

know the microgravity program exists,” says Peter Voorhees, chair of the panel and a materials researcher at Northwestern University in Evanston, Illinois.

The report appears to contradict one released in July that strongly emphasized biology and applied materials research such as combustion and de-emphasized fundamental physics. That panel, formed by NASA Administrator Sean O’Keefe and chaired by Columbia University endocrinologist Rae Silver, triggered dissents by several physical scientists on the panel who complained that their views had not been taken seriously (*Science*, 19 July, p. 316). “The conclusion of the [Silver report] is what biologists think, not what physical scientists think,” says Voorhees.

NASA officials say that physical scientists have overreacted to the Silver report. “We have very good opportunities coming up,” notes Trinh, pointing out that physical scientists have been given about half the experiment slots on the station (and another 20% or so for commercial materials work). Trinh insists that there are no contradictions between the NRC study, which dealt with detailed research areas, and the Silver report, which covered the entire range of science.

—ANDREW LAWLER

SEISMOLOGY

Whole Lotta Shakin’ in Alaska, as Predicted

Predicting anything about earthquakes is fraught with uncertainty today, but 30 years ago it was a nightmare. So seismologists at the U.S. Geological Survey (USGS) found themselves out on a limb in the early 1970s when they insisted that a quake could shake the proposed trans-Alaska oil pipeline far more violently than engineers were assuming. Eventually, the seismologists got their way, and the pipeline was engineered to be more quake-resistant. Last week’s temblor—the most powerful ever known to occur on U.S. soil—cut right beneath the pipeline, justifying the seismologists’ concerns. And the engineering paid off: Not a drop was spilled.

“I’m pleased the whole process led to a successful project,” says seismologist Robert Page of USGS in Menlo Park, California, who was involved in setting standards for the pipeline. “It’s an example of how science can help reduce natural-hazard risks to society.”

In the early ’70s, it was obvious that there would be risks involved in pumping a couple of million barrels of oil a day down a

1280-kilometer pipe across some of the wildest country in the world. Drawing primarily on skimpy geological evidence and one large earthquake that struck the region in 1912, USGS seismologists inferred that the Denali fault—which sliced across the proposed pipeline route in central Alaska—could unleash a magnitude 8.0 quake. Not a bad estimate: Last week’s temblor measured 7.9.

But the contentious issue between USGS seismologists and some engineers in the debate over the pipeline’s potential environmental impact was how strongly such a quake would shake the ground near the fault. Seismologists had just gotten their best measurements yet of ground shaking anywhere near a large, rupturing fault during the 1971 San Fernando earthquake in California. The results were sobering. “All I knew was that the ground was shaking harder than the earthquake engineers had been expecting,” says Page. Whether a Denali quake would work the same way and severely test conventional designs remained in contention; at stake was an \$8 billion project—the world’s largest privately funded project at the time—as well as the design standards for nuclear power plants on the seismically hazardous West Coast. But in the end, USGS seismologists were allowed to set a demanding seismic standard for the pipeline, and engineers designed kinks into the pipe so it could compress, extend, and slide sideways on Teflon-coated pads without failing.

And survive it did. The pipe crossing the fault slid to the edge of its crossbeams—as intended—and slipped off at only one spot. Some supports failed, but the pipe held. Oil was flowing again after 3 days of inspection



Not a drop. The quake on the Denali fault, which broke through the highway at lower left, could not rupture the trans-Alaska oil pipeline.

and shoring up. “It worked,” says earthquake engineering geologist Lloyd Cluff of Pacific Gas & Electric in San Francisco, who helped develop the final pipeline design. Page and USGS were right to stand by their science, he says; a basic scientific understanding of a fault combined with appropriately conservative engineering can accommodate even the uncertainties of 3 decades ago. —RICHARD A. KERR

HUMAN CLONING

U.N. Split Over Full or Partial Cloning Ban

Efforts to craft an international ban on human cloning stalled last week in the United Nations when 37 countries, including the United States and Spain, refused to support a proposal they said was too narrow. That proposal, sponsored by France, Germany, and 20 other countries, would have banned just reproductive cloning: efforts to implant cloned embryos into surrogate mothers and allow them to develop to term. The United States and its allies said they would support only a measure that banned all forms of human cloning, including so-called research cloning.

Scientists are in almost unanimous agreement that human reproductive cloning is not only morally questionable but also dangerous for both surrogate mother and potential child. But some argue that research cloning, in which cloned human embryos might be used to produce embryonic stem (ES) cells, could be a boon to medicine. The resulting ES cells could be used to study genetic diseases or—eventually—treat sick patients. Opponents of embryo research argue that such experiments create human life only to destroy it.

France and Germany announced 2 years ago that they wanted to craft a ban in the United Nations to block the efforts of some fringe groups to create cloned children. But that proposal ran into opposition from the United States, which offered its own alternative, a convention banning all cloning of human embryos. French and German diplomats argued that opinions varied so much that negotiating a complete ban would take too long. They pushed for an immediate ban on reproductive cloning while leaving open the possibility of eventually hammering out a broader ban.

The U.N. committee in charge of international law was unable to reach a consensus on whether to support a complete or partial ban and decided on 8 October to postpone any further debate on the subject until next fall. A meeting to discuss the issue further is planned in South Korea next spring.

