

Ideas for future IYPT problems

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1. X-rays

Camara *et al.* have reported that peeling adhesive tape can produce X-ray radiation. Investigate the phenomenon further.

2. Balloon in the Space

A rubber balloon, inflated with a light gas, is released and starts to ascend, once disappearing visually. Investigate its further motion.

3. Nanoscience

A suspension of colloidal particles is rotated with a sufficient angular speed. What information about the size, shape, and mobility of the nanoparticles may be obtained with such an experiment?

4. Dating satellite imagery

Find a satellite image of your home town on *Google Maps* or on a similar service. Determine the exact time of when the image was taken. Is it possible to retrieve further information, such as the altitude of the camera?

5. Ball in foam

A ball is placed inside the soap foam. Investigate its motion in function of relevant parameters.

6. Granular alignment

Investigate the patterns appearing when a large vessel filled with rods (e.g. matches) is shaken.

7. Egg timer

Investigate the precision and reproducibility of measuring time with an egg timer.

8. Starch monsters

Put some solution of starch on a speaker and turn the speaker on. Study the behavior and motion of the "starch monsters".

9. Bottle tone

Fill a bottle with some water and blow air across the mouth of the bottle to produce a sound. Investigate how the properties of the sound depend on the relevant parameters.

10. Compact disks

A casual laser pointer is illuminating the surface of a compact disk. What information can be retrieved from the reflected beams?

11. A wave of fire

A number of common matches are installed vertically in a row. Investigate how fast the fire propagates along the row if the first match is ignited.

12. Tornado

Develop and construct a device to produce air tornadoes. Investigate the properties and the stability of such a tornado.

13. Contrails

What information about the atmospheric conditions and the motion of an aircraft can be retrieved from the condensation trails visible behind aircraft engines?

14. Flat flow

Fill a gap between two large parallel plates with a liquid and make a little hole in the centre of one of the plates. Investigate the flow in such a cell, if a colored liquid is injected through the hole.

Appendix: historical proposals

Submitted in 2010 and in 2009.

I am not sure if the large collection of previous proposals fully indexes the earlier submissions, but I assume that the following proposals may be of ongoing interest for the selection. Please do not duplicate the proposals if they are already in the collection. Thank you!

H1. Honey coils

A thin downward flow of viscous liquid, such as honey, often turns itself into circular coils. Study and explain this phenomenon.

H2. Vinyl disk

Investigate how the quality of sound evolves after numerous playbacks of a vinyl record.

H3. Coastal waves

Waves near the coastline of large ponds move towards the shore, regardless of the wind direction. In small ponds, however, waves move along the wind. Study and explain this effect. How the wave pattern depends on relevant parameters?

H4. Ballpoint pen

A ballpoint pen may perfectly write on one side of a copybook page, but write badly on the other side of the same page. Explain the phenomenon.

H5. Drill bit

A jet flowing from a paper carton of juice has often a spiral-like shape resembling a drill bit. Explain this phenomenon.

H6. Shower in a hostel

Temperature of water in a shower may sharply change if someone turns the tap in a nearby room. Investigate how the temperature surge depends on relevant parameters.

H7. Energy saving light

When an energy saving fluorescent lamp is switched on in the vicinity of loudspeakers, an unexpected squeaky sound can be heard. Sometimes, the sound continues as the lamp glows. Explain this phenomenon.

H8. Cooler

Despite rotating very fast, after some period of operation, the blades of a laptop fan are covered with a thick layer of dust. Explain this phenomenon and investigate how the thickness of dust coating grows with time.

H9. Light bulb in a microwave

Place a light bulb into a glass with water so that all metal contacts are below the water level. When placed into a microwave oven, the lamp in the glass will start to glow. Study and explain this phenomenon.

H10. Giant soap film

Propose a method to make a soap film of maximally possible surface and obtain it in a convenient room. Study the mechanical and optical properties of the film, as well as its stability.

H11. Laser pointer

A laser pointer makes a bright spot on a screen. Study the parameters of the spot in dependence of the distance from the laser pointer. How does the spot look like if the distance reaches several kilometers (in open air)?

H12. Tree in the snow

In winter, there is often no snow on the ground surrounding a tree trunk, even if the snow layer is quite deep farther from the tree. Study and explain this phenomenon.

H13. Vacuum in a syringe

What minimum pressure can be achieved in a common medical syringe?

H14. Brush car

Fix an eccentric vibrator on the top of large cleaning brush. When put on a table with bristles down, the brush will start moving ahead. Study and explain this effect.

H15. Spot on the glass

Even in a warm room, a spot of condensate forms if someone breaths on a glass. Investigate how does the spot disappear and explain why it disappears from the edge.

H16. Paper glue

When one sheet of paper is put on top of another and ironed, the two sheets are pasted together. Investigate how this effect depends on relevant parameters, such as presence of moisture.