genus of tree snail (in D. A. Saunders *et al.*, *Nature Conservation: The Role of Remnants of Native Vegetation*, Chipping Norton, N.S.W. Surrey Beatty, 1987).

Making trade-offs

The land between the Los Peñasquitos Canyon and Torrey Pines nature preserve exemplifies many of these issues. The area is hardly pristine wilderness. Laced with roads and suburban neighborhoods, it is bordered on the west by the eight lanes of Interstate 5, one of the most heavily traveled roads in the country. But in the middle is a relatively undisturbed mesa covered with scrub and chaparral.

Pardee's plans call for creating a development of almost 1000 homes on 160 hectares of this mesa. In exchange, the company would set aside a number of other parcels—including a wildlife corridor that snakes around the developed areas and past I-5 by way of a tunnel and a proposed bridge, forming a 3-kilometer route between the two reserves. This corridor will keep the two reserves connected, Pardee believes, and allow large predators like coyotes, bobcats, and cougars to maintain a presence in Torrey Pines, which in turn may help prevent it from being overrun by squirrels and smaller predators like feral cats and raccoons.

But corridor advocates like Soulé and Michael Beck of the Endangered Habitats League, a southern California environmental group that is spearheading the fight to protect the mesa, argue that this skinny, winding path is not enough to assure connectivity and safeguard Torrey Pines from isolation. They want to see the development on the mesa moved to the southern portion, creating a much wider corridor through the northern part and preserving much of the mesa's scrub and chaparral. And they have vowed to fight Pardee.

This is, advocates say, the only cautious and prudent course. Noss argues that in the absence of hard evidence, it is always a good idea to maintain existing connections wherever possible. And Beck, who admits there is no definitive evidence to support the mesa's use as a corridor, agrees that the best course is to be conservative. Pardee's development proposal, in his words, "is not biologically conservative at all. It takes the heart out of the mesa." He believes Pardee's needs are sufficiently flexible to allow a wider corridor.

Skeptics think corridor boosters are going to give up a guaranteed deal that will create open space in favor of an unproven scientific concept. Studies similar to Beier's, UCLA's Walter points out, suggest large mammals need no more than the narrow path called for in Pardee's current plans. Moreover, he says, the "caution" of corridor advocates actually disguises other risks. Money does not grow on trees, the ecologist says, and tapping public coffers to buy the mesa almost certainly precludes spending funds on other conservation efforts. Noting that exotic plants and other forms of degradation plague the Torrey Pines reserve—an observation that has broad scientific support—Walter asks if the area's limited conservation resources might be better spent on restoring the reserve's ecological health.

Beck worries, however, that without the biggest possible link, the degradation in Torrey Pines will only continue. "If we write off wildlife dispersal to Torrey Pines," he says, "it won't have the dynamic mechanisms that balance wildlife activity."

The debate over the corridor through the mesa, like many others around the country, must be resolved without the evidence scientists usually rely upon to settle such disputes. To Walter, it is risky for scientists to come out strongly for a concept with such uncertain empirical backing. "How are we going to get Congress to listen to biology if they think it is being used solely as an excuse to stop development?" he asks. And he worries that the result could be a discrediting of science.

Others argue that development pressure is too intense to allow researchers to work with perfect data, no matter what they do. But they disagree about what to do in the absence of evidence. "Corridors are not bad per se," says Harrison, "but there's a range of [possible conservation strategies], and you should at least consider them before blindly rushing into things." Murphy doesn't disagree, but feels that corridors should be given the benefit of the doubt. "Given what we know about the dispersal of species and the persistence of populations," he says, "I think the burden of proof should fall on those who would deny corridors to a reserve system, not on those who lobby for them."

