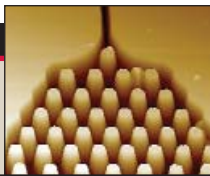


Letting viruses loose on bacteria



Cut-price sequencing



Virtual reality meets the genome



protons). Velkovska says that perhaps a par-tion flying away from a collision somehow “knows from the beginning that it’s going to be a baryon.” But both admit that these are wild guesses at the moment.

James Thomas of Lawrence Berkeley National Laboratory in California, who works with the RHIC detector called STAR, says that data due to be collected in 2004 will reveal whether a similar pattern holds with heavier baryons and mesons, such as the lambda baryon and the K meson. The next RHIC run, however, will collide deuterium with gold and protons with protons—a lower energy regime than gold-on-gold collisions. If the anomaly disappears under these lower energy conditions, physicists will be much more confident that this effect and others stem from the formation of some sort of dense plasma, rather than from partons traversing the nucleus.

—CHARLES SEIFE

NATIONAL SCIENCE FOUNDATION

## White House Concerns Block Doubling Bill

Call it a case of double or nothing. Legislators thought they had worked out a deal to authorize a 5-year doubling of the National Science Foundation (NSF) budget, a cherished goal of science lobbyists, as part of a comprehensive bill covering myriad NSF programs. But a last-minute objection from the White House sent lawmakers home last week with nothing to show for their efforts. Angry legislators from both parties accuse the Office of Management and Budget (OMB) of sabotaging the long-awaited agreement, which lobbyists hope can be salvaged when Congress returns after the



**Hold on.** Senator Jon Kyl (R-AZ) is apparently in no hurry to double NSF’s budget.

5 November elections.

The money to run an agency comes from appropriations bills, most of which are still pending 1 month into the 2003 fiscal year. But authorizing legislation provides detailed and binding instructions on how an agency should operate. The House of Representatives passed its version of the NSF authorization bill (H.R. 4664) in June, a 3-year blueprint with annual increases intended to put NSF’s current budget on a doubling track. Last month two Senate panels approved a different version (S. 2817) that provided for a full doubling, to nearly \$10 billion, by 2007. In addition, the bills require NSF to publicly rank proposed major research facilities and give greater hiring and budget autonomy to the National Science Board, NSF’s presidentially appointed oversight body. NSF Director Rita Colwell had previously raised strong objections to both items (*Science*, 27 September, p. 2187).

Although the full Senate has yet to vote on the measure, on 10 October House and Senate negotiators resolved their remaining differences and prepared for a pro forma vote by each body on identical bills. But on 16 October Senator Jon Kyl (R-AZ) raised a parliamentary objection, blocking a vote in the Senate. Sources say that his “hold” reflects OMB’s concerns that a 5-year doubling is arbitrary—a point science adviser John Marburger has made repeatedly—and runs counter to the Administration’s long-term budget strategy. Congressional aides nevertheless feel that they were blindsided; they say the Administration never formally objected to the provisions. “It came up at 11:59 p.m.,” says one frustrated staffer. “And now it’s 12:01.”

Congress is now weighing an OMB counterproposal that shortens the bill to 3 years and removes the word “doubling” from its title. But although that might be acceptable to some members, it rankles others. “It’s a doubling bill,” says one aide. “And it’s not a random increase; we were very careful to spell out our priorities.”

In fact, the 91-page bill discusses several NSF programs in great detail. The annual ranking of proposed research facilities, for example, is intended to clear up the community’s confusion over the status of various projects that the board has approved but for which NSF has not requested funding. And the science board provisions are meant to ensure that the NSF director does not wield undue influence over the board. “The board can

certainly live with the provisions in the authorization bill,” says board chair Warren Washington, a climate modeler at the National Center for Atmospheric Research in Boulder, Colorado. Washington says that the board is already developing a ranking of pending facilities projects and hopes to polish the list at its 20 November meeting.

—JEFFREY MERVIS

EVOLUTIONARY GENETICS

## Jumbled DNA Separates Chimps and Humans

**BALTIMORE, MARYLAND**—For almost 30 years, researchers have asserted that the DNA of humans and chimps is at least 98.5% identical. Now research reported here last week at the American Society for Human Genetics meeting suggests that the two primate



**Loosened family ties.** Gene-chip studies reveal previously unrecognized differences between these two species.

genomes might not be quite as similar after all. A closer look has uncovered nips and tucks in homologous sections of DNA that weren’t noticed in previous studies.

The results are quite exciting, says Michael Conneally, a human geneticist at Indiana University Medical Center in Indianapolis. With this research, “we can really find out so much more about evolution,” he predicts.

In the past 3 decades, biologists have used all sorts of biochemical methods to assess differences between genomes, particularly those of humans and chimps. As more DNA sequence became available over that time, many researchers began to look at short stretches of DNA and count the number of single bases that didn’t match the equivalent bases in another species—

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known as single-nucleotide polymorphisms. In contrast, some cytogeneticists have taken a more global view of the genomic landscape, mapping out differences in how chromosomes appear under the microscope.

Now two research teams have spotlighted the middle ground, using so-called gene chips to evaluate millions of bases of DNA in a single experiment. The chips—some of the most powerful to date—carry snippets of known genetic material that, when paired up with DNA in a test sample, tell researchers what genetic code is present.

