1:
   (a) Make a loop by taking a strip of paper and taping the ends together.
   
   (b) Now take a pencil, put the point in the center on the inside of the loop, and hold it on the paper while you pull the paper around until the pencil line meets itself. How many sides does your loop have?
   (c) Predict what will happen if you cut along the pencil line. Now do it!
2. Task 2
   (a) Take a strip of paper and tape the ends together with a half-twist. This is called a Mobius band.
   
   (b) Now take a pencil, put the point in the center on the inside of the Mobius band, and hold it on the paper while you pull the paper around until the pencil line meets itself. How many sides does your loop have?
   (c) Predict what will happen if you cut a Mobius band lengthwise down the middle. Then try it.
   (d) How long is your loop, and how many twists does it have?
3. What variations of this experiment could we try?

1 Multiple twists

4. Make a loop with two half twists instead of one.
   (a) How many sides does it have?
   (b) What happens if you cut it down the middle?
   (c) Do you get one loop, two loops, or more?
   (d) How long are these loop(s)?
   (e) How many half-twists do your resulting loop(s) have?

5. What about a loop with three half twists?

6. Experiment with different numbers of half twists and try to come up with rules that will let you predict what would happen with n half-twists. You can use the chart below to organize your findings.

# half-twists	# sides	# pieces of paper after cutting	Length(s) after cutting	# half-twists after cutting	Total # of half-twists .
0					
1					
2					
3					
4					

2 Cutting in pieces

7. Predict what will happen if you cut a Mobius band lengthwise in thirds. Then try it.

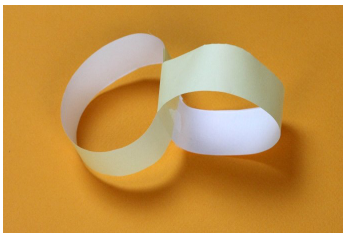
8. What if you cut a Mobius band lengthwise in quarters?

9. Experiment with cutting lengthwise into strips of width $\frac{1}{n}$ for different values of n. You can use the chart below to organize your observations.

Cut into strips of length $\frac{1}{n}$	# pieces of paper after cutting	Length(s) after cutting	# half-twists after cutting	Total # of half-twists .
$\frac{1}{2}$				
$\frac{1}{3}$				
$\frac{1}{4}$				
$\frac{1}{5}$				

3 Mobius Chains

10. Tape two ordinary loops together as shown. Cut each loop down the middle. What happens?



11. What happens if you tape one ordinary loop and one Mobius band together, and then cut down the middle of both?

12. Does it matter which direction you make the half-twist?

13. What happens if you tape two Mobius bands together, and then cut down the middle of both?

14. Does it matter which direction you make the half-twists?

15. Experiment with longer chains, or different numbers of twists.

For a story related to today's topic, watch the 7 minute Vi Hart video *Wind and Mr. Ug*