In a statement, France and Germany said the failure to move forward on a ban on reproductive cloning “leaves the field open to those working toward giving birth to a cloned human being.” A spokesperson for the German mission to the U.N. says his country supports the idea of a ban on all cloning experiments but believes a ban on reproductive cloning is a more realistic goal. “It’s more a difference in how to proceed,” he says. “In our domestic legislation we have prohibited all forms of cloning. On the other hand, we didn’t see a chance to pass that here.”

Research cloning is expressly legal in

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Fine with them. Human reproductive cloning advocates (left to right) Panos Zavos, Avi Ben Abraham, and Brigitte Boisselier won't be slowed by any U.N. resolutions this year.

several countries, including the United Kingdom, Singapore, and the Netherlands. Indeed, Scottish researcher Ian Wilmut, one of the creators of Dolly the cloned sheep, has said he plans to proceed with human cloning experiments with the goal of producing ES cell lines (*Science*, 4 October, p. 37).

The United States has no national legislation governing cloning, and several privately funded U.S. groups are proceeding with research cloning experiments. A similar disagreement in the U.S. Senate earlier this year foiled efforts to pass either a ban on reproductive cloning or a ban on all human cloning research (*Science*, 21 June, p. 2117). However, that situation might change now that Republicans have regained control of the Senate (see p. 1313).

—GRETCHEN VOGEL

TROPICAL DISEASE

Misspelled Gene Tames Malaria

Malaria kills about a million people each year. But even in countries where the disease takes a heavy toll, the risk is not the same for everyone: Some people have a remarkable ability to suppress the malaria parasite's debilitating effects. Now, researchers have tied that resistance to a subtle variation in a single gene that can cut by nearly 90% the risk that an infection will become life-threatening.

The gene mutation causes people to ratchet up production of nitric oxide (NO), a gas that plays a role in a diverse range of physiological processes. Previous studies with rodents had found that NO can protect against malaria and a variety of other diseases, says microbiologist Ferric Fang of the University of Washington, Seattle. But the new study provides some of the best evidence to date that NO plays an important role in disease protection in humans, says Fang, who calls the study a "significant contribution."

The study was led by hematologist Brice

Weinberg of the Veterans Affairs and Duke University Medical Centers in Durham, North Carolina. Weinberg's team sampled DNA from 185 Tanzanian children—47 of whom had been infected by the malaria parasite but remained healthy, and 138 who were sick with the disease. The researchers looked for mutations in and around the gene that encodes inducible nitric oxide synthase (*NOS2*), the enzyme that makes NO. They found that a single mutation in which a cytosine replaces a thymine in the *NOS2* gene's promoter region—its DNA on-switch—turned up more often in the healthy children. Children with the mutation had higher than normal NO levels in their blood and urine, suggesting that the gas could be protecting them.

The team then analyzed DNA samples and clinical data from a 5-year study of 1106 children in Kenya run by the Centers for Disease Control and Prevention. They again found that the mutation in the *NOS2* promoter had a protective effect. "Overall, the mutation lowered the risk of severe malaria by 88% in Tanzania and 75% in Kenya," says molecular geneticist Maurine Hobbs of the University of Utah in Salt Lake City, a co-author of the study, which appears in the 9 November issue of *The Lancet*.

This isn't the first mutation thought to protect against malaria, but "this study is one of the most compelling because they have demonstrated a connection between genetics, NO production, and clinical status," says clinical immunologist Brian Greenwood of the London School of Hygiene & Tropical Medicine in the United Kingdom. "The story told by this study is very appealing and logical."

Exactly how NO protects is still unclear, however. Researchers have hypothesized



Unlucky. A chance twist in the genetic code can protect against malaria.

ScienceScope

Finally Wellcome The United Kingdom's premier genomics lab is set to grow. After 5 years of intense negotiations, local authorities have approved a plan by the Wellcome Trust to add 27,000 square meters of academic and commercial space to its Genome Campus in Hinxton, near Cambridge. The trust's initial plan for a larger expansion was rejected in 1997.

The Genome Campus is already home to the Sanger Institute, a prominent player in the Human Genome Project. Next week, workers will break ground on an additional 10,000 square meters of labs, along with mouse and computing facilities. Future additions will include an Innovation Centre for start-up companies and additional space for firms growing as a result of progress in related fields. The project is expected to be finished by 2007, at a cost of \$150 million.



All Together Now Look for the Bush Administration to kick off a math and science education initiative next month with a high-profile gathering at the Smithsonian Institution.

The initiative, part of the "No Child Left Behind" presidential campaign, is intended to meld the myriad federal and private-sector efforts aimed at improving student achievement, teacher preparation, and community involvement in math and science at the elementary and secondary school levels. "We're going to start off with what we know works in math because, frankly, we know so little about how children learn science," says Susan Sclafani, counselor to Education Secretary Rodney Paige.

Sclafani's office will spearhead the effort, which she hopes will attract professional societies and high-tech companies as well as other federal agencies funding research on teaching and learning. If so, the initiative has a ways to go. "It's news to me," says one federal official about next month's get-together, echoing the comments of an executive at one association long involved in the subject. "But it sounds like a good idea."

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