Lasagna say the FDA could safely farm out many reviews. "The notion that only the FDA has the expertise is silly," he adds. Expanding the pool of expertise could improve both the quality and timeliness of product approvals, critics say.

Others prefer a more drastic approach. The drug industry could mimic the industry-funded Underwriters Laboratory, which sets standards and tests products in the electrical sector, says one congressional staffer. And the Progress and Freedom Foundation envisions organizations with an FDA stamp of approval scattered throughout the country—an arrangement similar to the British model. The FDA in this scheme could object to a drug approval, but a final decision would rest with an independent arbitrator.

FDA officials, on the other hand, see few advantages in shifting review activities outside the agency. "I haven't seen a plan that makes any sense," says Schultz. He and others rattle off a litany of obstacles to increased outside review. "Conflict of interest is a real problem," says Kathryn Zoon, director of FDA's Center for Biologics Evaluation and Research (CBER). She says it's already hard to find academics or even NIH scientists who are free of ties to industry to serve on advisory panels.

In addition, FDA officials say they would have a hard time ensuring the consistency of outside reviews. In rapidly developing fields, "you see a finding published in *Science*, and 2 days later it's on your desk as an IND," says Kenneth Seamon, CBER's associate director for research. "You really don't have time to generate an external network familiar with the regulatory issues to help evaluate the risks of a novel therapy," he says. "You can get reviews all over the place depending on who you send it out to," adds Zoon. "In my personal opinion, outside review isn't going to move things faster."

Kessler: A lightning rod

With the FDA's enemies massing for an assault, you might think the agency's chief would be avoiding further confrontations. But as always in his tenure, Kessler is not shying away from taking on powerful interests and controversial issues. Take his relentless investigation of the tobacco industry. For more than a year, Kessler has been conducting a broad review of whether FDA has the evidence and the authority to regulate nicotine as a drug. His efforts have put the agency in a bitter confrontation with the tobacco companies. Earlier this month President Clinton shied away from endorsing sweeping regulations on tobacco, but he did call for strict rules that would reduce the availability of cigarettes to minors. Kessler's aggressive stance on tobacco infuriates many Republicans and some Democrats in southern states, including Representative Bliley.

Kessler makes no apologies: "Add up the risks posed by everything else that we regulate, and look at the risk posed by tobacco, and then ask me about priorities," he says. But others say they are baffled by his penchant for antagonizing key lawmakers at such a delicate time for the agency. "He is a very complicated man," says Lasagna. "He tends to be confrontational. You'd think he'd be good at [working Congress]. He trained with Republicans, and you'd think he would have friends on both sides of the aisle. Instead, he has enemies."

To Kessler, that's just a sign of a job well done. He readily cites statistics that show that 70% to 80% of Americans support the current FDA. The criticism, he maintains, is coming from "people who want us off their back"—that is, the industries he regulates. "And the fact is, when you are a regulator, you have to say no. ... That's not going to make you friends. If you want to make friends, get a different job." But in the coming battle the commissioner may find that he will need all the friends he can get to keep his agency intact.

–Andrew Lawler and Richard Stone

GEOSCIENCES

525 Laid Off As USGS Looks Ahead

Although Congress has promised to shrink the federal work force as part of its campaign to reduce the deficit, layoffs are still only a rumor at most agencies. But not at the U. S. Geological Survey (USGS). Last week the survey announced that 525 employees in its Geologic Division—including hundreds of scientists—would be out of a job as of 15 October. Ironically, the staff cuts came even though the division's budget appears to have weathered this year's flurry of budget cuts (*Science*, 11 August, p. 748). USGS officials say the layoffs are a belated response to years of stagnant funding and an attempt to spread research dollars across fewer activities.

The jobs lost, mostly in the Geologic Division's main offices in Reston, Virginia; Denver; and Menlo Park, California, include 345 permanent and 180 nonpermanent positions. About three fourths of those laid off were scientists and technical staff, with the remainder administrative and support personnel, says minerals specialist William Cannon, who coordinated the cuts. About 200 others will be demoted or moved to other positions. USGS employees had known for several weeks that job losses of this magnitude were coming (*Science*, 30 June, p. 1840), but researchers didn't know exactly where the ax would fall until the pink slips were handed out last week.

