

IYPT 2019 研究课题之中文翻译

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1. Invent Yourself 自己创造

Build a simple motor whose propulsion is based on corona discharge. Investigate how the rotor's motion depends on relevant parameters and optimize your design for maximum speed at a fixed input voltage.

建立一个基于电晕放电来推进的简单马达。研究相关参数是如何决定转子的运动的，并在固定的输入电压下，对你的设计进行优化以达到最大速度。

2. Aerosol 气溶胶

When water flows through a small aperture, an aerosol may be formed. Investigate the parameters that determine whether an aerosol is formed rather than a jet for example. What are the properties of the aerosol?

当水流经一个小孔时，可能会形成气溶胶。调查决定水形成气溶胶而非直接射流的参数。气溶胶的特性是什么？

3. Undertone Sound 低音

Allow a tuning fork or another simple oscillator to vibrate against a sheet of paper with a weak contact between them. The frequency of the resulting sound can have a lower frequency than the tuning fork's fundamental frequency. Investigate this phenomenon.

让一个音叉或一个简单的振荡器在一张纸上振动，其间的接触很弱。产生声音的频率可以比音叉的基本频率更低。调查这种现象。

4. Funnel and Ball 漏斗和球

A light ball (e.g. ping-pong ball) can be picked up with a funnel by blowing air through it. Explain the phenomenon and investigate the relevant parameters.

一个轻质球（如乒乓球）能够通过向漏斗中吹入空气被拾起。解释这个现象并研究相关参数。

5. Filling Up a Bottle 装满瓶子

When a vertical water jet enters a bottle, sound may be produced, and, as the bottle is filled up, the properties of the sound may change. Investigate how relevant parameters of the system such as speed and dimensions of the jet, size and shape of the bottle or water temperature affect the sound.

当垂直水流射入瓶子时，可能产生声音，当瓶子装满时，声音的特性可能会改变。研究

该系统的相关参数，如射流的速度和横截面、瓶子的大小和形状或水温等对声音的影响。

6. Hurricane Balls 飓风球

Two steel balls that are joined together can be spun at incredibly high frequency by first spinning them by hand and then blowing on them through a tube, e.g. a drinking straw. Explain and investigate this phenomenon.

连接在一起的两个钢球，可以通过用手旋转，再使用一根管子（如吸管）吹气后，以极高的频率旋转。解释并调查这个现象。

7. Loud Voices 响亮的声音

A simple cone-shaped or horn-shaped object can be used to optimise the transfer of the human voice to a remote listener. Investigate how the resulting acoustic output depends on relevant parameters such as the shape, size, and material of the cone.

一个简单的锥形或喇叭状物体可以用来优化人类声音向远程收听的传递。调查相关因素如锥的形状、大小、材料，是如何影响产生的声学输出的。

8. Sci-Fi Sound 科幻之声

Tapping a helical spring can make a sound like a “laser shot” in a science-fiction movie. Investigate and explain this phenomenon.

在科幻电影中，敲打螺旋弹簧可以发出类似“激光枪”的声音。调查并解释这个现象。

9. Soy Sauce Optics 酱油光学

Using a laser beam passing through a thin layer (about 200 μm) of soy sauce the thermal lens effect can be observed. Investigate this phenomenon.

使用激光束通过一层薄酱油（约200 μm ），可以观察到热透镜效应。调查这种现象。

10. Suspended Water Wheel 悬浮水轮

Carefully place a light object, such as a Styrofoam disk, near the edge of a water jet aiming upwards. Under certain conditions, the object will start to spin while being suspended. Investigate this phenomenon and its stability to external perturbations.

在靠近水射流的边缘小心地将一个轻质物体朝上放置，如聚苯乙烯泡沫塑料盘。在一定条件下，物体将在悬浮时开始旋转。调查这个现象并研究它对外界干扰的稳定性。

11. Flat Self-Assembly 自动组装平面

Put a number of identical hard regular-shaped particles in a flat layer on top of a vibrating plate. Depending on the number of particles per unit area, they may or may not form an ordered crystal-like structure. Investigate the phenomenon.

在平坦的振动板上放一些同种的形状规则的硬质颗粒。根据每单位面积上的粒子数，它们可能或可能不形成有序的晶体状结构。调查这种现象。

12. Gyroscope Teslameter 陀螺仪特斯拉计

A spinning gyroscope made from a conducting, but non-ferromagnetic material slows down when placed in a magnetic field. Investigate how the deceleration depends on relevant parameters.

一个由非铁磁性的导电材料制成的旋转的陀螺仪，被置于磁场中时会减速。研究决定减速的相关参数。

13. Moiré Thread Counter

When a pattern of closely spaced non-intersecting lines (with transparent gaps in between) is overlaid on a piece of woven fabric, characteristic moiré fringes may be observed. Design an overlay that allows you to measure the thread count of the fabric. Determine the accuracy for simple fabrics (e.g. linen) and investigate if the method is reliable for more complex fabrics (e.g. denim or Oxford cloth).

当紧密间隔的非交叉线（在其之间有透明间隙）的图案被覆盖在一块机织物上时，可以观察到特征的莫尔条纹。设计一个可以测量机织物的经纬密度的覆盖物。确定测量简单织物（如亚麻）的精确性，并调查该方法是否对更复杂的织物（例如牛仔布或牛津布）是可靠的。

14. Looping Pendulum 循环摆

Connect two loads, one heavy and one light, with a string over a horizontal rod and lift up the heavy load by pulling down the light one. Release the light load and it will sweep around the rod, keeping the heavy load from falling to the ground. Investigate this phenomenon.

将一重一轻两个负载用水平杆上的绳子相连，并拉动轻负荷来吊起重负荷。释放轻负荷，它将围着杆扫动，使重负荷不会坠落到地面。调查这个现象。

15. Newton's Cradle 牛顿吊架

The oscillations of a Newton's cradle will gradually decay until the spheres come to rest. Investigate how the rate of decay of a Newton's cradle depends on relevant parameters such as the number, material, and alignment of the spheres.

牛顿吊架的振动将逐渐衰弱到球体静止。研究相关因素如球体的数量、材料、排列是如何影响其衰变速率的。

16. Sinking Bubbles 下沉的气泡

When a container of liquid (e.g. water) oscillates vertically, it is possible that bubbles in the liquid move downwards instead of rising. Investigate this phenomenon.

当一个盛有液体（如水）的容器垂直摆动时，液体中的气泡可能不会上升，而是向下运动。调查这个现象。

17. Popsicle Chain Reaction 雪糕棒连锁反应

Wooden popsicle sticks can be joined together by slightly bending each of them so that they interlock in a so-called “cobra weave” chain. When such a chain has one of its ends released, the sticks rapidly dislodge, and a wave front travels along the chain. Investigate the phenomenon.

通过轻微的弯曲将木制的雪糕棒连接在一起，这样它们就可以在所谓的“眼镜蛇式编织”链中互锁。当该链的一个末端被释放时，棍棒迅速地脱落，波前沿着链条移动。调查这种现象。