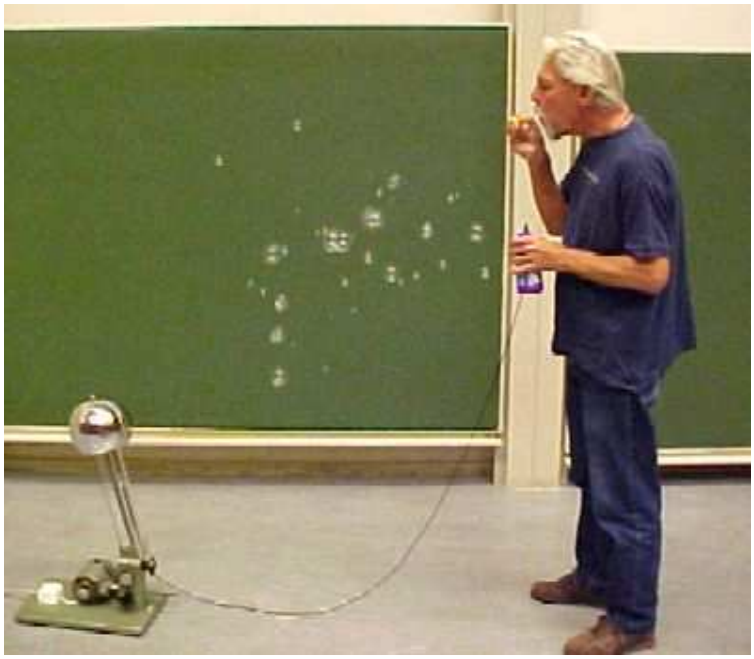
Electric soap bubbles

Aim: To discuss with students the phenomenon shown. It seems easy at first thought but yet appears rather complicated when shown to them..

Subjects: 5A10 (Producing Static Charge)
5A40 (Induced Charge)

Diagram:



Equipment:

- Van de Graaff generator.
- Soap solution.
- Grounded wire.
- Teacher, blowing soap bubbles.

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Presentation: The teacher asks the students to reflect about what will happen to neutral soap bubbles that come in the neighbourhood of a running Van de Graaff generator. After their ideas are discussed, and some predictions made, the Van de Graaff generator is switched on. The ground lead is plunged into the soap solution and at a distance of around 1.5-2 meters soap bubbles are blown into the direction of the generator.
The bubbles are clearly attracted towards the dome of the generator; they are accelerated (when coming close to the dome even their shape changes, see Figure1). The first bubble hits the dome and explodes (occasionally it remains intact and bounces).

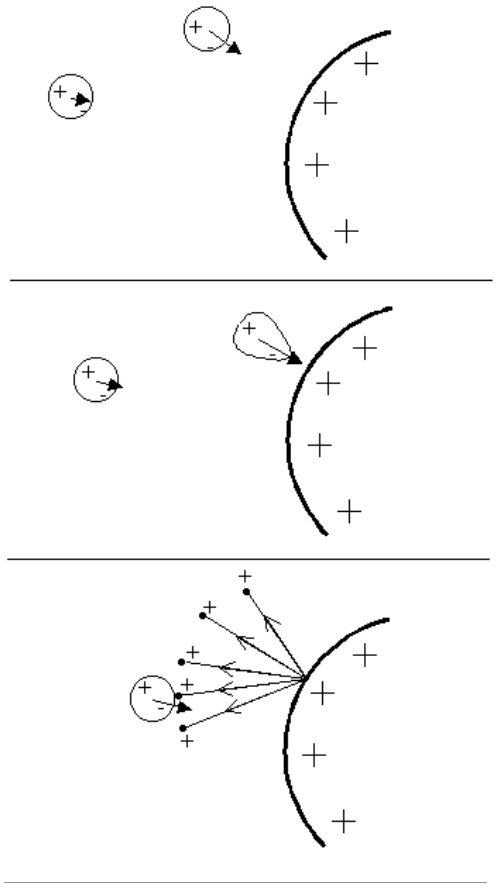

Figure 1

The other bubbles that are still on their way towards the dome are now pushed away from it. Also the next series of blown bubbles are all repelled.
When you want again to see attraction, you first have to clean the dome.

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Explanation: The blown bubbles are neutral and they are polarized in the E-field of the dome. Since this field is divergent, a polarized bubble is attracted and accelerated. On contact, the bubble obtaines the charge of the dome and when the bubble survives it will be repelled from it (bounces). But when the bubble breaks it will break up as a very fine spray of very fine droples all having the same charge as the dome and moving fast because of their very small size. This charged spray charges the other bubbles, that are still approaching, and these bubbles becoming charged by the spray they will be repelled now as well.

Remarks:

- That a very fine spray occurs can be observed in a separate, individual experiment in which you make a drop of water fall on the charged dome and in your face you feel a refreshing fine haze (see Figure2).

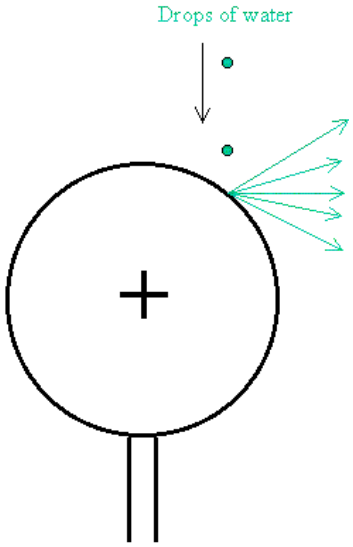

Figure 2