Problems for the 10th IYNT 2022

The implications of this research are intriguing.
It may be that commissioned work will, in general,
be less creative than work that is done out of pure interest.
Teresa M. Amabile

Main Problems for Science Fight 1

1. Chocolate and speed of light
A visual method to measure the speed of light is to place a chocolate bar in a microwave oven until chocolate starts to melt and measure the distance between hotspots. Study this effect and investigate the accuracy of the method.

2. Rotary phones
If volunteers of different age groups are challenged to dial a number on a rotary phone, it may turn out that some age groups are unfamiliar with the old technology. Obtain statistical data in controlled conditions and discuss the results.

3. Matches on fire
When the outermost match in a regular array of matches is lit, the following matches ignite one by one. Investigate the parameters that determine the speed for such a fire wave.

4. Microscopic swimmers
Investigate experimentally and theoretically the locomotion of bacterial or eukaryotic cells that use natural flagella to move in a liquid.

5. Frosty patterns
Patterns similar to frost on a winter window are obtained if magnesium sulphate in solution is deposited on a glass surface. Investigate this effect.

6. Ship wakes
The wave pattern produced by a ship moving on the water is visually similar to a Mach cone and depends on various parameters. Investigate the effect.

Main Problems for Science Fight 2

7. Clicking fingers
Snapping one's fingers results in a loud popping sound. Investigate the nature and properties of this sound.

8. Seeing through pinholes
An opaque sheet with regularly arranged pinholes corrects myopia similar to corrective lenses. Explain this effect and introduce parameters to describe image perception by myopic humans with and without pinhole glasses.

9. Parosmia
Misperception of existing odors is a common post-COVID side effect that may persist for months. Collect data to study and characterize this dysfunction.

10. Rubber bands heat engine
All the spokes in a bicycle wheel are replaced by rubber bands. If the rubber bands on one side of the wheel are heated, the wheel starts to rotate. Investigate this effect.

11. Resistant plants
Some plants are tolerant of freezes but others can hardly survive low temperatures. Perform experiments to investigate what plants can survive freezing temperatures.

12. Colored fire
It is easy to colorize a flame using various chemicals. Identify the chemicals needed to get a specific color and investigate what color is obtained if a mix of two chemicals is used.

Problems *Invent Yourself* for Science Fight 3

13. Invent Yourself: Naming colors
A Munsell color chart can be used to survey volunteers about their perception of different colors. Suggest a problem related to color naming by humans and investigate the factors that influence how individuals categorize visible colors.

14. Invent Yourself: Wave optics
Formulate an open, though-provoking problem that concerns a phenomenon of wave optics.

15. Invent Yourself: Biological clock
Examples of timing processes in living organisms are plants opening their flowers at particular times of the day or sleep-wake cycles in humans. Propose a problem concerning rhythms and timing in the species of your choice.

16. Invent Yourself: Flying seeds
It is interesting to observe how maple seeds spin when falling to the ground, or how dandelion seeds fly away with the wind. Propose a problem about the flight of the seeds from a plant of your choice.

17. Invent Yourself: Principle of least effort
Propose an interesting experimental test of how a complex natural system chooses the path of least resistance in particular settings or situations.