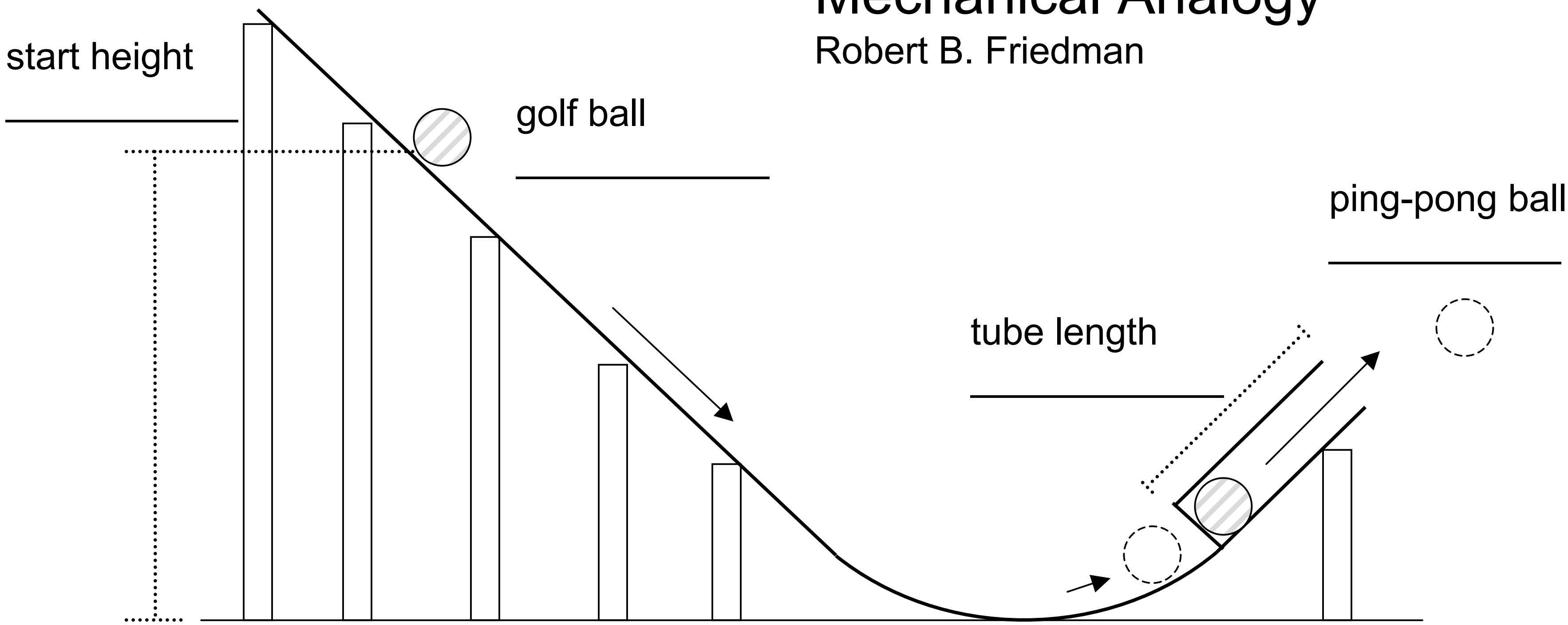
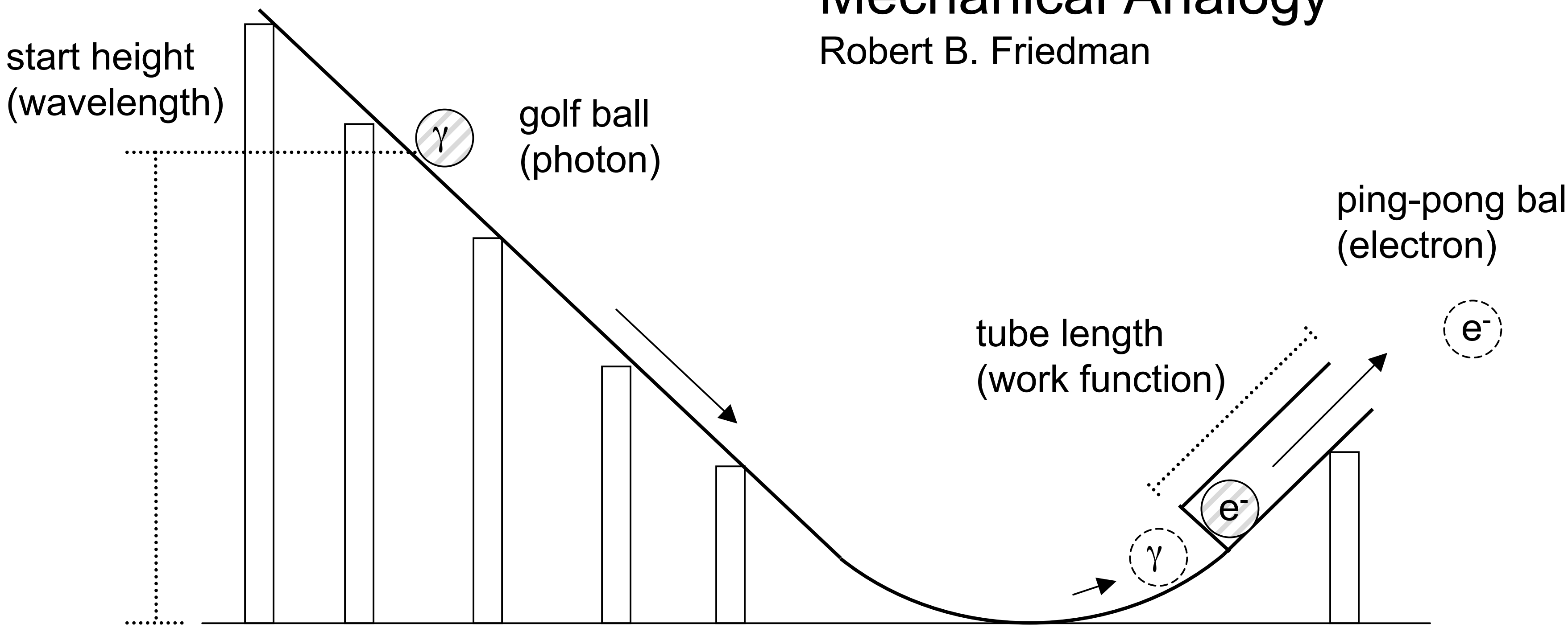
Photoelectric Effect Mechanical Analogy

