GENE WARE, BYU

Multispectral imaging on a degraded papyrus fragment (left) can rediscover hidden words (right).

some burnt 6th-century-AD scrolls in Jordan. "The new multispectral system was able to record the carbonized scrolls very effectively," says Ware.

Over the past seven years, BYU has been building an interdisciplinary team, including Ware, classicist Roger Macfarlane, and computer scientist Steven Booras, to develop an MSI technique specifically for papyrus. It works by placing an automated rotating wheel with 10 to 15 filters in front of a digital camera. Longer wavelengths in the IR often increase contrast because most carbon-based inks remain dark while papyrus, animal hide, bark, and the like tend to become lighter. Focusing and shooting each photograph takes about a minute, with exposure times between 50 and 1000 milliseconds. "The real power of MSI comes from post-processing . . . where some really exciting results are often obtained by combining images at different wavelengths," says Ware.

The process typically works well on darkened, charred, or stained surfaces. It may not be as successful on washed-out surfaces or those coated with mud, clay, or silt. More than one filter is often needed to uncover the hidden text, because spectral characteristics may change across a document.

Four years ago, after working with the BYU team on damaged scrolls from Herculaneum, a small town caught up in the eruption of Mt. Vesuvius in AD 79, Oxford's Dirk Obbink asked the team to apply its technique to the Oxyrhynchus papyri, a collection of 400 000 fragments (3rd century BC through 7th century AD) excavated in Egypt 100 years ago from an ancient trash dump. Only 5000 of the fragments have been published; the rest are currently unreadable, and all the fragments are exceedingly fragile.

"It would take roughly 450 years to complete the multispectral imaging of the collection," says Obbink. But that's just half the story. Once the text is legible, the computer-aided process of identifying the author and checking for matching fragments begins.

During a visit to Oxford to test improved equipment this past April, Ware and Obbink uncovered parts of a long-lost tragedy—*Epigonoi* (*The Progeny*) by Sophocles—and writings by Euripides, Hesiod, and Lucian. The most significant find, says Obbink, is a 30-line passage from *Elegies* by the 7th-century-BC poet Archilochos. Oxford University Press will publish these newest discoveries next month. Says Ware, "There is no question that the ability to image deteriorated papyri and carbonized scrolls has significantly added to our knowledge of the ancients."

Paul Guinnessy

Private Donations Fund Theory Institute in Germany

In a quest to become internationally competitive in the theoretical sciences, the fledgling Frankfurt Institute for Advanced Studies in Frankfurt, Germany, is breaking with European traditions in the structural, teaching, and funding schemes it adopts.

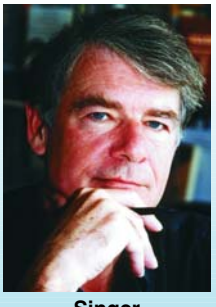
"We have a strong group in neuroscience," says Wolf Singer, a director at the nearby Max Planck Institute for Brain Research and, with nuclear physics theorist Walter Greiner, a founding director of FIAS. Singer ticks off areas of inquiry at the new institute: polymers, the immune system, neural networks, hadron physics, heavy-ion cancer therapy, left-handed chirality of biologically relevant molecules. "These are all multicomponent systems that self-organize to ordered states, generate patterns, and encode information," he says. "That's what ties them together. It's essentially nonlinear dynamics."

"Our fellows are very strongly urged to collaborate across disciplines," says Horst Stöcker, an astroparticle physicist at FIAS. So far, he says, "I am really impressed by the chemistry among the people." Adds Greiner, "One has to be careful that it's not just interdisciplinary blah blah blah, shallow talking. We are eager to go into depth."

Structurally, FIAS is patterned after the Institute for Advanced Study in Princeton, New Jersey. The new institute currently has nine fellows plus a dozen or so adjunct fellows, and the plan is to double in size. When it was founded, the IAS got off to a running start, Greiner says. "First, they had a tremendous donation. Second, many of the great Jewish scientists who emigrated [from Europe because of the Nazis] went to Princeton. This made Princeton big and famous on the spot. We don't have that. But we have people from Russia who, because of the general decline of support and living standards, want to come to western countries. This gives us the opportunity to hire the best, which we did."

Greiner

Unlike at Princeton's IAS, FIAS fellows must teach. They do that at the Frankfurt International Graduate School for Science, which, like FIAS, is located on the new science campus of the University of Frankfurt. Teaching is in English and, in contrast to most PhD programs in Europe, doctoral students must take classes.



Singer

Perhaps most striking is that FIAS's funding comes mainly from private and corporate donors—no strings attached. In this sense, says Stöcker, "FIAS is an excellent model. The problem in Europe in general is that we have much less sponsoring by private sources. We have sponsoring for sports and for museums, but not in the brains of the next generation." FIAS has raised about C15 million ($19.3 million) to be spread over five years. More is needed to establish permanent positions—they're now three- and five-year appointments—and to erect a dedicated facility.

Toni Feder

Mixed Results for Women, Minorities at DOE Labs

Women and minorities working at six US Department of Energy laboratories are not treated significantly differently from men and white