form placebos only among extremely depressed individuals, says a team led by psychologist Irving Kirsch of the University of Hull, England. In these cases, relatively weak placebo responses, rather than any heightened reactions to antidepressants, explain the medications' superiority, the researchers hold.

"There is little evidence to support the prescription of antidepressant medication to any but the most severely depressed patients, unless alternative treatments with fewer side effects have failed to provide benefit," Kirsch says.

Alternative depression treatments with demonstrated effectiveness include physical exercise, several forms of psychotherapy, and even certain self-help books, in his view.

Kirsch and his colleagues obtained data from 47 clinical trials submitted to the FDA as late as May 2007. They then weeded out 12, focusing on 35 clinical trials that typically lasted 6 weeks and also showed substantial completion rates and consistent monitoring of depression symptoms. Those trials compared randomly assigned placebo treatment to treatment with any one of four antidepressants—fluoxetine (Prozac), venlafaxine (Effexor), nefazodone (Serzone), and paroxetine (Paxil).

A total of 5,133 depressed patients participated in the clinical trials.

The researchers statistically combined data from qualifying trials and calculated the extent to which antidepressants and placebos alleviated depression. Their findings, based on both published and unpublished data, appear in the February *PLoS Medicine*.

The placebo response "was exceptionally large," Kirsch says. Statistically, it accounted for more than 80 percent of the symptom alleviation observed in antidepressant-treated patients. Final depression scores for patients taking antidepressants generally did not indicate any greater effects than those observed for placebo patients, Kirsch holds.

For as yet unclear reasons, the placebo effect, while it remained substantial, was weaker in the most severely depressed patients.

All of the antidepressants, which belong to the newest generation of these medications, alleviated depression comparably well.

Still, the FDA data are from patients with a narrow range of scores on a standard depression-rating scale, Kirsch notes. These clinical trials focused primarily on patients who, at the start of treatment, scored as having "very severe" depression. Only a small number of patients started out with moderate to severe depression.

Future studies with data for patients with a wide array of depression scores might alter the results, Kirsch notes.

The placebo response identified in the new analysis parallels that reported in a previous assessment of FDA data directed by psychiatrist Arif Khan of the Northwest Clinical Research Center in Bellevue, Wash. The team analyzed 52 clinical trials of depression conducted between 1985 and 2000. Antidepressants outperformed placebos in only 25 of those trials.

Clinical trials recruit a select group of patients who, typically, are seriously depressed but not suicidal and not suffering from other psychiatric ailments, as often happens with depressed patients seen in clinical practice, Khan asserts. Thus, clinical trials don't negate the usefulness of antidepressant medication for depressed patients seen in physicians' offices.

Moreover, depression symptoms fluctuate over time, so it's hard to know whether changes observed in clinical trials reflect patients' spontaneous progress or deterioration.

Despite the drawbacks of clinical trials, "at this point, they're all we can rely on to assess the effects of antidepressants," Kirsch responds. —BRUCE BOWER

Greener Green Energy

Today's solar cells give more than they take

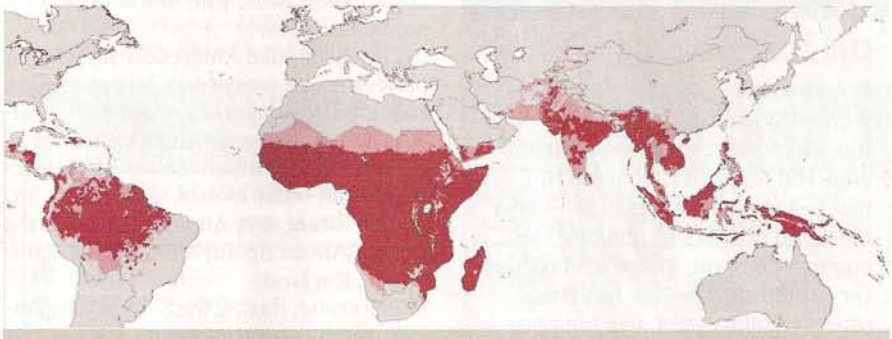
Solar power produces, per unit of energy, only about one-tenth as much carbon dioxide and other harmful emissions as does conventional power generation, a new study shows.

Solar panels don't release harmful gases during use, but making the solar cells does consume materials and energy—mainly from conventional power sources such as coal-fired power plants, which in turn produce emissions. Industrial techniques for making glass and other materials in solar panels also produce gases such as carbon dioxide.

In the 1970s, manufacturing a solar cell required about as much energy as the cell could produce over its 20-year lifetime, so using solar power provided little if any energy gain. Also, as recently as 10 years ago, total emissions from solar cells were about twice what the new study shows. "Solar power has been criticized in the past" for requiring too much energy to produce, says Vasilis M. Fthenakis of the Brookhaven National Laboratory in Upton, N.Y. "But what we find out is that those criticisms are not true with the new technologies."

Fthenakis and his colleagues compiled production records from manufacturers of four popular kinds of solar cells: multicrystalline silicon, monocrystalline silicon, ribbon silicon, and thin-film cadmium telluride. They calculated that, for each unit of energy produced by solar cells, the net emissions of greenhouse gases and other pollutants due to the cells' manufacture were between 2 and 11 percent of what power plants in the United States and the European Union would emit to make the same amount of energy, the scientists report online and in the March 15 *Environmental Science & Technology*.

