**Big bird.** Steller's sea eagle, the world's largest eagle, makes its home in Kamchatka.

sands of rare animals and plants, from eight unique species of lichen to a subspecies of brown bear. The end of the Cold War saw farmers, poachers, and timber and mining companies rush in to exploit the relatively untouched land, but now the besieged peninsula has found a new protector. A group of international and Russian agencies this week announced a 7-year project to bolster biodiversity conservation and research in four protected areas, with funding of almost $13 million. "We've been waiting a decade for this," says Olga Selivanova, a marine biologist at the Kamchatka Institute of Ecology and Natural Resources here in the region's capital city.

Soviet taxonomists won international recognition in the 1970s and '80s for their work on Kamchatkan species. Some 10% of the peninsula's 1168 plant species are found only here. The peninsula is home to the world's greatest diversity of salmon, trout, and char, as well as an estimated 15,000 Kamchatka brown bears, the second largest subspecies in the world. And Kamchatka is the breeding grounds for the world's largest eagle, the Steller's sea eagle. But with 59 Kamchatkan fauna on Russia's endangered species list, some experts contend that time is running out to protect what they see as a northern Galápagos.

Although the Russian government has approved modest expansions of some of the peninsula's parks, setting aside an additional 16,000 hectares over the past decade, cash-hungry bureaucrats and businesses threaten many biodiversity preserves, says Paul Grigoriev, a conservation biologist working for the United Nations Development Programme.

The Kamchatka project—the richest conservation effort yet in the Russian Federation—suggests that "the situation is improving," says Grigoriev, who's leading the effort. The project, backed by the Global Environment Facility, the Canadian International Development Agency, and the United Nations, will seek to bolster the legal status of protected sites and improve monitoring and management of almost 30,000 square kilometers, covering habitats ranging from temperate deciduous forest to arctic tundra and volcanic wastelands. The project will also fund scientific research and ensure that local people benefit by promoting tourism and integrating aboriginal hunting and fishing into site management.

The scientific program, with a budget of $550,000 over 7 years, will tackle the classification of existing specimens collected over the years. Selivanova, who crafted the project's scientific program, says that some 45,000 samples collected during Soviet times remain unclassified. She and others also hope to get back out into the field, as collecting trips were mostly abandoned after the Soviet collapse. "We want to get back to doing it now," she says.

–PAUL WEBSTER

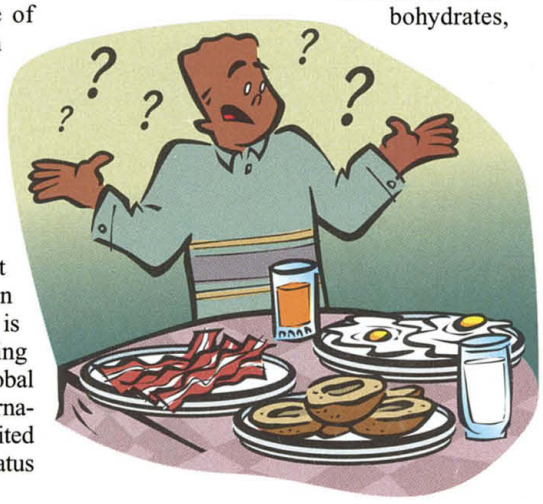
Paul Webster is a writer in Moscow.

NUTRITION RESEARCH

## IOM Panel Weighs In on Diet and Health

Consumers trying to make sense of divergent diet-book claims aren't likely to find easy answers in a new, 1000-page tome on diet and health issued by the Institute of Medicine (IOM). But they will find a review of the risks and benefits of consuming the disputed "macronutrients": carbohydrates, fats, and proteins. Although the report makes specific recommendations, it also laments gaps and contradictions in nutrition research, suggesting that even the experts are struggling to sort out the information.

After nearly 3 years of spirited debate, the 21 scientists on the IOM panel agreed on a bottom line: 20% to 35% of one's calories should come from fat, 45% to 65% from carbohydrates, and 10% to 35% from protein. A similar panel in 1989 suggested hard numbers within these ranges: no more than 30% from fat, no less than 50% from carbohydrates, and the rest from protein.



**Smorgasbord.** The public has been offered a bewildering array of recommendations on healthy diets.

CREDITS: (TOP TO BOTTOM) NATURFOTO HONAL/CORBIS; ILLUSTRATION: TIM SMITH

The flexible 2002 standards might reflect a newfound humility. "Twenty-five years ago, guidelines were presented with absolute certainty, [for example,] 'Thou shalt not eat eggs,' " says Walter Willett, an epidemiologist at Harvard's School of Public Health in Boston, who was not on the panel. "I think [this report] is a healthy acknowledgment that we don't know absolute truths."

