Problems for the 7th IYNT 2019

*In the fields of observation chance favors
only the prepared mind.*
Pasteur

Main Problems for Science Fight 1

1. 2D foam
Soap foam enclosed between two glass sheets appears as a network of polygons. Such foams evolve with time, as individual bubbles move and coalesce, and the liquid drains out. Investigate the structure and evolution of 2D foams.

2. Mountains
What are the tallest mountains in the Solar System? Propose and analyze the theoretical models that can allow predicting the maximum altitudes of mountains on various celestial bodies.

3. Salty soils
Saline soils may affect plant growth. How do salts affect the growth and development of plants?

4. Sunflower spirals
Patterns of seeds in the head of a sunflower have a very specific geometric structure. How can one describe and explain such a structure? What other plants demonstrate similar geometric patterns in their leaves or seeds?

5. After the tempest
Take two beakers of water and use a spoon to stir water clockwise in one beaker and counterclockwise in the other beaker. Observe the beakers after a sufficiently long time when the water flow has slowed down. Is it possible to determine the original direction of water flow after 1 hour? 1 day? 1 week?

6. Soundproofing
It is sometimes necessary to reduce unwanted noise in a closed space. Test various methods to soundproof your room.

Main Problems for Science Fight 2

7. Burning glass
Propose and test various methods to start a fire with a magnifying glass.

8. Smells
Smells spread through the air, however it would take some time before a human nose is able to detect the smell. Study different aspects of odor diffusion and sensation of odor by humans.

9. Fading in sunlight
Printed pages fade in direct sunlight, especially if certain types of ink and paper are used. Propose quantitative parameters to study the prolonged exposure of ink and paper to sunlight.

10. Elastic bones
Chicken bones kept in acidic conditions for a few days become elastic. Perform such an experiment in controlled conditions and investigate what components of bones are responsible for their mechanical properties.

11. Yeast
Investigate the rate of the multiplication of yeast at different temperatures.

12. Moon
The apparent size of the Moon perceived by an observer depends on multiple factors. Investigate these factors and their role.

Problems *Invent Yourself* for Science Fight 3

13. Invent Yourself: Baking bread
Distinctly different types of bread are produced by varying methods of baking, proportions of ingredients, and types of flour. Suggest an experimental and theoretical study of how one or several bread varieties are baked.

14. Invent Yourself: Eye movements
Human eyes are in constant involuntary and voluntary motion when exposed to visual stimuli, such as scene viewing, reading or tracking a moving object. Use eye movement data to select and study an interesting psychological effect concerning perception of images and motion, in humans or in animals.

15. Invent Yourself: Fractals
Propose an interesting experimental and theoretical investigation involving fractal geometry.

16. Invent Yourself: Short-term memory
What is the capacity and duration of human short-term memory? Suggest an experimental study to evaluate short-term memory and factors that may have important influence.

17. Invent Yourself: Atmospheric electricity
Electric field is present in the atmosphere even in good weather. Suggest an interesting problem concerning atmospheric electricity.