With this wide-ranging view, genomicsists Kelly Frazer, David Cox, and their colleagues at Perlegen Sciences in Mountain View, California, have detected insertions and deletions ranging from 200 bases to 10,000 bases in length that differ between chimps and humans, each of which has a genome of about 3 billion bases. Evan Eichler and Devin Locke, geneticists at Case Western Reserve University in Cleveland, Ohio, have studied changes extending about 150,000 bases. “A significant fraction of the variation [between chimps and humans] is present in these [two types of] rearrangements,” Frazer reports.

The Perlegen team used chips densely packed with small pieces of DNA, each 25 bases long. The chip is studded with “13 billion unique [pieces],” Cox points out. The researchers assessed the resemblance between the chimp’s chromosome 22 and the equivalent human chromosome, 21. They compared 27 million bases, and “much to our surprise, we found around 57 areas of rearrangement between the human and the chimp,” says Cox.

There seemed to be no rhyme or reason to the changes; they occurred just as frequently outside coding regions as within. The density of these differences is “a little bit higher than anyone would have predicted,” says Eichler. “The implications could be profound,” he adds, because such genetic hiccups could disable entire genes, possibly explaining why our closest cousins seem so distant.

Instead of using small bits of DNA, Locke, Eichler, and their colleagues deposited on a chip a series of bacterial artificial chromosomes, each of which contained about 150,000 bases of human DNA. The chip sported almost 2500 sequences covering 360 million bases in all. They compared this DNA to DNA from Asian and African great apes and found 63 chunks that were missing or added. The deletions and insertions they uncovered, which were larger than those picked up by the Perlegen team, tended to be close to large duplicated regions, Locke reported at the meeting, although the re-

searchers aren’t sure how to interpret this finding. The frequency of such genetic differences suggests, Frazer says, that “these rearrangements are playing a much bigger role [in evolution] than we expected.”

Locke’s and Frazer’s results come as no surprise to Roy Britten of the California Institute of Technology in Pasadena, who has analyzed the chimp and human genomes using a customized computer program. He compared 779,000 bases of chimp DNA with the sequence of the human genome, both found in the public repository GenBank. Single-base changes accounted for 1.4% of the differences between the human and chimp genomes, and insertions and deletions ranging up to 31 bases long accounted for an additional 3.4%, he reported in the 15 October *Proceedings of the National Academy of Sciences*. Locke’s and Frazer’s groups didn’t commit to new estimates of the similarity between the species, but both agree that the previously accepted 98.5% mark is too high.

Such findings leave researchers eager to scrutinize the full chimp sequence. Japanese, German, South Korean, Taiwanese, and Chinese researchers formalized a chimp genome project in 2001 (*Science*, 23 March 2001, p. 2297); that program recently got a boost when the National Human Genome Research Institute in Bethesda, Maryland, listed the chimp as a high priority for sequencing by its high-throughput centers. The sequence should be ready in mid-2003.

—ELIZABETH PENNISI

## PROTECTING HUMAN SUBJECTS

### Koski Steps Down After Bumpy Ride

The first director of a federal office created to beef up safety in clinical trials is heading back to academia after running into some bumps within the government and earning mixed reviews from outsiders.



**Patient advocate.** Greg Koski was “tireless ambassador” for shared responsibility.

Greg Koski, a Harvard anesthesiologist, says his decision to leave after 2 years is not related to the political winds blowing through his office, including a decision this summer to dismantle its advisory committee. But sources say that a lack of support from his bosses might have helped speed his return to academe.

**Pentagon Science Gains** A ballooning defense budget is lifting research spending, too. Congress last week approved a \$355 billion military spending bill that includes \$11.4 billion for science and technology programs in the 2003 fiscal year, which began 1 October. Basic research gets a 7.8% boost to \$1.5 billion, and applied studies receive a 12.5% increase to \$4.6 billion. Both totals exceed the Bush Administration’s request.

The Coalition for National Security Research, a group of universities and science societies, pronounced itself “pleased” by the outcome, which keeps research spending at about 3% of the Pentagon’s overall budget. That’s a goal backed by numerous government advisers and think tanks. The Pentagon is one of the biggest backers of math, engineering, and computer science research at U.S. universities, but its spending in those areas has lagged over the last decade.

The bill is just the second of 13 annual appropriations measures to clear Congress. The rest of the government is operating on temporary budget measures that freeze spending at current levels.

**Separate Partners** Congressional negotiators have stripped controversial language on how to manage a \$160 million education program from a bill (H.R. 4664) to reauthorize the National Science Foundation (NSF). Legislators last week agreed to eliminate a Senate provision that would have given each state a predetermined amount of money for the fledgling math and science education partnerships program, leaving intact NSF’s traditional system of awarding competitive grants through peer review (*Science*, 27 September, p. 2187).

The deletion represents a victory for backers of merit review and for the education lobby, which saw the Senate proposal as a threat to a similar, smaller program run by the Department of Education. “We’re very pleased that NSF will be allowed to continue to develop model programs. That’s what they do best,” says Gerry Wheeler, president of the National Science Teachers Association. The Education Department grants are a better way to serve all U.S. students, he says, adding that the \$12.5 million program needs to grow to at least \$100 million a year to achieve its goals. Congress must still approve the reauthorization bill, which has been stalled by budget politics (see p. 719).

