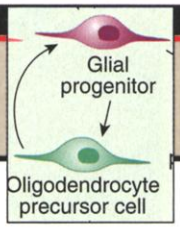
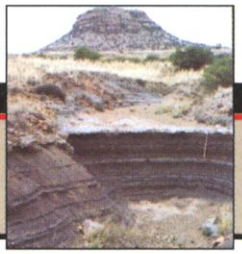


PAGE 1666
Turning back the cellular clock



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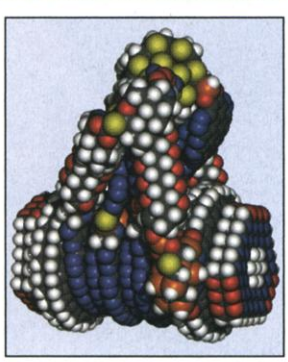
Permian-Triassic plant wipeout

2001 BUDGET

Research Gets Hefty Boost in 2001 Defense Budget

The desert tortoise that plods across California's rugged drylands may be slow, but it will keep some fast company in next year's defense budget. The $289 billion measure, which President Bill Clinton signed last month, includes big boosts for a host of science programs, from mapping the endangered tortoise's wanderings to developing laser weapons. And with the two major presidential candidates pledging further boosts, the Pentagon's portfolio is attracting increasing attention from the life sciences community as well.

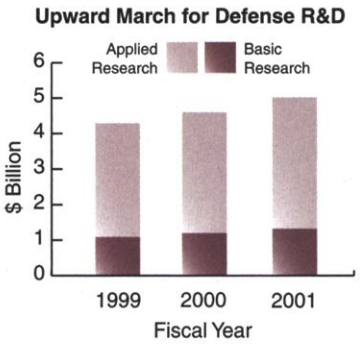
Researchers are still digesting the details of the massive bill, which provides $5.1 billion more than the Administration requested for the budget year that begins on 1 October. So far, however, most scientists like what they see in the first science-related 2001 spending bill to clear Congress. Overall, the Department of Defense's (DOD's) science and technology (S&T) spending will increase 8%, to about $9 billion, exceeding the hopes of a blue-ribbon advisory panel. Within that total, basic and applied research go up a combined 10%, to $5 billion (see graph). Several disciplines scored big, with Congress providing more than $350 million for biomedical research and $40 million to top up a nanotechnology initiative. "Congress was pretty receptive to S&T initiatives this year," says Robert Trew, head of DOD's basic research program.



Still, the funding boost did not please everyone. Computer scientists, for instance, will experience cuts in some information technology (IT) programs. Some analysts worry that Congress and the Pentagon may be shortchanging long-term, high-risk research in favor of projects with a more certain payoff. And others, including former presidential candidate Senator John McCain (R–AZ), complain that the extra spending adds fat, not muscle, citing scores of nondefense projects that favor particular regions or states. The bill has so many biomedical research earmarks, McCain scoffed, that it's difficult to distinguish it from legislation funding the National Institutes of Health.

Even critics, however, say that this year's defense budget heralds a refreshing change for researchers. Over the past decade, the Pentagon's S&T budget has typically shrunk or stagnated each year. The trend was especially troubling to universities, which depend on DOD for nearly $1 billion a year in research and fellowship funds.

The decline also disturbed some Pentagon advisers, who warned that shortchanging research now would weaken the increasingly technology-dependent military. The issue led to a 1998 recommendation from the Pentagon's Defense Science Board, composed of outside experts, for a major hike in military spending on S&T, with a goal of $8.4 billion for 2001. More than a dozen scientific societies in Washington, D.C., also took up the cause, forming the Coalition for National Security Research. This year, their effort was fueled by a growing budget surplus and the impending presidential election, which prompted both Democrats and Republicans to tout their support for a strong defense.



New recruits. Nanoscale pumps (*left*) and endangered species research (*above left*) are two of many areas that will benefit from this year's increase in the Pentagon's research budget.

The results are impressive. A collection of programs that fund basic research at universities, for instance, will jump by nearly $100 million, to $354 million. Half of the increase goes to 18 earmarked projects, including $4 million to study everything from the physiology to the distribution of desert tortoises. The project, to be conducted by researchers chosen competitively, stems from a controversial planned expansion of an Army base in Fort Irwin, California, which would push into tortoise habitat. Another part of the increase will supplement university investments in new research equipment, such as high-resolution electron microscopes. The Pentagon will also fund 3-year fellowships for young researchers up front, protecting them against future budget vagaries.

The university program isn't the only one to benefit this year. Congress approved $40 million for the military's share of the Administration's half-billion-dollar nanotechnology initiative, which aims to make everything from electronics to medical devices on a molecular scale (*Science*, 11 February, p. 952). Biomedical researchers will also be competing for new DOD funds, including $50 million in peer-reviewed grants on topics ranging from new imaging technologies for lung cancer to insect-transmitted diseases. In addition, Congress provided nearly $290 million for an ongoing program to combat breast, prostate, and ovarian cancer.

Those sums could be a harbinger of even greater DOD support for the life sciences, says Mary Hendrix, new president of the influential Federation of American Societies for Experimental Biology (FASEB), which represents more than 60,000 researchers. In December, FASEB will add DOD to the list of federal agencies it monitors and spotlights in its annual budget recommendations, and FASEB is trying to "identify new areas of common interest" at DOD. "There is some ignorance among [biomedical researchers] about what types of projects DOD funds," says Hendrix.

