

THE SECRETS of SOAP BUBBLES

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PART ONE

SEGMENT 1

This segment is just an introduction to some nice aspects of soap films.

The goal of the question "What would happen if you tried the same experiment in zero-gravity?" is to stimulate the creativity of the students. We do not expect a specific answer or understanding. The idea is to let everyone's mind roam free.

SEGMENT 2

This segment explores the concept of surface tension.

When we mention the electric forces you can make the connection to hydrogen, the Van der Waal force, dipole-dipole interactions, if the students have heard of them before.

In any case it is important to discuss the difference between INTER and INTRAmolecular forces, that is the forces that keep molecules close to each other and those that held a molecule together.

The teacher can discuss in class what are the similarities and differences between elastic and surface tension (i.e., the surface tension does not depend on the area, while the elastic tension depends on the rubber surface). See Gratton&Oss 2004 for a nice discussion.

SEGMENT 3

This section relates the energy and the area of soap films.

Prerequisites: discuss potential energy and mechanical work

- The demonstrations of why the circle is the surface that for a fix perimeter, has the largest area can be found at:

<http://mathforum.org/library/drmath/view/53668.html>

- The experimental configuration that can be used to measure surface tension is explained in:

http://www.funsci.com/fun3_en/exper2/exper2.htm

- When we introduce the potential energy of the two balls the teacher can discuss a slightly more sophisticated example, that is what happens if instead of 2 marbles we use to bigger balls or a smaller bowl. Then it could happen that when we let the ball from the top fall down, it may displace the one that is resting at the bottom and they may end up close to each other, not touching the bottom.

- In the motorway problem the solutions that can be found are not unique: soap bubbles indeed find LOCAL minima (a minimum within some neighborhood ---

<http://intsys.mgt.qub.ac.uk/notes/image/localmin.gif>).

PART TWO

SEGMENT 1

SEGMENT 2