Robert B. Friedman



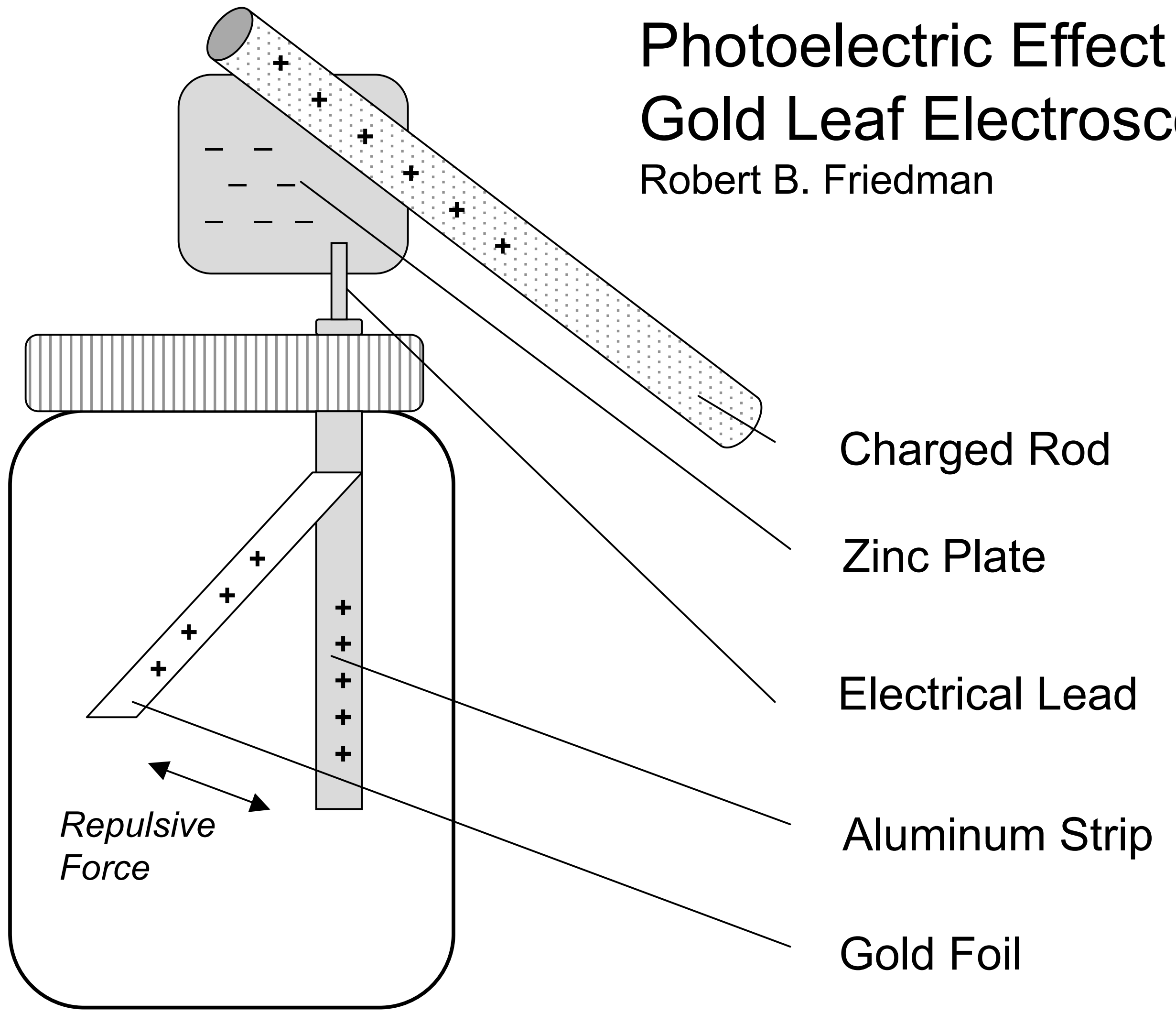
Photoelectric Effect Mechanical Analogy

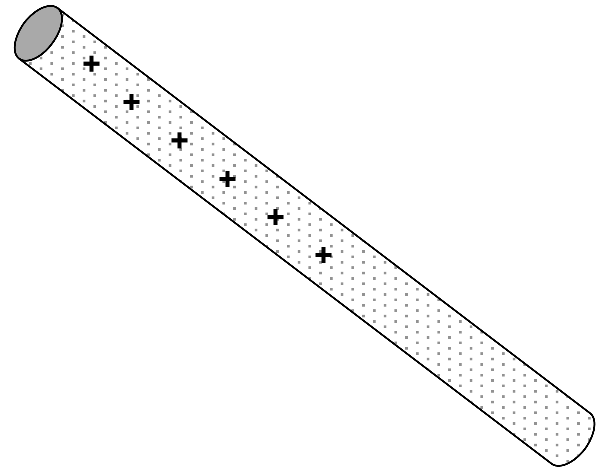
Robert B. Friedman