Computer scientists didn't fare as well. Congress significantly pared IT programs run by the Defense Advanced Research Projects

CREDITS: (CLOCKWISE FROM TOP LEFT) GERALD AND BUFF CORSI/VISUALS UNLIMITED; E. DREXLER/NASA

Agency (DARPA), in part, say aides, because lawmakers felt some programs were growing too fast while others duplicated work being done by other agencies. Although the exact impact of the cuts won't be known for months, "it's ironic that IT got cut just when everyone is saying that new computers and software will be so important to the future military," says Robert Parker, head of the University of Southern California's Information Sciences Institute in Arlington, Virginia. "We need to get much more proactive in making the case" for Pentagon spending on IT.

The cuts come at a time when some question DOD's stomach for the type of risky research that led to the Internet and radar-avoiding stealth aircraft. Jim Richardson, a former DARPA program manager who is now vice president of the Arlington-based Potomac Institute, believes that DOD's basic and applied research today "are focused on the nearer term than was the case 5 years ago," although he admits that the shift is hard to quantify.

Reversing that trend, he and other observers hope, will be high on the agenda of the next president. But although both Al Gore and George W. Bush have said they would significantly increase Pentagon R&D—with Bush calling for a $20 billion boost by 2006—neither has spelled out where the money would go. The details could emerge in January, when the new president submits his first budget to Congress.

–DAVID MALAKOFF

CANNIBALISM

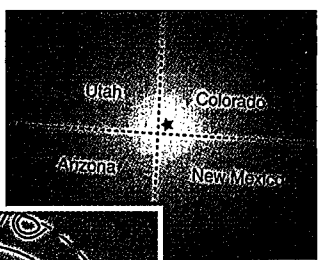
Molecule Shows Anasazi Ate Their Enemies

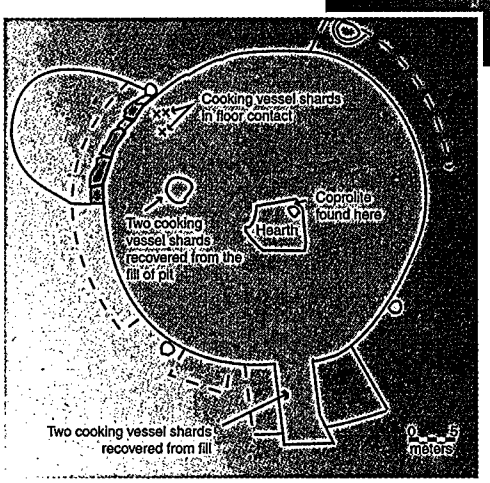
It's official: Scientists say they have definite proof that prehistoric Indians in the Southwest not only killed, butchered, and cooked, but actually ate other human beings. The evidence takes the form of a dried chunk of human excrement, or coprolite, containing a telltale human protein that could have gotten there only by being ingested.

"The bottom line," says biochemist Richard Marlar of the University of Colorado Health Sciences Center in Denver, is "yes, [cannibalism] did occur in the Anasazi population. Now it's up to the anthropologists and archaeologists to say how and why it happened."

In this week's issue of *Nature*, Marlar and colleagues claim their data refute those who would "take the archeological and osteological evidence and say there was a potential for cannibalism" but no proof that butchering and cooking led to actual consumption of human flesh. The coprolite, he believes, has forged the final link in this gruesome food chain. A handful of critics are unswayed, however, insisting that alternative interpretations of the evidence have not been fully explored.

The 850-year-old coprolite was found near Cowboy Wash in southwestern Colorado. The Four Corners area (above) contains a number of sites offering strong evidence of cannibalism: human bones disarticulated, cut, burned, and cast about in exactly the same fashion as the bones of animals known to have been used for food. Investigating this small settlement of three half-buried "pit houses," scientists found two that contained mutilated remains of seven men, women, and adolescents—apparently massacre victims whose bodies were butchered. The coprolite was found in a cold fire pit in the third pit house.





Hard evidence. Analysis of human coprolite found in the hearth of this pit house in southwestern Colorado solidifies the argument for cannibalism.

The scientists looked for traces of myoglobin, an oxygen-transporting molecule that occurs in skeletal and heart muscles but not in the gut. They developed an assay that distinguishes between human myoglobin and that of nine food animals. The assay found human myoglobin in the coprolite, but no traces of it in any of 25 control human fecal samples. It also identified beef myoglobin in feces from people who had recently eaten cooked beef. The authors report finding more human myoglobin on shards of a cooking pot, as well as human blood on two cutting tools.

"It appears that in two of the pit structures, people cooked and processed human remains and then left the bones on the floors," says the lead archaeologist at the site, Brian Billman of the University of North Carolina, Chapel Hill. "In the third pit structure, they appear to have cooked human remains in a pot and then, after they were done [eating], they defecated into the hearth and smashed the cooking pot."

Not everyone agrees, however. For example, Debra Martin of Hampshire College in Amherst, Massachusetts, says the fecal chunk could have been contaminated with human proteins during handling by scientists. And Peter Bullock of the Museum of New Mexico in Santa Fe questions whether the coprolite is even human. "It's most likely from a coyote," a common scavenger in these parts, he says. But Billman says the coprolite lacks the bone chunks, hair from grooming, and fur that are almost always found in canine coprolites, and there were no canine tooth marks on the human remains.

Those who worked on the site acknowledge that their findings pack a cultural wallop. "Unfortunately, it's a very emotional debate," Billman says. But he doesn't agree that cannibalism "dehumanizes" early native Americans: "This is, unfortunately, what human beings do."

–CONSTANCE HOLDEN

SPONGIFORM DISEASE

Experts Downplay New vCJD Fears

The thought of coming down with *Salmonella* after eating a tainted chicken sandwich may be alarming—but "mad cow disease"? That kind of chilling scenario was splashed across the mainstream British press last week based on a report from a leading U.K. lab that prions—abnormal proteins linked to bovine spongiform encephalopathy (BSE) and its human form, variant Creutzfeldt-Jakob disease (vCJD)—can jump from one species to another more easily than previously believed.

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