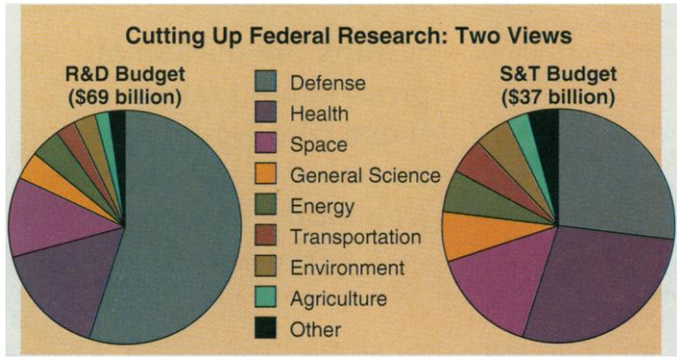
–Charles C. Mann and Mark L. Plummer

Charles C. Mann and Mark L. Plummer are co-authors of Noah's Choice: The Future of Endangered Species.

SCIENCE FUNDING

Report Strips R&D Down to the Basics

When it comes to federal spending on research, the National Academy of Sciences (NAS) hopes that less may be more. A report* released this week argues that the federal science budget is now defined so broadly that its ups and downs say little about the health of U.S. research. Instead, the academy argues, a tighter definition of R&D that includes only activities that generate new knowledge or technologies, and leaves out items such as developing new weapons and launching rockets, would provide a much sounder basis for federal policy-making. It would focus attention on the elements of the science budget most likely to keep the nation healthy and economically strong.



A healthy change. Biomedical research would become the largest component of the new S&T budget, surpassing defense R&D.

The report, written by a panel chaired by former NAS President Frank Press and discussed in a Policy Forum on page 1448, estimates that the current science and technology (S&T) budget would amount to around $37 billion under such a definition. That's a little more than half the sum the government now claims to spend on R&D. The programs not included in this total should be defended on their own terms, not for their contributions to science, the committee says.

Committee member Barry Bloom, an immunologist at Albert Einstein College of Medicine, acknowledges that some may view this new definition as implying that the country can get by with less research—"that we've sold out." But, he says, "the fact is that budgets are going down, and we're suggesting a way to protect what's most important when you don't have enough to do everything." Bloom says the committee assumed that the federal R&D budget, as it's currently defined, might shrink by 30% by 2002, and that prospect set the tone for its deliberations. By tightening the definition of R&D, he says, you can get a better sense of how core programs are faring.

The study was requested last fall by the Senate appropriations committee to help it decide how to allocate scarce R&D dollars. Funded by the National Institutes of Health, the National Science Foundation, the De-

* "Allocating Federal Funds for Science and Technology," National Academy Press, 1995.

fense Department, and the academy itself, the report not only redefines research spending but offers tools to help policy-makers squeeze the most out of the existing system.

Among its 13 recommendations is a separate S&T budget, drawn up by the White House under the new definition and presented to Congress. Within that budget, says the committee, the focus should be on people and projects rather than research institutions. The report praises university-based research, citing its use of peer review, its role in training the next generation of scientists, its easy dissemination of new knowledge, and its flexibility in accommodating new research directions. "The committee does not presume that academic research is always of higher quality than that conducted in industry or federal laboratories," the report says, but it "supports a general preference for academic over nonacademic institutions."

Federal laboratories, the panel says, should be downsized or closed if they no longer serve the mission of the funding agency. An independent commission, similar to the panel the military used to close unneeded military bases, "will probably be needed as a last resort" if individual agencies prove incapable of taking decisive action, the report notes.

Some of the recommendations echo earlier calls from other advisory panels, including a 1993 report by the academy's Committee on Science, Engineering, and Public Policy that says the goal of federal research should be world leadership in selected fields and world-class abilities in all areas. The new report also revives a suggestion by the 1993 panel for 5-year reviews of how U.S. efforts stand up to those of the rest of the world.

Several committee members see the efforts of the National Science and Technology Council, set up by the Clinton Administration to coordinate R&D spending among 20-odd federal agencies, as a first step toward the unified approach to science that they are recommending. "Our report represents an endorsement of the current process," says Lew Allen Jr., chair of the Charles Stark Draper Lab in Pasadena, California, and former director of NASA's Jet Propulsion Lab. The next step, says the report, is a mechanism for both Congress and the White House to monitor the fate of R&D priorities as they make their way through the legislative maze, rather than simply waiting until all spending bills have passed and tallying up the results.

