which would have blotted out the star-forming signature of Hu's more distant galaxy.

But Hu says both observations may be right. Seeing the signature of star formation in the newly discovered galaxy suggests that enough galaxies already existed to see off the neutral hydrogen around it, in turn implying a largely transparent universe. By contrast, a quasar is so brilliant—about 1000 times brighter than an ordinary galaxy—that it clears away the neutral hydrogen fog around itself. So although the quasar itself may shine through, this says little about the condition of other parts of the universe. And the neutral hydrogen that Fan sees may well be due to cold, dark clouds of neutral hydrogen between us and the quasar, says Hu, rather than evidence of the widespread pre-reionization fog.

Spinrad is confident that Hu's faint source is a true early galaxy. "I think the result is right," he says. "The idea that the universe was dark … at that kind of redshift, it can't be a completely correct statement any longer." Loeb, however, would prefer to wait for more results: "It would be much more convincing if there were more objects of this type."

–ANDREW WATSON

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CHEMISTRY

Whisper of Magnetism Tells Molecules Apart

High-energy physicists aren't the only scientists with a lust for power. For decades, chemists have built ever stronger magnets to improve nuclear magnetic resonance (NMR) spectroscopy, a technique that gleans the structure of molecules from the unique magnetic signatures of their component atoms. But generating those high magnetic fields is expensive, which drives up the cost of those probes and related medical imaging scanners.

A team led by researchers at Lawrence Berkeley National Laboratory (LBNL) and the University of California (UC), Berkeley, is bucking the trend with a strategy that could pay off for physicians and their patients. On page 2247, the group describes a new way to get detailed chemical information at ultralow magnetic fields. Because NMR forms the basis of magnetic resonance imaging (MRI), the new technique might someday eliminate the massive and costly magnets used in today's medical imaging systems.

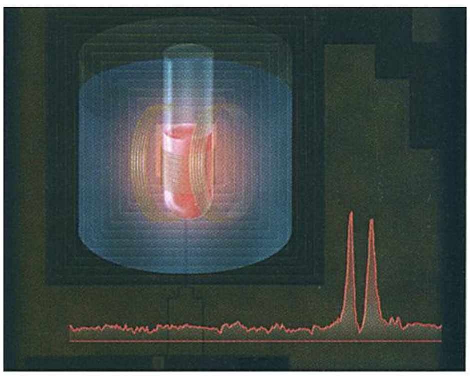
"It's a very elegant piece of work," says Warren S. Warren, who heads the center for molecular and biomolecular imaging at Princeton University in New Jersey. Allen Garroway, a physicist at the Naval Research Laboratory in Washington, D.C., says that the prospect of low-field medical imaging is "tantalizing" because of the "huge market" for low-cost MRI. But all agree that extending this technique to medical MRI machines still faces significant hurdles.

In traditional NMR, bigger magnets make it easier to track atoms. Some atomic nuclei behave like tiny bar magnets and align when placed in a magnetic field. In NMR, researchers disrupt that alignment slightly and use the telltale oscillation, or precession, of nuclei around the magnetic axes to identify particular atoms and their positions. The more powerful the external magnetic field is, the more pronounced this "chemical shift" signal becomes. That makes it possible to work out the structure of larger molecules and make use of smaller samples.

But NMR spots other telltale magnetic signatures beyond the chemical shift. In a related effect, called "J-coupling," for example, electrons around different atoms in a molecule influence one another in ways that split the atoms' spectral signatures from one line into two or more. "It tells you which atoms are bonded to which," says Alexander Pines, a chemist at UC Berkeley, who led the new study along with physicist John Clarke of UC Berkeley and LBNL. The signal for this effect, it turns out, remains constant as the applied magnetic field drops.

Pines and his colleagues decided to see whether they could use this effect to identify compounds using only a very small magnet and a simple two-part test. In a test tube, they placed a solution of water and two different test molecules: methanol and phosphoric acid. They then used an ultrasensitive magnetic field detector, called a SQUID, to try to pick up the characteristic spectral-line splitting signature of a phosphorus atom bound to an oxygen that is, in turn, bonded to a hydrogen. Phosphoric acid has this phosphorus-oxygen-hydrogen configuration. But when it's mixed with water, hydrogen atoms quickly drop off and reattach themselves to the acid molecules. The NMR detector didn't see this as a three-atom configuration and registered just a single spectral line.

Next, the researchers reacted the methanol



Power-less. A sensitive detector (background) picks up molecular fingerprints in NMR spectra without high-field magnets.

CREDIT: ROBERT MCDERMOTT

and phosphoric acid to form trimethylphosphate, a compound that also has the three-part phosphorus-oxygen-hydrogen configuration, but with the hydrogens fixed in place. In this case, the SQUID spotted a phosphorus-oxygen-hydrogen configuration and registered it as a split in the spectral line.

Pines hopes the work will lead to a low–magnetic-field approach to MRI imaging. But that effort faces at least one very difficult challenge, says Warren. MRI builds images piece by piece, detecting the magnetic spins of hydrogen nuclei in small volumes of a material. Reducing the applied magnetic field makes it harder to pick the spins out of random background noise and could degrade the resolution of a scan. Warren says alternative advanced imaging techniques may solve the problem. If so, J-coupling could revolutionize medical imaging by making the machines, now housed in specialized centers at hospitals, cheap enough for the doctor's office.

–ROBERT F. SERVICE

FORENSIC SCIENCE

Judge Reverses Decision On Fingerprint Evidence

A federal judge in Philadelphia has changed his mind and decided that fingerprint examiners should have their say in court—even if what they do isn't science.

In January, Judge Louis H. Pollak of the U.S. District Court for the Eastern District of Pennsylvania found that fingerprint identification didn't meet the U.S. Supreme Court's standards for scientific evidence (*Science*, 18 January, p. 418). Pollak ruled that fingerprint identification failed three of four criteria set by the high court in its 1993 decision, *Daubert* v. *Merrell Dow Pharmaceuticals*. He said that the technique hadn't been scientifically tested, wasn't subject to scientific peer review, and didn't possess a known rate of error. Fingerprinting was "generally accepted" among forensic scientists, he found, but that did not establish its reliability. Pollak said fingerprint examiners could testify in an impending murder trial, but he forbade them from stating whether prints found at the crime scene matched those taken by authorities.

Worried that the ruling would undermine one of their most powerful tools, federal prosecutors persuaded Pollak to reconsider the issue. On 13 March, he ruled that his interpretation of *Daubert* had been too narrow. Fingerprinting is a form of technical expertise akin to accident reconstruction or art appraisal, he said, so it need not meet the scientific peer-review requirement. And although the method's error rate is unknown, he writes, there is no evidence that it is unacceptably