

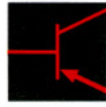
## Geology



Analyzing rock samples provides important information

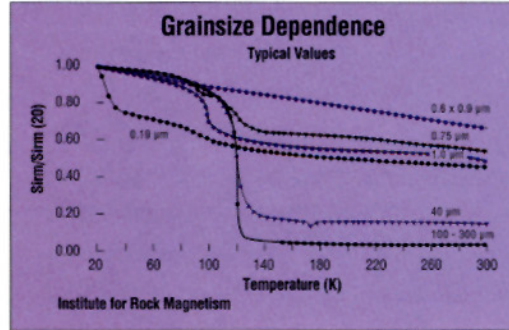
about planet Earth—from studying its early history to the dynamic internal changes associated with vulcanism and plate tectonics. For example, inspecting specimens from ancient sea-bed lava flows provides data on periodic reversals in the Earth's magnetic field. Geophysical studies of anisotropy, susceptibility, remanence, coercivity and transformation in samples can require very high temperatures. The MPMS can be tailored to these applications by adding the optional Sample Space Oven which extends temperature capabilities to 800 K. Samples with very high inherent magnetic moments can be measured using the Extended Dynamic Range option.

## Electronics



Deeper understanding of the magnetic and electrical properties of

materials is crucial to the electronics industry. The focus is on miniaturization, speed and lower heat dissipations—packing devices as closely together as possible to shorten communication distances and boost performance. The study of both LTS and HTS superconductors and semiconducting materials such as Gallium Arsenide is of increasing importance. Magneto-optics, dealing with the influence of magnetic fields on a material's absorption, emission or reflection of light, is also an important new application area.



Institute for Rock Magnetism

The grainsize dependence of the Verwey transition in magnetite (@ 120 K, a magnetocrystalline transition occurs causing remanence to be lost). [SIRM = Saturation Isothermal Remanent Magnetization].

## Biology



Growing fields of inquiry include bioelectromagnetism—

which investigates the effect of electromagnetic energy on biological systems—and biomagnetism—which analyzes the magnetic fields produced by the living organisms themselves. Fields in the  $10^{-14}$  to  $10^{-9}$  Tesla range result from ion currents in muscles, nerves, and organs such as the brain, lungs and liver and concentrations of iron in animal tissue and chlorophyll. For example, magnetotactic bacteria will swim northward in induced magnetic fields as small as 0.1 Gauss (in comparison, the earth's field at the surface is 0.5 Gauss). Their "internal compass" is a minute amount of iron organized into crystals of magnetite.



*"It's incredibly versatile. Whether it's thin film technology or microbiology, you can count on the MPMS for fast and accurate results."*

There is also research into the possibility that certain viruses may have magnetic preferences. The study of magnetism plays a role in the design of pharmaceuticals and the understanding of fundamental processes like photosynthesis. Using the MPMS to increase understanding of phenomena like these may lead to the development of enhanced diagnostic and therapeutic techniques.