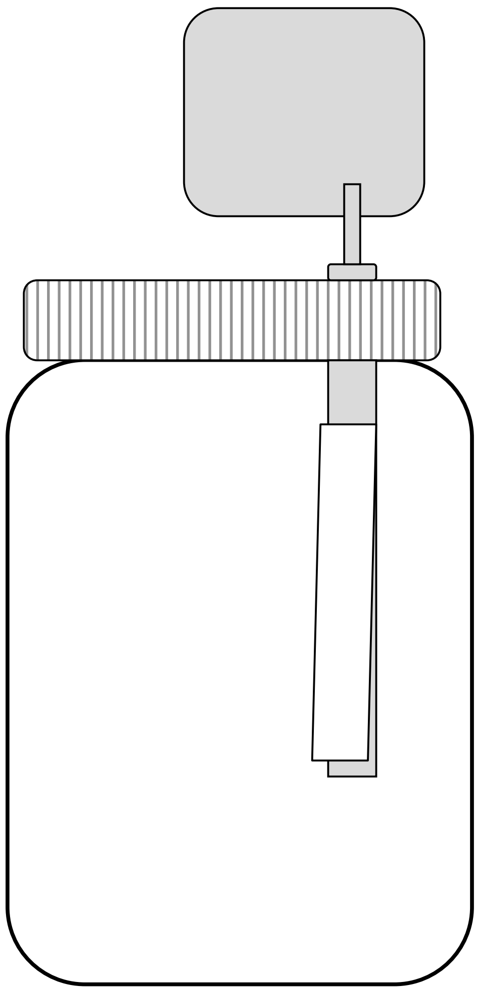


Photoelectric Effect
Gold Leaf Electroscope

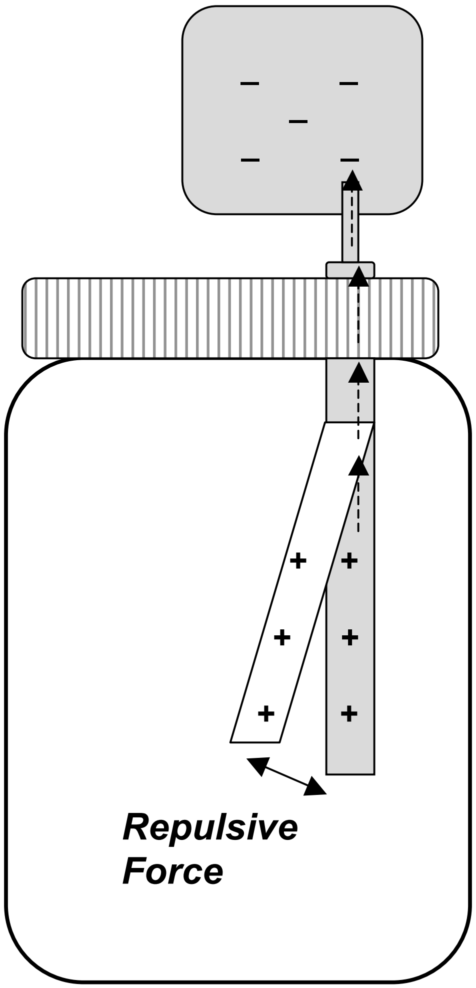
Robert B. Friedman

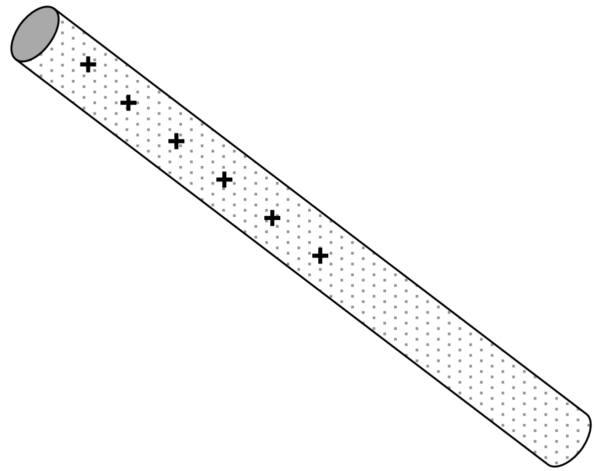




