

substantial—it would make for quite a hackathon prize to give winners the chance to further develop and eventually test early-stage hardware in one of those locales.

As an example from my own work, I aim to bring electronic textile technology to astrophysics. The intrinsically interdisciplinary rapid-prototyping effort leverages the International Space Station for resiliency testing. Scientific instrumentation that can be incorporated directly into a spacecraft's essential thermal blanket could find high adoption rates in comparison with traditional dedicated sensors. The research model used here, which focuses on bridging two fields and then testing out some early prototypes in an extreme venue, is driven by the same culture of making that inspires hackathons.

Of course, the cost, skill, time, and specialized laboratory access required to create certain types of precise and complex instrumentation can be prohibitive. But we ought to encourage a creative and flexible outlook. I welcome ideas for other potential projects under the umbrella of cross-disciplinary research or for places

where such a scientific institute might find a home.

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Another use for liquid metals

Michael Dickey covered a number of interesting uses of liquid metals in his article "Liquid metals at room temperature" (PHYSICS TODAY, April 2021, page 30), but he left out one that has had great practical importance: the liquid-metal ion source (LMIS). Developed in the 1970s,¹ the LMIS revolutionized focused-ion-beam (FIB) technology by allowing usable currents (1–10 pA) to be focused to a diameter of only a few nanometers. Most FIB systems use liquid gallium because of its low vapor pressure at room temperature, its ability to stay liquid below the melting point, and its high surface tension.

Among other applications, LMIS-based FIB is used in semiconductor manufacturing. High-resolution FIB makes it vastly easier to do failure analysis on submicrometer-scale integrated circuits. The technology also enables the rewiring of integrated circuits in the development stage: Conductors can be cut and new ones added through the deposition of metallic compounds. That allows design engineers to make modifications to a circuit without needing to produce a new mask set each time. Hundreds of papers and at least three books^{2–4} have covered LMIS technology and its applications.

References

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