"It would have been easier to ask for a 10% increase" in the research budget, says Bloom about the challenge facing the NAS panel. "But we decided to focus on the process, emphasizing the S&T budget and peer review, to help Congress make the hard choices that lie ahead."

–Jeffrey Mervis

SCIENTIFIC MISCONDUCT

Panel Urges New Approach to Inquiries

In the criminal justice system, those who investigate alleged crimes—the police—are not asked to take the case to trial also, much less decide whether the defendant is guilty or what sentence to mete out. But when some biomedical researchers funded by the federal government are accused of committing scientific misconduct, the Office of Research Integrity (ORI) does it all—investigates, adjudicates, and recommends punishment. That's too many hats to wear, says an outside panel of experts who studied how ORI operates.

Last week, in an 80-page report,* the Commission on Research Integrity recommended that ORI shed some of its enforcement responsibilities. The recommendations are intended to correct flaws in how the office has operated, notes the report, including exercising poor judgment in choosing some cases and being too secretive during investigations. The 12-member commission also concluded that research institutions should take the lead in preventing as well as rooting out misconduct, and it revised a definition of misconduct that clarifies an earlier draft (*Science*, 29 September, p. 1811).

"It's an accepted standard that the investigation and prosecution are separate from the judicial [outcome]."

—Kenneth Ryan

"[ORI officials] haven't always selected or pursued their cases very well because they've gotten caught up in the chase," says one member of the commission, which was created 17 months ago after Congress asked the Department of Health and Human Services (HHS) to review its approach to alleged misconduct. The report says ORI Director Lyle Bivens "cannot be considered a disinterested party to the success of the investigative effort."

Separating adjudication and investigation at HHS—a principle that should also be applied at the institutional level—would help solve these problems, the report concludes. "It's a commonly accepted standard of law that the investigation and prosecution are separate from the judicial [outcome]," notes Kenneth Ryan, a Harvard reproductive biologist and chair of the commission.

The commission favors the approach taken by the National Science Foundation, where the inspector general performs investigations and makes recommendations to the deputy director, who then decides if the accused is guilty and sets the appropriate punishment. Ryan says the changes could involve "some new relationship" between ORI and the department's appeals board, the next step in the adjudicatory process. The report even discusses having investigations be "assisted or directed by" the HHS inspector general, leaving ORI to concentrate on education and other functions.

Despite endorsing a role for the government, the panel says that individuals, institutions, and professional societies should "have primary responsibility" for enforcing good research conduct. "Those who are closest to the work are best suited to make the decisions," explains commission member Kristina Gunsalus, associate vice chancellor for academic affairs at the University of Illinois. The report says institutions should expand programs for teaching researchers about misconduct, now required only for recipients of training grants, and should handle most investigations.

The report also recommends replacing the current Public Health Service definition of research misconduct, which begins with the words "fabrication, falsification, plagiarism," with two categories explained at length—misappropriation and misrepresentation—and a new term, interference. The panel also recommends that an interagency task force be formed to develop a common research misconduct definition and that the HHS secretary come up with a regulation to protect those who first report allegations.

The report is getting a lukewarm reception from experts in the field. The recommendations "would probably make a useful difference," says Barbara Mishkin, a misconduct attorney in Washington. However, Mishkin says the commission has gone overboard in recommending that some disputes among collaborators be treated as misconduct without defining the rights of team members to data. And Paul Friedman, a radiologist at the University of California, San Diego, says a recommendation that the government make site visits to institutions "would be an excruciating waste of time."

The next step is for the panel's recommendations to be reviewed by a group of senior HHS officials. Next year the department is expected to issue a proposed rule—including a new definition—telling how it plans to handle allegations of misconduct.

–Jocelyn Kaiser

* Integrity and Misconduct in Research; contact Henrietta Hyatt-Knorr, 301-443-3400.