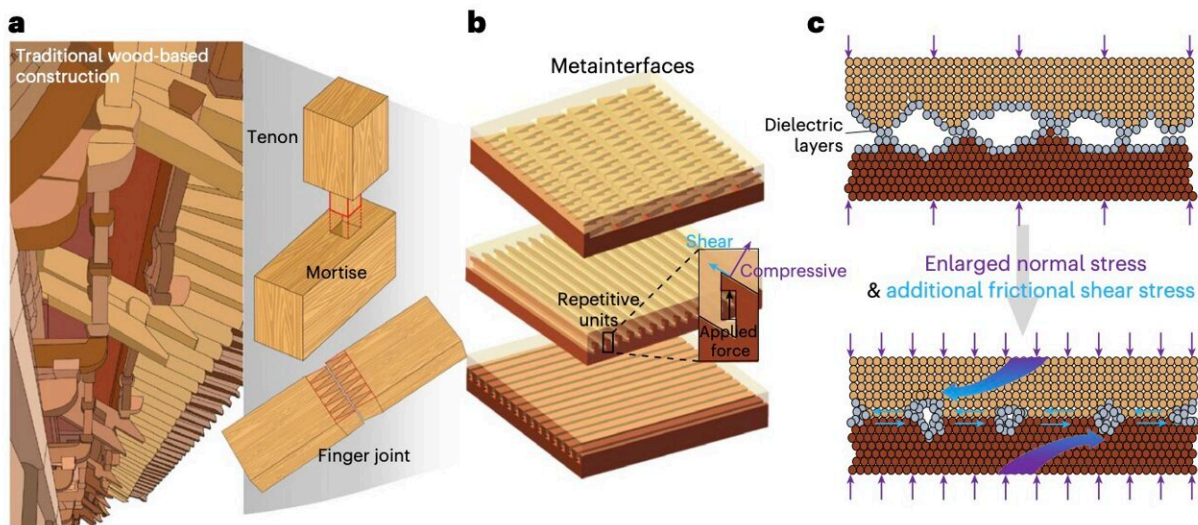


Ancient woodworking technique could save modern electronics from overheating

May 23 2026, by Ingrid Fadelli



Schematic of traditional-carpentry-inspired metainterfaces. a, Traditional wood-based construction and carpentry techniques. b, Designs of mechanical metainterfaces. c, Schematic of the geometry-driven contact force augmentation in metainterfaces, in combination with the conversion of interfacial stress from compressive to shear. Credit: Hao et al. (*Nature Electronics*, 2026).

Electronic devices and electric vehicles are often made up of several materials and components. The regions where different materials meet play a key role in ensuring that electricity and heat are safely and reliably transferred between underlying materials.

In many devices, different materials are pressed together, forming what are known as mechanical interfaces. While this approach is widely used, it can lead to imperfections and the poor transport of electrons (i.e., negatively charged particles that carry electrical current) and phonons (i.e., vibrations that carry heat) across different materials.

Poor transport across interfaces can produce electrical resistance, an opposition to the flow of electric current. This can in turn prompt the generation of unwanted heat while electricity is passing through materials, which can reduce a device's energy efficiency, lead to internal damage and potentially even prompt a device to break or explode.

Researchers at Southeast University in China and other institutes recently introduced a new type of mechanical interface that is inspired by types of joints typically used by woodworkers to combine different parts together.

These interfaces, presented in [a paper published in *Nature Electronics*](#), were found to enhance contact between materials, improving the flow of electricity and heat through devices.

"I've always been amazed by how smart some ancient/conventional engineering solutions were," Menglong Hao, first author of the paper, told Tech Xplore.

"Without modern materials and tools, ancestors built so many wonders, like the pyramid and all kinds of exquisite crafts. I believe there is an incredible amount of wisdom we can draw from this human heritage. The original objective of this study was to solve the thermal contact issue in electronic cooling."

Overcoming challenges in the cooling electronics

As silicon chips are fragile, engineers cannot place too much stress onto them, even if higher pressure would result in closer contact between components. Many existing interfaces thus result in poor or uneven contact between materials, which slows down cooling.

Wood is also a relatively fragile material, yet carpenters have long mastered the art of joining wooden components together tightly, producing strong and resilient interfaces. Drawing inspiration from the joints used in woodworking, Hao and his colleagues set out to develop new joints that could increase contact between silicon chips and electronic components, preventing the accumulation of heat in devices.

"We picked several traditional carpentry joint designs that we thought were suitable for the applications at hand, and basically just shrunk them to make an array of them at the interface, to make the footprint smaller and fit the size requirement of electronics," explained Hao. "These structures gave very high contact conductance, both electrical and thermal."



Photos of traditional wood-based construction and carpentry. Credit: *Nature Electronics* (2026). DOI: 10.1038/s41928-026-01622-3

The new interfaces introduced by this research team were inspired by various joints commonly used by carpenters, including mortise-and-tenon and finger joints. These joints were found to enhance contact between materials, converting compressive stress into shear stress.

Shear stress is a sideways force that allows electrons and phonons to easily break through thin insulating surface layers, known as dielectric barriers. In initial tests, the carpentry-inspired joints were found to significantly improve electron transport and the flow of heat through various devices.

Towards safer electric vehicles and electronic devices

So far, the researchers tested their woodworking-inspired interfaces on an LED, a semiconductor component that converts electricity into visible light. Their findings were highly promising, as the joints lowered temperatures in the chip by 44 °C compared to existing interfaces.

"The most notable takeaway, at least for me, is that to make an interface better for energy conductance, it's not just how much pressure you put on the interface, how you exert the pressure (normal or frictional shear stress) makes a huge difference," added Hao.

"Practical applications of our work include high-end electrical connectors and electronics packaging designs. To enable these applications, I am working on a lower-cost version of this design suitable for mass manufacturing."

In the future, the new joints introduced by Hao and his colleagues could be tested on various other devices. Eventually, they could help to enhance the energy efficiency, durability and safety of a wide range of technologies, including large LED lighting systems, computer processors, displays, fast-chargers, components of solar cells or wind turbines, and even electric vehicles.

More information: Menglong Hao et al, Carpentry-inspired interfaces for improved electronic and thermal transport, *Nature Electronics* (2026). DOI: [10.1038/s41928-026-01622-3](https://doi.org/10.1038/s41928-026-01622-3).

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