World Wind Speeds Suggest Plentiful Energy

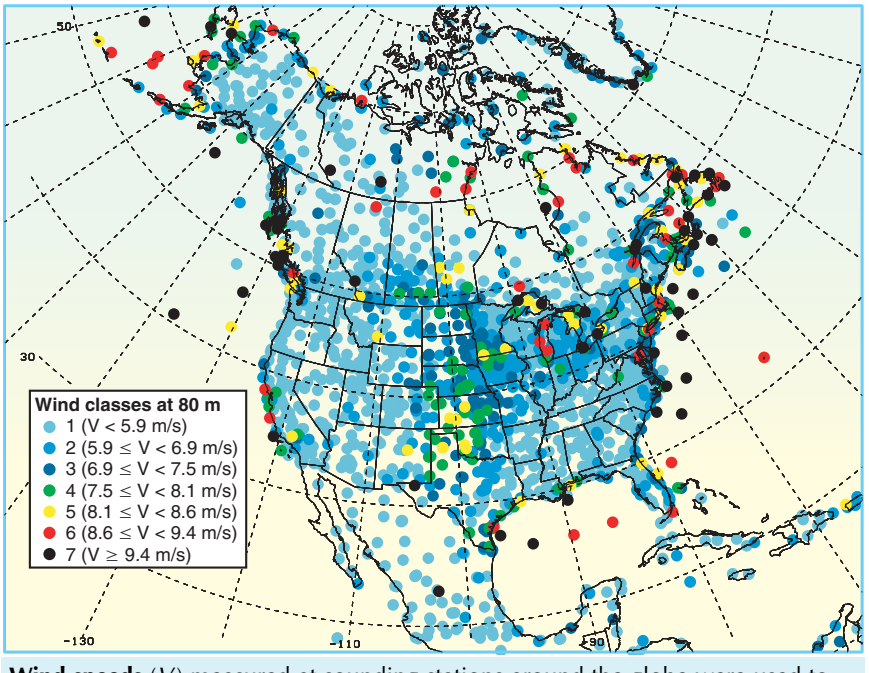
Wind could power the planet. So say Cristina Archer and Mark Jacobson, who recently created a world map of potential wind power.

"Wind is much more widely available than was previously thought. We'd be fools not to use it," says Archer, Jacobson's former graduate student at Stanford University and now an atmospheric modeler for the Bay Area Air Quality Management District in San Francisco. For wind power to be cost effective, or comparable with fossil fuels, "you have to have winds faster than 6.9 meters per second," adds Jacobson. The wind map shows that 13% of all sites considered meet that criterion. "That's huge," says Jacobson, "if you converted it to energy, there's a factor of seven more energy than needed to fulfill all energy demands worldwide."

To create their wind map, the pair used freely available wind measurements for the year 2000 from 8000 ground stations and 400 sounding stations—that is, balloon launches, which give height profiles—and did least-squares fits to estimate wind speeds 80 m above the ground stations, at the height of modern wind turbines. They compared their estimates with measurements at several towers. "It worked really well," says Archer. "And the actual value in average is always greater than our estimates. Our results are conservative." The world's windiest areas are the Great Lakes region and the northern coasts of North America, along the North Sea in northern Europe, the southern tip of South America, and the Australian island of Tasmania. Archer and Jacobson's results will appear soon in the *Journal of Geophysical Research*.

In response to the objection that wind is intermittent, the scientists point to their calculations on linking several wind farms. "This greatly increases the reliability of wind energy," says Jacobson. To another objection—that wind turbines kill birds and bats—he says, "That's a red herring! Last year 10 000 birds died from hitting wind turbines in the US. That pales in comparison to the tens of millions that died from transmission lines and buildings."

At the moment, less than 1% of the world's electric power is generated by wind; among countries, Denmark derives the highest fraction of its electricity, 20%, from wind power. "From my point of view, we should really try to switch to wind power as much as possible," says Archer. "It's an amazing source of energy—it's free, there's no fossil fuel involved, why not? I hope our results push the issue a little further." It's a cultural and political problem, adds Jacobson. "There are a lot of entrenched interests in coal and fossil fuels." **Toni Feder**



Wind speeds (V) measured at sounding stations around the globe were used to estimate values at other sites. For wind speed maps of other regions, see http://www.stanford.edu/group/efmh/winds/global_winds.html.

News Notes

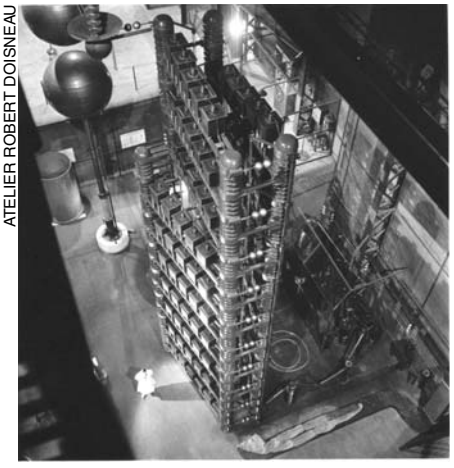
ITER funding eliminated. In a game of budgetary hardball between the White House and Congress, the House of Representatives passed an amendment eliminating funding for ITER and prohibiting the US from joining the international fusion project until March 2006. The amendment, added by Committee on Science Chairman Sherwood Boehlert (R-NY) to the fiscal year 2006 Energy and Water Development Appropriations bill, is intended to force the administration to clarify where the estimated $1 billion US share of the project will come from.

"I want to make sure that before we commit a dime to ITER that we have a consensus on how we will find that money," Boehlert said in offering his amendment. He added that although he is a strong supporter of ITER, he is "very, very tired of the US signing on to international science agreements that we later come to regret."