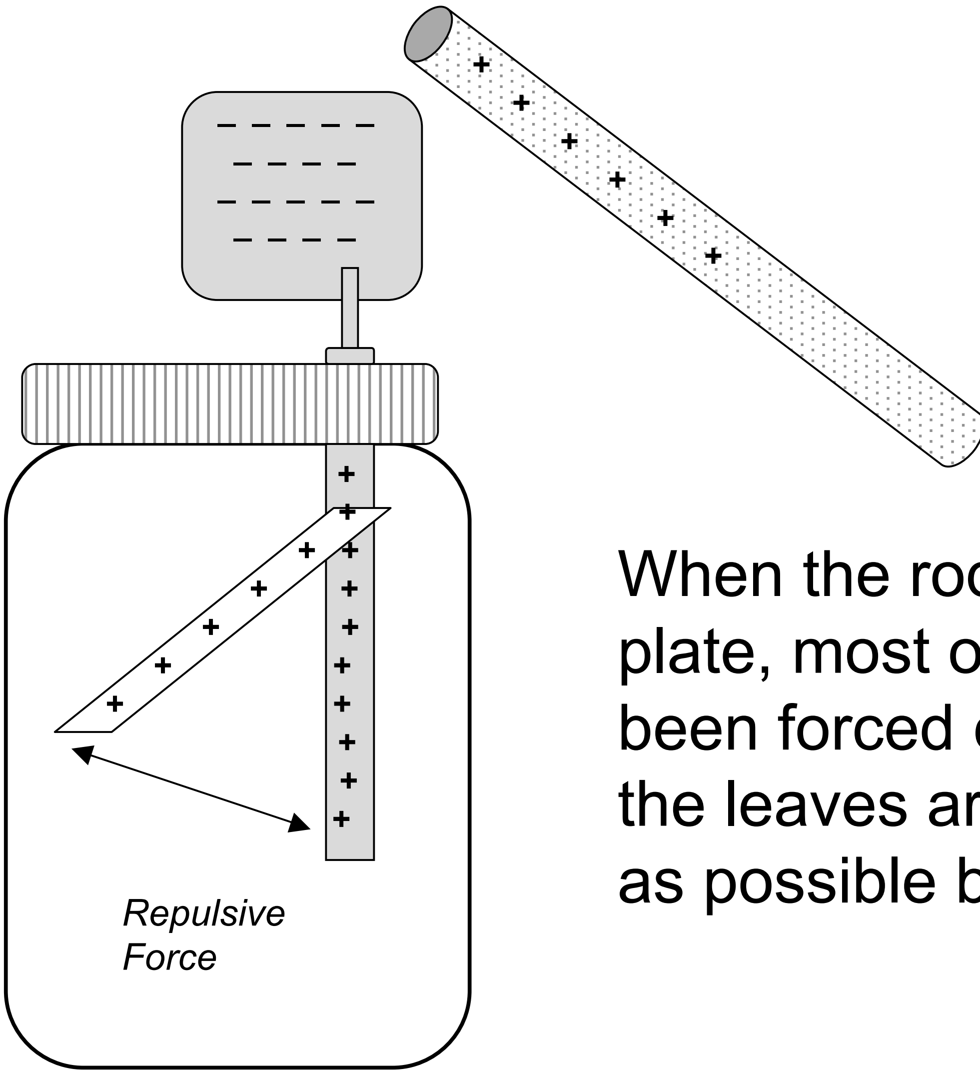


We start with a strongly positively charged rod far from the electroscope.
The electroscope is initially neutral everywhere.

