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, genomicists 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 researchers 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.

ScienceScope

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).

CREDITS: (TOP TO BOTTOM) J. D. MOSSMAN/U.S. AIR FORCE; HHS

Koski was recruited by then–Department of Health and Human Services (HHS) Secretary Donna Shalala to lead the newly promoted Office for Human Research Protections (OHRP) after a death in a gene-therapy trial brought increased scrutiny of patient safety in research. Once there, he worked to persuade institutions that protecting patients required obeying their "consciences" as well as federal rules. Since Koski's arrival, OHRP has begun developing a system in which institutions—rather than the government—grade themselves on their oversight programs. A report earlier this month from the Institute of Medicine supports this approach, as well as voluntary accreditation of human-subjects protection programs.

Bioethicist Mary Faith Marshall of the University of Kansas Medical Center in Kansas City says Koski was a "tireless ambassador" in campaigning for "shared goals." David Korn of the Association of American Medical Colleges (AAMC) in Washington, D.C., agrees that Koski "deserves a lot of credit" for promoting the idea that protecting human subjects should involve the entire institution. But Korn is still waiting to see if the office follows AAMC's advice on the issue of reducing financial conflicts of interest. Koski says he hopes final guidelines will be out by the end of the year.

Some patient advocates and members of Congress, however, are pushing for mandatory standards. And one government official is skeptical that Koski accomplished much with OHRP's more than doubled budget and staff. "His brief tenure was reminiscent of a placebo: Some people thought it worked," quipped the official.

Koski insists that his departure "is not a political decision" but rather marks the end of a 2-year leave from Harvard in Massachusetts, where his family still lives. However, his time at HHS was not always smooth sailing. Koski often failed to follow proper procedures for developing policies and releasing information, one official says.

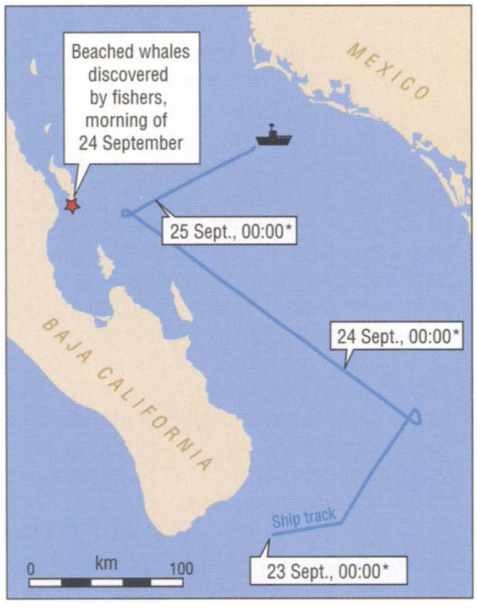
The office was also caught up in a revamping of HHS advisory committees (see p. 732). Koski acknowledges that he did not expect HHS's decision to let lapse the charter of OHRP's advisory panel, which Marshall, the chair, says "shocked and dismayed" members. HHS now plans to convene a smaller group, with 11 members instead of 17, and has revised its charter to include specific topics, such as protection of fetuses and embryos, that reflect the Bush Administration's opposition to abortion. Fetuses are already mentioned in federal regulations for protecting human subjects, but Koski says including embryos is "a change." Korn says AAMC is "very concerned" about the membership of the panel: "I just hope it isn't packed with ideologues." –JOCELYN KAISER

SEISMOLOGY

Suit Ties Whale Deaths To Research Cruise

The U.S. National Science Foundation (NSF) has a whale of a problem involving sounds, lawsuits, and the high seas.

Last week an environmental group asked a federal judge to suspend an NSF-funded sea-floor mapping expedition off Mexico that it claims led to the deaths of two whales. NSF rejects a link between the deaths and the air guns used by shipboard researchers to generate sound waves, adding that the researchers were following the law.



* All ship track times are GMT. To correct to local time, subtract 7 hours.

Too close for comfort? The research vessel *Maurice Ewing* sailed near the island in the Gulf of California where beaked whales beached.

But the incident has curtailed an expensive international mapping project and reignited controversy over the impact of noise on marine mammals. The case, filed 17 October in San Francisco, California, by the Idyllwild-based Center for Biological Diversity (CBD), could also lead to new regulation of U.S. researchers who use sound at sea.

The controversy began 25 September, when five vacationing marine biologists sailing in Mexico's Gulf of California happened upon two freshly beached Cuvier's beaked whales (*Ziphius cavirostris*). The group, which included several beaked-whale experts, tried to inform Mexican colleagues about the unusual find. In the process, they discovered that the *Maurice Ewing*, a research vessel owned by Columbia University's Lamont-Doherty Earth Observatory in Palisades, New York, was conducting a seismic survey nearby. The ship was bouncing sound pulses produced by blasts of compressed air off the gulf's floor to map the margins of the continental plate.

Human-created noise, including the use of sonar by military vessels, has been linked to other strandings of beaked whales, a poorly understood group of species (*Science*, 26 January 2001, p. 576). Although there is still no clear explanation of how sound might harm the whales, the gulf strandings "just seemed too coincidental, given the history," says Barbara Taylor, one of the vacationers and a whale researcher at the government's Southwest Fisheries Science Center in La Jolla, California.

Five days after the incident, Lamont officials temporarily halted the $1.6 million, 6-week cruise to review environmental precautions. Lamont's director, Michael Purdy, says there is no clear link between the mapping and the strandings, noting that the *Ewing* appears to have been at least 50 kilometers from the animals when they stranded. But cruise managers ultimately decided to reduce noise levels, drop half the planned routes, increase efforts to spot and avoid whales, and end night work, when whale monitoring is impossible. Lamont is also paying for aerial surveys to look for new strandings and helping outside researchers study the noise signature produced by the *Ewing*'s air-gun array. The cruise is scheduled to end 4 November.

The additional precautions, however, don't satisfy some whale experts. Air-gun signals can travel 10 or more kilometers from the ship, they note, a distance far beyond the gaze of sentries. Beaked whales are notoriously difficult to spot, they add, moving quickly and staying submerged for 30 minutes or more. "The *Ewing* should cease operations; they don't have a workable plan," says John Hildebrand, a whale and acoustics specialist at the Scripps Institution of Oceanography in La Jolla.

The incident has also raised the complicated legal question of whether the researchers had the proper permits. Last April, Hildebrand asked the U.S. Marine Mammal Commission, a government advisory body, to review the planned cruise after becoming concerned about surveying in an area known to be rich in beaked whales. Lamont and NSF officials, however, concluded that the cruise did not need U.S. marine mammal permits as it would occur in Mexican waters, and the Mexican government approved the mission. The biodiversity center contests that interpretation of U.S. law, saying that cruise planners should have consulted with U.S. regulators.

As *Science* went to press, the judge was still deciding whether to halt the cruise. Even if it continues, CBD attorney Brendan Cummings hopes that the case will clarify which laws apply to U.S. research vessels. It is cer-

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