Over the past couple of budget cycles the Department of Energy has proposed funding ITER primarily through significant cuts to most other domestic fusion programs. Boehlert said that shifting other fusion money to ITER "makes sense," but DOE's Fusion Energy Sciences Advisory Committee has repeatedly warned against funding ITER at the expense of other projects. Congressional appropriators agreed with the committee and restored non-ITER fusion funding last year. The White House said in a statement that "elimination of the [ITER] funding . . . would have a serious negative impact on US participation in future international fusion efforts." **JLD**

Joliot-Curie collection. An exhibit highlighting recently rediscovered photos relating to Irène Joliot-Curie and Frédéric Joliot opened at Paris's Musée des arts et métiers on 31 May and will run through 16 October.

The photos, taken in the 1940s and 1950s by photographer Robert Doisneau, began as part of a Vichy government propaganda effort to glamorize French intellectual life. Many of the nearly 100 photos of the Nobel Prize-winning couple and their laboratories "give a feeling of fantastic or surrealistic activities," says curator Ginette Gablot. "Doisneau's photos show the development of accelerators and the transformation of labs as instruments got larger and more diverse." Also on display are contemporary comic drawings inspired by science, video clips, scientific instru-


ATELIER ROBERT DOISNEAU

ments, and a cyclotron log book from the time of Germany's occupation of France. Both the photo above and part of the 12-m-high, 3-MV impulse generator it depicts are in the exhibit. **TF**

OSTP scientists move to NIST, NSF. Two deputy directors at the Office of Science and Technology Policy have been nominated by President Bush to move to more influential management positions in government. Astronomer William Jeffrey, who spent much of his career working on defense and national-security issues, will become the director of NIST; Kathie Olsen, associate director for science at OSTP, will become the deputy director of NSF. Jeffrey, the senior director for homeland and national security and the assistant director for space and aeronautics at OSTP, is expected to continue NIST's work on developing technology for the federal government's electronic identification systems. Jeffrey has a PhD in astronomy. Olsen, who has a PhD in neuroscience, was acting deputy director for NSF's division of integrative biology and neuroscience in the mid-1990s. She became NASA's chief scientist in 1999 and moved to OSTP in 2002. At press time, both Jeffrey and Olsen were expected to be easily confirmed by the Senate. **JLD**


OSTP

Jeffrey Olsen

European women in science. A stronger voice for women scientists in the research policy debate is the overarching goal of the European Platform of Women Scientists, an umbrella organization that is getting started with C2 million ($2.5 million) in seed money from the European Commission.

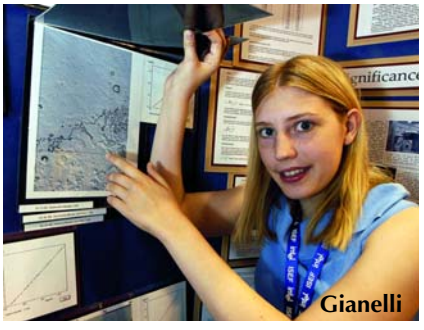
To begin with, the platform is linking existing networks of women scientists through an open-source electronic forum for exchanging information and organizing advocacy activities.

The most pressing issues are "empowering women scientists in their careers and bringing the gender issue into the mainstream of discourse," says project coordinator Brigitte Muehlenbruch. Across Europe, she notes, Latvia has the highest percentage (23%) of women in senior academic staff positions in the natural sciences and engineering; by comparison, France has 16%, the UK 14%, and Germany 8%; taking up the rear is Malta, with 2%.

For purposes of the platform, science is broadly defined: Membership is open to organizations and individual researchers in any field that is taught at the university level. For more information, visit http://www.epws.org. **TF**

Intel prizes. Projects in space science, chemistry, and behavioral and social sciences took the grand prizes in this year's Intel International Science and Engineering Fair, the world's largest pre-college science competition. More than 1400 high-school students from 45 countries made it to the finals, which were held in May in Phoenix, Arizona.

Gabrielle Gianelli, 17, of Orlando, Florida, had the most physics-related project of the three top winners. By applying fractal geometry to a topographic map of Mars, she identified a possible ancient coastline. The other top prizes went to Ameen Abdulrasool, 18, of Chicago, Illinois, for developing a navigational system for the blind


INTEL CORP

Gianelli

that combines GPS technology with verbal, directional, and vibrational signals, and to Stephen Schultz, 19, of Gelsenkirchen, Germany, for his electrochemical analysis of flavonoids, radical inhibitors that may combat cancer and other diseases. Each won a $50 000 college scholarship and other prizes.

These and other Intel prizes, plus a slew of awards by other sponsors given out through the science fair, totaled $3 million. **TF** ■

WEB WATCH

http://www.eh.doe.gov/ohre

From the early 1940s through the cold war, US government scientists conducted radiation experiments on human subjects. To preserve and make public that troubling history, the Department of Energy in 1994 formed the **Office of Human Radiation Experiments**. The office's website provides access to a growing collection of documents, oral histories, and photographs.

http://www.vertic.org/trustandverify.html

Trust & Verify is a bimonthly newsletter devoted to developments in the verification of the nuclear nonproliferation treaty and other pacts that preserve and promote peace. The newsletter is published by VERTIC, an independent, nongovernmental organization based in London.

http://eqworld.ipmnet.ru

Under the editorship of Moscow-based mathematician Andrei Polyanin, **EqWorld** provides general solutions to many types of equations that scientists and engineers are likely to encounter. The website also includes articles and reading lists.

To suggest topics or sites for Web Watch, please visit http://www.physicstoday.org/suggestwebwatch.html.

Compiled and edited by **Charles Day**