The new tally shows that net emissions from solar power have decreased signifi-



MALARIA ATLAS PROJECT, PLOS MEDICINE

Pinning down malaria's global reach

Local governments and organizations that fund malaria research need proper maps of its spread to allocate resources effectively, but it has been 40 years since scientists last cobbled together an accurate worldwide view. Using data from more than 4,000 clinical surveys from 2002 to 2006, researchers have now assembled the up-to-date map shown here. Red shading identifies zones where people live at high risk of malaria caused by the parasite *Plasmodium falciparum*, which causes the most severe disease. Pink shading denotes where *P. falciparum* malaria is less frequent but still prevalent. Scientists at the University of Florida in Gainesville and at Oxford University–Wellcome Trust in Nairobi, Kenya, and Oxford, U.K., note that roughly 2.4 billion people live in these at-risk areas. Their report appears in the February *PLoS Medicine*. —NATHAN SEPPA

cantly in recent years. "There have been studies before, but they've become outdated because technology has been changing," says Fthenakis, the study's lead scientist.

"It's a really solid piece of analysis," comments Robert M. Margolis, senior energy analyst at the National Renewable Energy Laboratory in Washington, D.C. "It's the most up-to-date analysis on solar that's out there."

Much of the improvement is from reducing energy and materials for making solar cells. Compared to those made in the 1970s, modern panels contain about one-third as much purified silicon, which is energy intensive to make. And thin-film solar cells trim back even further by depositing silicon or other materials in layers only a few thousandths of a millimeter thick.

These improvements in efficiency mean that today's solar panels can "pay back" in only 1 to 3 years the energy needed to make them, the study concludes.

Improvements in manufacturing efficiency could reduce emissions from solar power by another 50 percent within 5 to 7 years, the researchers say. —PATRICK BARRY

Digging that Maya blue

Before plucking the hearts from humans and tossing the bodies into the sacred cenote, the sacrificial well, the Maya of Chichén Itzá painted their offerings blue—Maya blue. The process for making the unusual pigment, also found on pottery, sculpture, and murals from roughly 400 to 1519, has long puzzled researchers. Now an analysis of a 600- to 700-year-old pot (above) found in the well suggests that the pigment was made on the spot during ceremonies honoring the rain god Chaak. Indigo and palygorskite, a mineral clay, were probably heated over a fire of copal, a gummy incense derived from tree resin, says Dean Arnold of Wheaton College in Illinois, who led the study, to appear in the March issue of *Antiquity*. —RACHEL EHRENBERG

KRILL ZONE This female krill, full of eggs, from the surface waters of the Southern Ocean belongs to the same species glimpsed 3,000 meters down, researchers say.

Hidden Depths

Antarctic krill startle deep-ocean scientists

Biologists looked into the abyss and the abyss looked back, with lots of little compound krill eyes.

The shrimplike Antarctic krill, a major player in polar ecosystems, is supposedly a creature of the upper ocean. Yet the first science cruise to lower a camera to the abyssal seabed of the Southern Ocean off Antarctica found what looked like krill 3,000 meters down, says Andrew Clarke of the British Antarctic Survey based in Cambridge, England.

The cruise, during the South Pole summer of 2006–2007, inaugurated the United Kingdom's remotely operated, camera-carrying Isis vehicle. Clarke says that he and several other biologists were just piggybacking on a mission primarily designed for glaciologists and geophysicists to examine the deep continental slope and seabed beyond.

By that time of year, photosynthesizing plankton have multiplied in a great burst at the surface of the ocean and drifted down. When the scientists lowered their camera to the sea bottom, they saw a layer of still-green plankton-fall—and the krill feeding on it. These animals were the classic Antarctic krill species, *Euphausia superba*, say Clarke and Paul Tyler of the National Oceanography Center in Southampton, England, in the Feb. 26 *Current Biology*.

The Antarctic krill species matures to 6 centimeters in length, a giant among krill kind, and its red markings show up in the Isis video. The animals, including females ready to spawn, even made nosedives into the sediment, a behavior seen in shallow water that sends up puffs of fallen plankton. The krill then scooped debris out of the water with spiny structures on their legs, held to form what biologists call a feeding basket.

Based on the video evidence, "there isn't really much else it could be" other than the Antarctic krill, says Stephen Nicol of the Australian Antarctic Division in Kingston, Tasmania. Previous camera missions at some 600 m down have sighted these krill now and then, he says.

With so few observations of krill in the deep, biologists can only speculate about what's going on. Nicol says krill swarm in ravenous schools at the surface, reminding him of locusts. He guesses that krill feeding on a plankton bloom may have just kept eating as their lunch sank.

"Maybe what you've got is another link between the bottom and the surface," Nicol says, a matter of import in the study of nutrient cycling. If masses of krill routinely do this, the already uncertain estimates of their population could be even more so, he adds.

"I have heard rumors about this finding," e-mailed Peter Wiebe, of the Woods Hole Oceanographic Institution in Massachusetts, who is currently shipboard on a krill survey cruise. "If the observation proves true about the krill at 3,000 m, then it shows how little we really understand about how the ocean ecosystem is structured and functions." —SUSAN MILIUS

J. WEINSTEIN/THE FIELD MUSEUM; BRITISH ANTARCTIC SURVEY