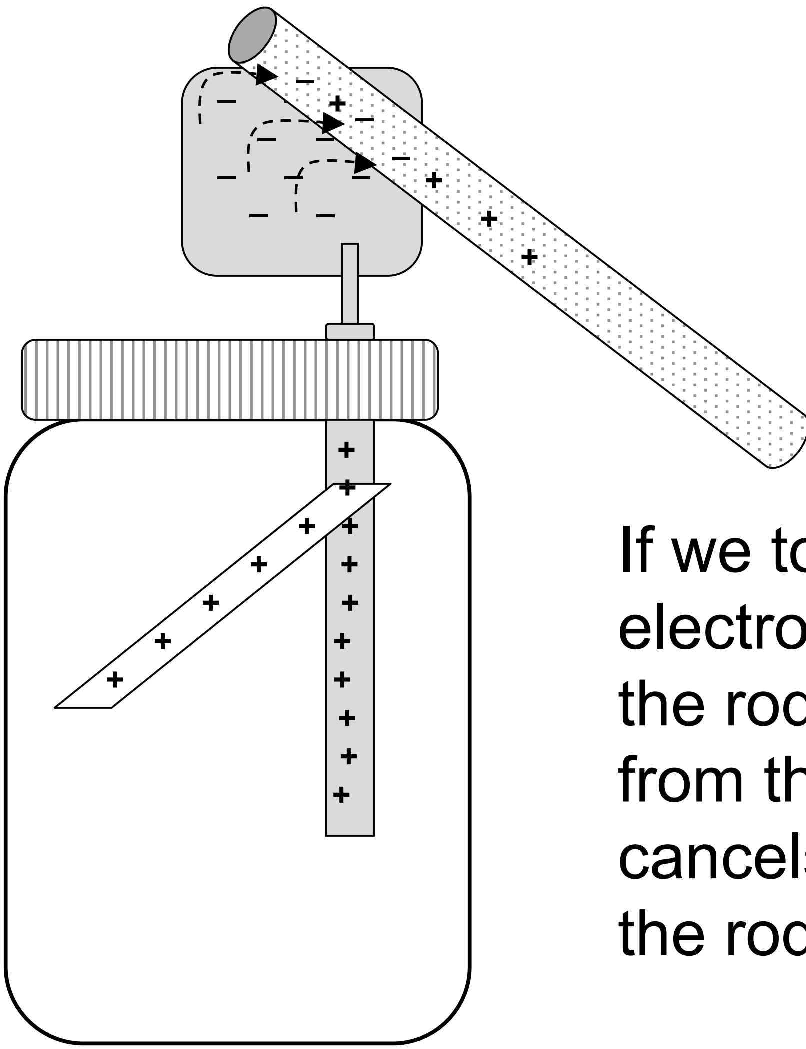




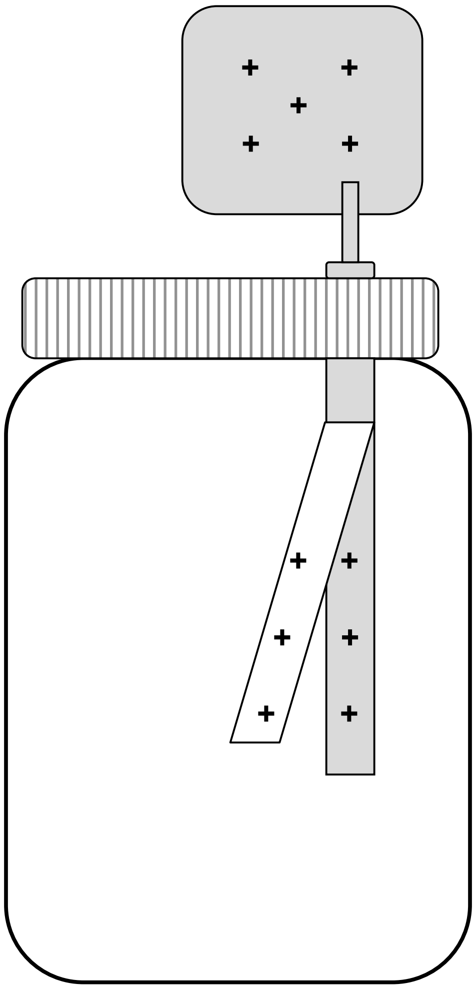
As we bring the rod closer, electrons in the foil leaves are attracted toward the rod and are forced upwards. This makes the foil and aluminum strip acquire a positive charge and the plate a negative one.

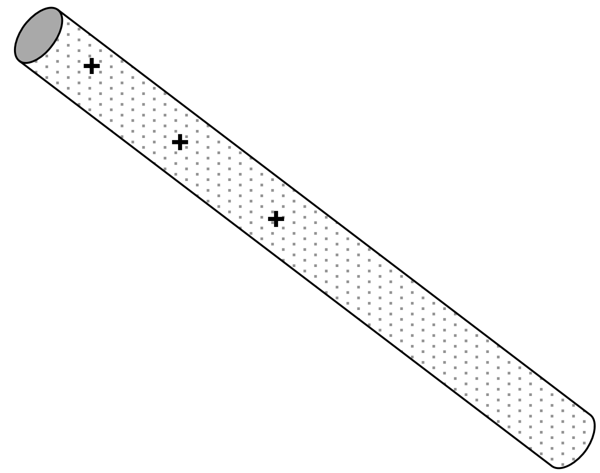


When the rod is very close to the plate, most of the electrons have been forced completely upwards and the leaves are forced apart as much as possible by their like charge!

