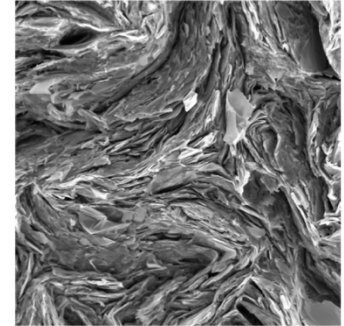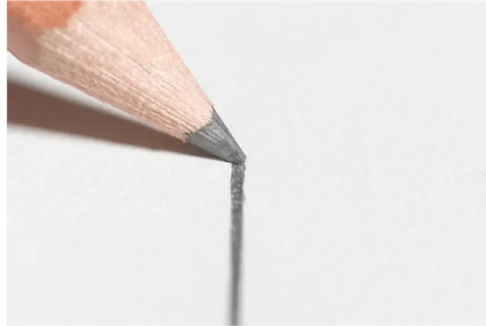**Solid lubricants: from spacecraft to pencil friction**

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Reducing friction between materials is a long-standing challenge in tribology—the science of friction, wear, and lubrication. In everyday machines, friction is usually controlled with **liquid or semi-solid lubricants** such as **oils** and **greases**. Oils are used in engines and gearboxes because they form a thin film that separates moving parts, while greases are helpful in places where the lubricant needs to stay in place for a long time, like in bearings.

However, these traditional lubricants cannot be used in certain environments. For example, in **space applications**, oils and greases tend to **evaporate in vacuum**, making them ineffective. In such cases, engineers turn to **solid lubricants** made from layered materials like **graphite** or **molybdenum disulfide (MoS_2)**. These materials have a special structure that allows their layers to slide easily over one another while still supporting high loads. Despite their importance, the way solid lubricants work is still not fully understood.

In this internship, we aim to explore the basic principles behind solid lubrication using a very accessible model system: **a pencil sliding on paper**. Pencil leads are made mostly of graphite, making them a simple and instructive way to study friction in layered materials. During the internship, you will design and build a small experimental setup to measure pencil/paper friction under various conditions of normal force and sliding velocity. We will then aim at rationalizing with simple arguments the probable deviation of the frictional behaviors from classical macroscopic friction laws.

This project is a great opportunity for students interested in experimental physics and materials science. It will provide hands-on experience with designing simple experiments, collecting data, and interpreting physical phenomena.