The layoffs pare the Geologic Division's staff from about 2200 to 1970. Scientists in the agency's two other divisions, Water Resources and National Mapping, have been spared for now. And there are winners and losers even within the Geologic Division's six major program areas. A reorganization of the division is aimed at making its research "reflect national needs and priorities," says David Russ, associate chief geologist of the division.

Russ says that minerals research—especially studies of rock and mineral formation—is being cut by about 40% because mineral resources are "less of a policy concern" in the aftermath of the Cold War. Also sharply cut were some areas of energy research, such as uranium and shale studies, which have fallen out of favor with Congress. Other programs will be refocused—marine studies, for example, will do less deep-water surveying and more environmental work near coastal areas. "You might actually be able to do more with fewer people if you've got the money to send people to the field," says seismologist Robert Hamilton.


USGS

Hard landing. USGS layoffs will free up funds to send mappers like this California team into the field.

Indeed, USGS officials say that savings from the layoffs and reorganization will be used to upgrade lab equipment and provide more direct support for field research, which has accounted for a dwindling share of USGS's budget. Having "geologists sitting in the office is really not the way to do science," says Patrick Leahy, head of the Geologic Division. Cannon adds that shifting funds from salaries into research support will permit the division to lift the fraction of its budget going into operations from its current level of between 5% and 10% to 20% next year, which officials say is the appropriate balance.

Among those likely to benefit are researchers studying the northern slope of Alaska. That area sits on a political fault line, as it is home to both the Arctic National Wildlife Refuge and reserves of oil and gas. USGS scientists have spent years gathering seismic, geochemical, and other data of use to policy-makers weighing the future development of the region, but in recent years the data collected have been meager. Sending teams by helicopter into the remote, roadless region "costs tens of thousands of dollars a day," says Thomas Fouch, chief geologist for the division's central region.

In other instances, marine researchers will be able to afford to lease their own ships instead of sharing time on other agencies' vessels, and geological mappers will no longer have to pay field costs out of their own pockets. A survey of the nation's coal reserves, once done every 5 years, can be conducted for the first time in 2 decades.

In spite of these benefits, several staffers told *Science* that they question whether it was necessary to cut so many positions, or to do so in one blow. They point out that the cutbacks were based on a projected 20% cut next year in the Geologic Division's current appropriation of $213 million, but this summer the House gave it $208 million and the Senate, $211 million. (The difference will be ironed out when Congress reconvenes next month.) Cannon says, however, that the reorganization was needed to halt the erosion in the research budget over many years.

Even so, some worry about how the changes will affect both basic research and the response to floods and earthquakes. On top of the layoffs, buyouts over the last 2 years cut 400 jobs at the Geologic Division, including many senior scientists. Their shoes will be hard to fill, say colleagues. "A lot of what these people knew they walked around with in their heads," says a senior researcher in the Menlo Park office. "It's just not certain how that's going to play out."

–Jocelyn Kaiser

CHEMISTRY

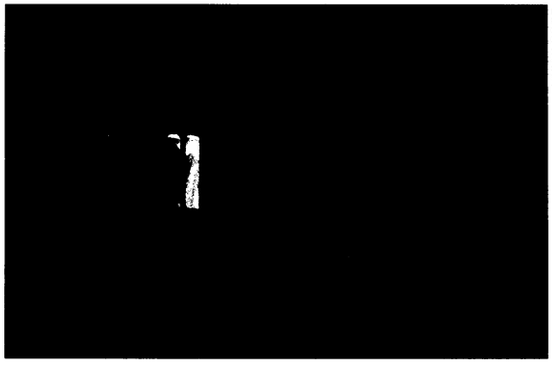
Polymer Light-Emitters Gain New Life

Roll-up television screens, luminescent wallpaper, and cheap, brilliant displays for everything from cellular phones to microwave ovens—those are just a few of the benefits that polymer-based light-emitters seemed to promise when they were developed 5 years ago. But this promise has since dimmed with the discovery that light-emitting diodes, or LEDs, made of polymers have a shelf life of just months and often an even shorter working life. On page 1086 of this issue, however, a team of researchers from UNIAX Corp. in Santa Barbara, California, reports a new design for a polymer light-emitter that may give the technology some life support.