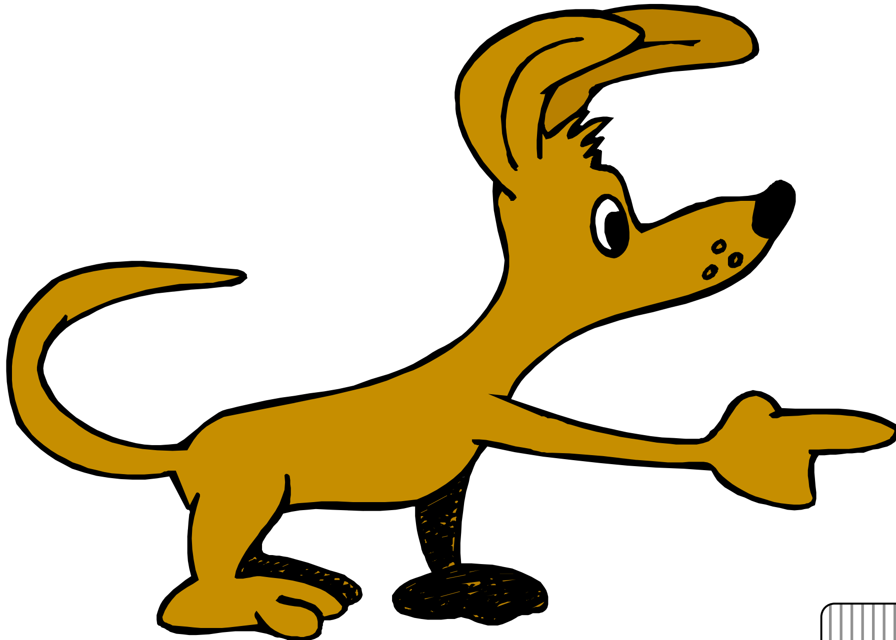


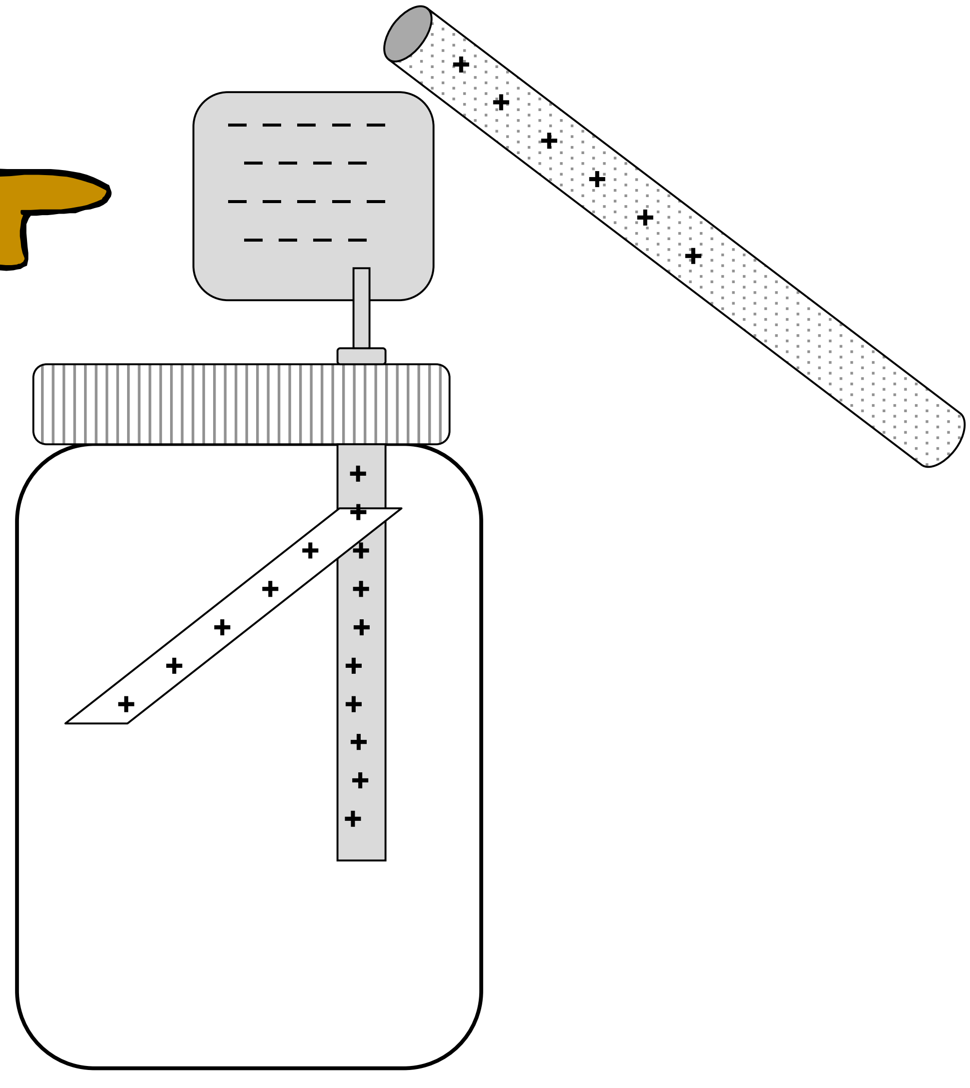
If we touch the rod to the plate, electrons will flow from the plate to the rod. This removes electrons from the electroscope and partially cancels out the positive charge on the rod.



