1. Sound thermometer
Devise a method to obtain the temperature of a fluid by listening to the sound emitted when it is poured into a cup (video on IPT website). State the precision, accuracy and the limits of your method as well as the important parameters of the fluid.

2. Static speaker
Build an audio speaker without any moving part. Discuss the maximum bandwidth, signal-to-noise ratio and power efficiency achieved with your design. Is it possible to modify your device to use it as a microphone?

3. Ink tree
When a drop of ink is injected inside especially still water, or dropped very close to its surface, it first forms a ring of ink which then divides into smaller rings (video on IPT website). The process repeats again and again and forms a tree-like structure of ink. What is the maximal number of ring divisions that one can see and how does it depend on the important parameters?

5. Fluidic Calculator
Droplets having different concentrations of food coloring (containing propylene glycol) move in beautiful and intricate patterns when placed on a clear glass slide (video on IPT website). A wide variety of autonomous fluidic machines can be produced using this property. Implement diverse arithmetic operations using such droplets and optimize the operation speed.

6. Sonic black hole
A sonic black hole is a phenomenon in which sound is unable to escape a region of space which is not bounded by any walls. Just the same as for usual black holes where light is unable to escape some region of space-time. Try to create your own sonic black hole. What represents the event horizon? Does the Hawking radiation exist for your black hole model? Which properties of usual black holes cannot be represented?

7. Half-life sparkles
Sparks caused by an angle grinder tend to fly over a certain distance and then to split into several smaller sparks. What causes them to split? What is the condition for a split to occur? What influences the distance before the split? What will be the distance distribution of the sparks to fly? **Be extremely careful when performing experiments!**

9. Screaming balloon
If you put a hex nut in a balloon it is possible to make it «scream» by giving a certain rotational movement to the balloon (video on IPT website). How do the characteristics of the sound produced depend on the important parameters of the system?

12. Particle detectors for dummies
Build a simple device that can detect cosmic ray particles. Characterize the particle identification capabilities of your device. Try to test your device in different conditions and also try to obtain the energy spectrum of the cosmic ray particles.

14. Erratic raindrops
When a car moves with high speed in rain sometimes the drops on its side window will not be down. Explain the phenomenon and find the conditions for it to occur (size of the drops and the car speed for example). What determines the drop trajectory and how does it depend on the important parameters?

15. High-speed CD
If one spins a compact disk very fast, its surface starts to warp (video on IPT website). However one can observe that the warp rotates with a different speed than the point on the surface. How do these two rotational velocities relate to each other? **Be extremely careful when performing experiments!**