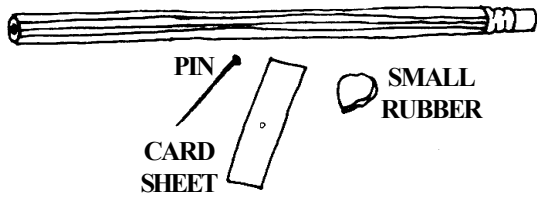
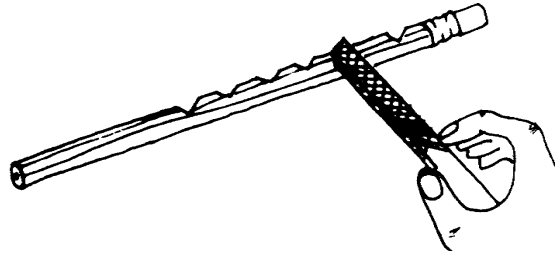


## PERPLEXING PENCIL

This toy has been around for over a hundred years.  
It has been a darling of physicists and has been quite a hit with children. It is very easy to make it.



1. You need a pencil with a rubber on one end. A paper pin, thick card sheet, a small piece of rubber and a penknife or a triangular file.



2. Make 5 or 6 “V” shaped (deep) notches on the pencil with the penknife or with a triangular file.

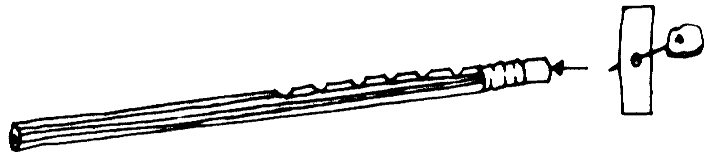
3. Take a 5-cm x 1.5-cm rectangle from a greeting card. Mark its diagonals and make a hole in its center. This makes the propeller fan.



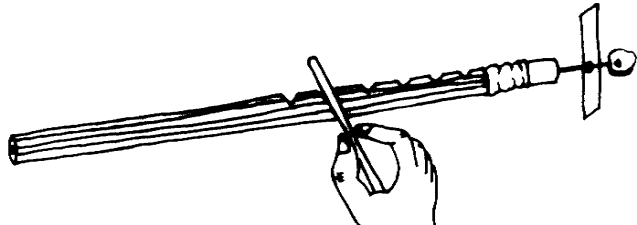
4. Poke a paper pin through a small piece of rubber. The rubber acts like a stopper and prevents the fan from flying away.



5. Weave the pin through the fan and insert it deep into the rubber end of the pencil. Make sure the fan rotates smoothly on the pin.

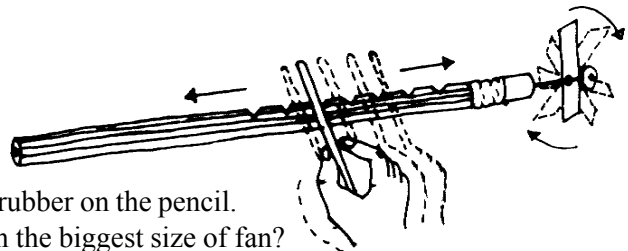


6. Now rub an old ball pen refill along the notches of the pencil.



7. For best results hold the refill near the edge and rub it hard. The fan will start rotating.

Can you make the fan rotate in the opposite direction?  
Children have been doing this for a long time by pressing the index finger of the hand holding the pencil next to the rubber on the pencil.  
Will the fan rotate if you rub it with your finger? What can the biggest size of fan?  
The fan rotates because of the vibrations in the pencil produced by the refill.



The physics behind the toy is a bit complex and several learned research papers have been written on it!

*(Pix by Anu Gopinath)*