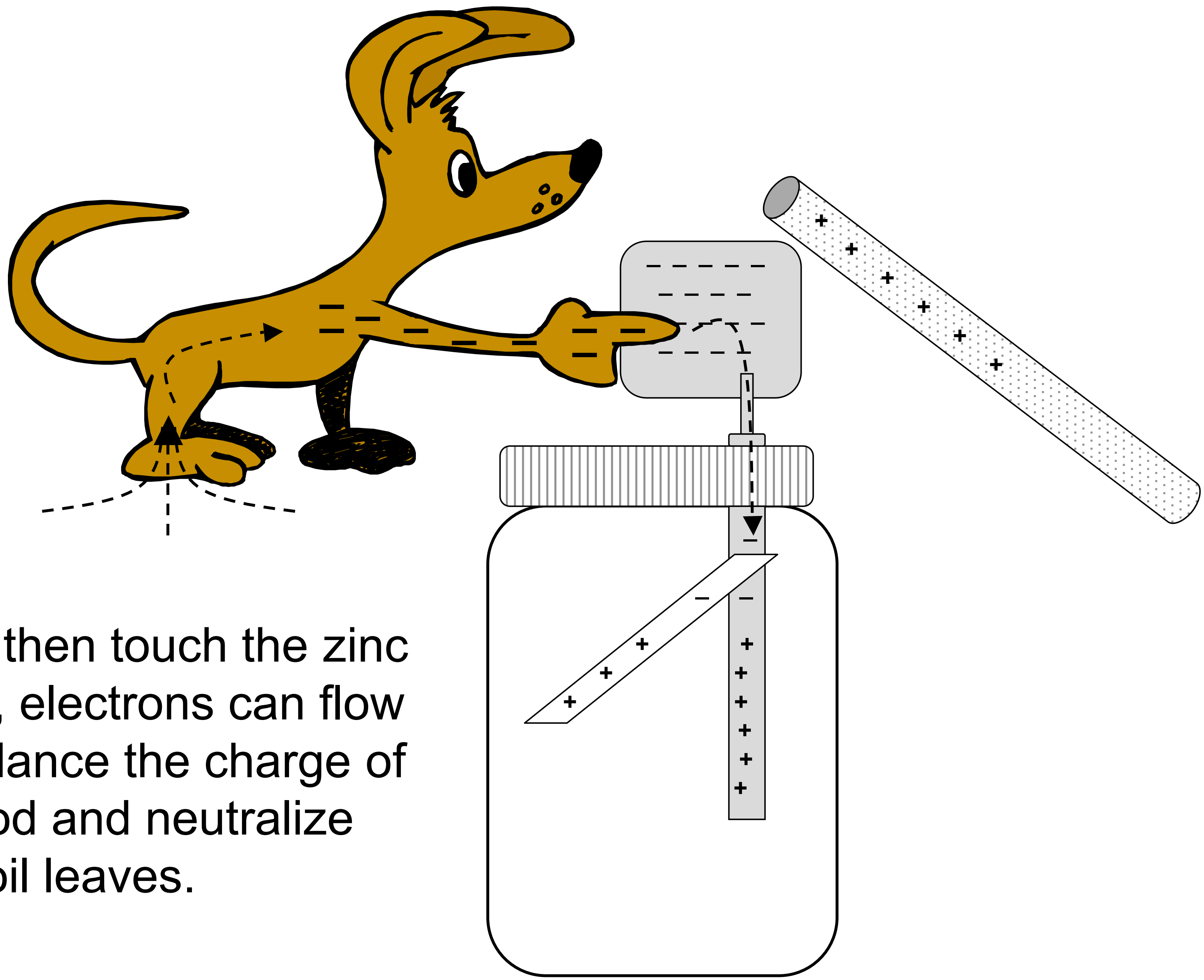


Taking the rod away, the electrons will redistribute themselves. But since we took some away with the rod, there will not be enough to cancel all the positive charge, leaving the electroscope with positive net charge.



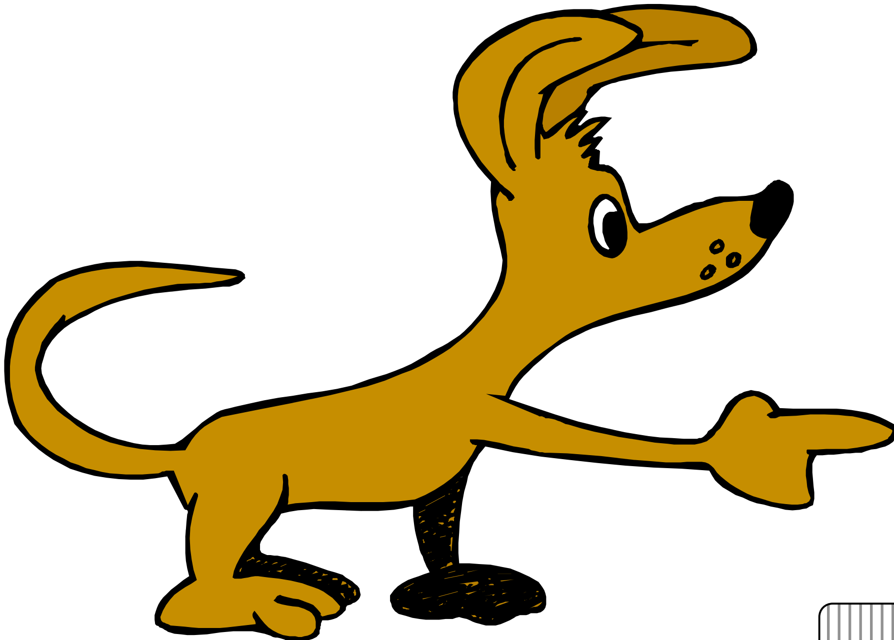


We can charge the electroscope by another method called induction. In this case we use ourselves as a “ground”, or a free electron source.

