superconducting magnets chilled by liquid helium. And to make matters even more obscure, though these computers may someday be useful for physics and cryptographic calculations, it’s not clear that quantum algorithms will emerge for business computing applications. Leading labs working in this area include IBM, Massachusetts Institute of Technology, UC–Berkeley, and Stanford.\(^{36}\)

**Epilogue**

Microprocessor chips are not the only computer components that consume energy. Other components that do so include storage and display devices. We’ve already covered efforts to improve the efficiency of displays, and we will continue to do so in the future. Furthermore, we plan to cover research into new low-energy-consuming data storage technologies soon. Please watch *ET Currents* for more updates on this exciting new frontier of efficiency technology.

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**New Coating May Reduce Mechanical Friction**

*Heather Stroud*

Chemical engineers at North Carolina State University have developed a new way to reduce surface friction. Jan Genzer and his research team have come up with a method to control the density of molecules arranged on a flexible substrate, a technology he calls mechanically assembled monolayers (MAMs). The tightly packed molecules in a MAM form a surface that has inherent durability, water-resistance, and low friction. Waterproof coatings for boat hulls, marine cables, and scratch-proof disk-drive components are among potential applications that Genzer lists for this high-performance coating.

The MAM’s surface also holds great potential for reducing friction in mechanical parts. Although the surface friction on a MAM is innately low, Genzer believes it could be reduced even more with further research on the molecular level. Development of this application could significantly improve the performance of systems in which efficiency is limited by mechanical friction, and it may reduce the need for lubrication in moving parts.

Both compressors and pumps would reap considerable efficiency benefits from reduced friction. Genzer admitted that his team had not yet considered these applications, but he expects they will be viable with further research. In compressors, the MAM coating could be applied to internal surface finishes including impellers and diffusers, and it could be used in gearboxes to increase durability and reduce friction. The MAM coating could also be effective in pumps, as one half of their lost efficiency is due to hydraulic friction. Extremely smooth and hydrophobic surfaces in pumping systems would allow water to flow through more easily, thus increasing efficiency. Pump efficiency is also lost through bearing and seal friction, which could be reduced by applying MAM coatings to internal parts.

Genzer and his team discovered the MAM method by accident while working with a family of coatings called self-assembled monolayers (SAMs). In a SAM, molecules align themselves into a single layer on a substrate. Genzer found that if he first stretches the substrate slightly and then introduces the surface molecules, they will align in the same pattern. He then releases the tension on the substrate, allowing it to spring back to its original
dimensions and squeeze the surface molecules into a very dense monolayer. This process forces the surface molecules closer together than they would normally get in a SAM, thus giving the coating its unique qualities (see figure). Genzer reports that many industrial sectors have expressed interest since the release of his preliminary findings on this versatile coating.

Genzer expects several more years of research before this technology is ready for commercial availability. His findings were published in the December 15, 2000, issue of Science.

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High-Performance Wires May Offer Less Resistance, Higher Flexibility, and Improved Efficiency

Rachel Reiss

A new wire technology under development is intended to be 30 to 35 percent less resistive than conventional cables, allow for faster signal transmission, yet still maintain a high degree of flexibility. Most electrical conductors are classified as either solid wires or cables, in which wires generally are more efficient and cables more flexible, but Scilogy, formerly General Science and Technology, has developed the technology for a product that provides an optimal balance between these two configurations. Within the past year, Scilogy has received 12 patents for its Multifilament Drawn (MFD) wire, a technology consisting of multiple wires compacted into a single wire for improved flexibility, elec-