The design addresses two roots of polymer LEDs' lifetime problem: the need to load the polymers with electric charges through electrodes made with highly reactive metals, which degrade quickly, and the need for high voltages to operate some LEDs, which can heat the devices and damage the polymers and electrode materials. The team, working with UNIAX polymer researcher Floyd Klavetter, came up with a single solution: a new type of light-emitter, called a light-emitting electrochemical cell (LEC), that is much easier to load with charges, thereby doing away with the need for both the unstable electrodes and the high voltage.

"It's a radical new innovation with great promise," says Olle Inganäs, a physicist and polymer LED specialist at the University of Linköping in Sweden. "You input less energy into the devices, and the energy comes out as light instead of heat," which should lengthen the working lifetime. The new light-emitter also has a dramatically longer shelf life, the UNIAX group reports—already 1 year and counting. But Inganäs and others point out that LECs don't solve all of the problems that stand between polymer light-emitters and the market, because the specialized polymers at the heart of these devices tend to break down even under the best circumstances.

The UNIAX team built on the basic LED design, which sandwiches a semiconducting polymer between two electrodes. When a voltage is applied across the electrodes, it creates an electric field that pulls low-energy electrons from polymer molecules near the positively charged electrode, or anode, forming electron vacancies, or "holes." Meanwhile, the opposite electrode, or cathode, adds high-energy electrons to the adjacent polymer molecules. These holes and excess electrons migrate through the conducting polymer. When they meet at the center of the device, the energetic electrons can drop into the holes, giving up their excess energy as light.



UNIAX CORP.

Lasting shine. The addition of mobile ions extends the shelf life of these polymer light-emitters.

But setting these charges in motion in the first place can be difficult. The polymers' poor conductivity means they don't easily accept electrons, and so it can take high voltage to drive negative charges into them. To improve the electron transfer, researchers make the cathodes from calcium or some other reactive metal that is especially eager to give up electrons. But oxygen degrades such materials, so they must be sealed from exposure to air, which would boost the cost of making a commercial device. And because such seals often leak, in the long run these cathodes still end up degrading.

To get around the problem, the UNIAX researchers—Qibing Pei, Gang Yu, Chi Zhang, Yang Yang, and Alan Heeger—added charged ions that temporarily boost the conductivity of the polymers when the power is on. As in a battery or any other electrochemical cell, the ions—in one case, positively charged lithium ions and negatively charged trifluoromethanesulfonate, or triflate, ions—are free to migrate through the polymer, because the mixture also includes a solvent. That mobility enables the ions to act as chaperones for incoming charges.

When a device containing a polymer-ion blend is switched on, the charged polymers created near the anode and cathode attract ions of opposite charge. There, ions pair up with polymer molecules, stabilizing these charges. That prevents the charges from moving off these polymers into the center of the device, a change that improves the conductivity of the molecules. As a result, additional charges can flow more readily from the electrodes into the device—and the extreme measures needed to pump charge into earlier devices can be dispensed with.

Using stable metal cathodes made from aluminum or gold, the UNIAX researchers have built LECs that emit orange, green, and blue light, depending on the polymer—and do so at voltages as low as or lower than those of LEDs that use reactive electrodes. After sitting on a shelf unused for a year, test devices still worked normally, the group found. Now the researchers are trying to determine how long the devices last when operating. If they can shine on for thousands of hours, a number comparable to today's best polymer LEDs, they may finally help polymers shine on the market as well.

–Robert F. Service