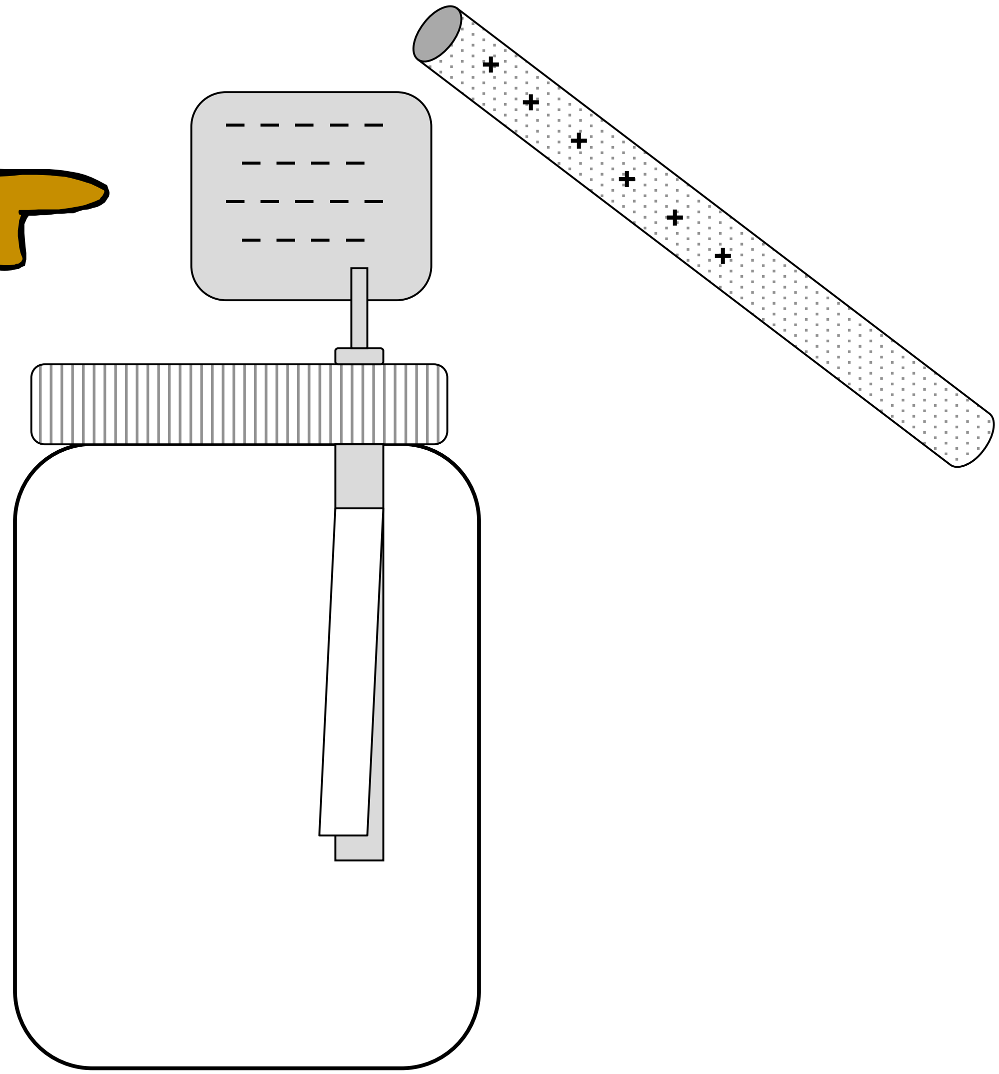


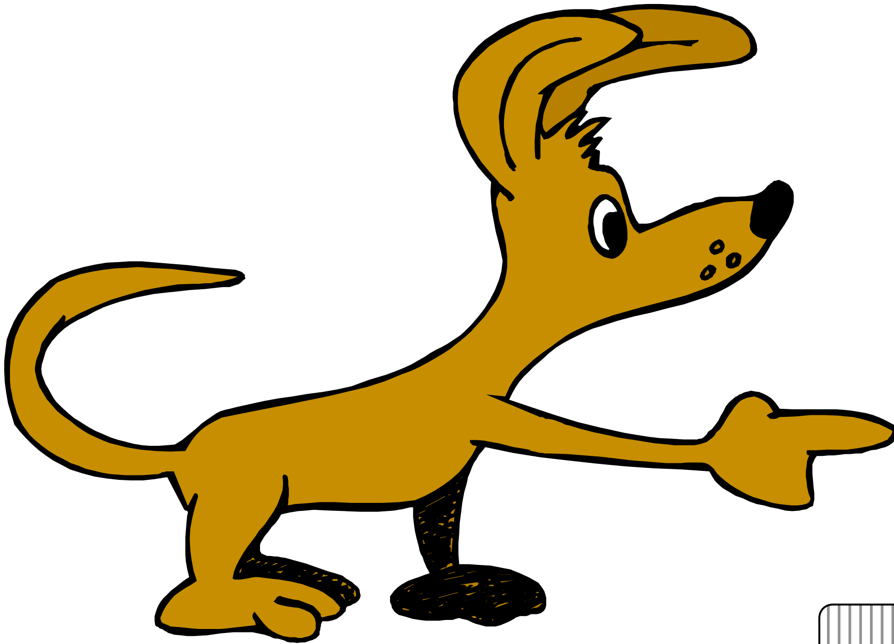
If we then touch the zinc plate, electrons can flow to balance the charge of the rod and neutralize the foil leaves.

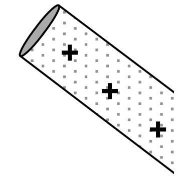
Once we have provided enough electrons to the electroscope to balance the rod, the foil leaves will relax.



Removing our finger traps the electrons on the plate so they cannot escape.







Finally, removing the rod allows the electrons to evenly redistribute throughout the electroscope.