The panel set out to determine the impact of macronutrients on chronic diseases such as diabetes. The assignment proved enormously complex. Fat, for example, is an umbrella that covers the omega-3 fatty acids and monounsaturated fat, which are considered healthy; the *trans*–fatty acids, which are considered unhealthy; and the saturated fats, about which there is no consensus.

The report also comes during a raging public debate on diet. To remain neutral, the panel members "put on blinders" to the policy implications of their work, according to panel chair Joanne Lupton, professor of nutrition at Texas A&M University in College Station. Popular diets, such as the heavily criticized Atkins diet, advocate nearly eliminating carbohydrates and relying on fat and protein. At the same time, the evidence favoring a low-fat diet has been questioned (*Science*, 30 March 2001, p. 2536).

IOM panelists tried to limit the scope of their review by focusing on diets for healthy individuals, not those seeking to lose weight. But the duel over fat and carbohydrates edged its way into discussions anyway, as the panelists examined scientific studies dating back to the 1930s. "It's a very, very difficult decision as to whether high carb … and lower fat is better," says Sheila Innis, a panel member and expert in pediatric nutrition at the University of British Columbia in Vancouver. On the one hand, Innis notes, "there are populations that do very well with high-fat diets," such as the Greeks. Their so-called Mediterranean diet, though, is composed largely of the healthy fats found in fish and olive oil—not the kind consumed by most Canadians and Americans, the report's intended audience. In the end, says Innis, the panel leaned toward carbohydrates because, in the context of a North American diet, they were deemed safer.

Although the IOM report aims to stay out of the big battle, it is one of the first government-funded efforts to parse out the underlying science. And it stakes out

some clear positions. For example, it suggests roughly doubling average fiber intake, to 38 grams per day for men and 25 grams for women.

Certain recommendations—such as urging every adult to get an hour's daily exercise, twice the amount recommended in the past—seem to ignore the real-life lifestyles of North Americans. "I couldn't possibly do an hour of exercise a day," says Marion Nestle, chair of the department of nutrition and food studies at New York University. Nestle, who was not on the panel, complains that the report is too complex for "an already confused public." What causes obesity "isn't rocket science ... eating too much [does]."

Indeed, panel member Ronald Krauss, who studies diet and heart disease at Lawrence Berkeley National Laboratory in California, agrees that the report might not respond to the question people generally ask: "How much of this should I eat?" Unfortunately, science isn't able to deliver such detailed diet advice quite yet.

–JENNIFER COUZIN

UNDERGRADUATE SCIENCE

## Biology Departments Urged to Bone Up

In 1998, Sheldon Wettack, a dean at Harvey Mudd College in Claremont, California, decided that undergraduates needed a better appreciation of the connections between biology and the physical sciences. He and a few faculty members devised a program, called the Interdisciplinary Laboratory, that parallels intro chemistry and physics classes and includes such exercises as how thermodynamics affects animal design. Wettack hoped that the new team-taught lab would strengthen the biology curriculum and maybe even attract majors from the more quantitative sciences into biology.

This kind of approach is exactly what's needed to train the next generation of biomedical researchers, says a new report by the National Research Council (NRC).* "Biological research is already highly interdisciplinary, but undergraduate education is not," says panel chair Lubert Stryer of Stanford University in Palo Alto, California. "And the gap is increasing."

The NRC panel, funded by the National Institutes of Health and the Howard Hughes Medical Institute (HHMI), found that undergraduate biology education also needs a more rigorous curriculum. Many of the recommended changes are longtime favorites of science education reformers (*Science*, 31 August 2001, p. 1607), including thought-provoking lab exercises and independent research projects. To improve quantitative skills, faculty members should include more concepts from math and physical sciences in biology classes. Ideally, the report says, the entire curriculum would be revamped to add more heft.

But these changes face many obstacles, including the expense of developing new course materials and the conservative influence of the Medical College Admission Test (MCAT), a national qualifying exam for would-be U.S. medical students. "It is time that the curriculum started driving the MCAT, not the other way around," says David Hillis of the University of Texas, Austin. When it comes to curricula, there is also a massive amount of inertia in higher education, says Peter Bruns, vice president for grants and special programs at HHMI. "People say the only institution more conservative is the [Catholic] Church."

Even when reform is on the agenda, it's hard for departments to agree on how to carry it out. "If you add something, you have to take something away," says Hillis, and no one wants his or her subject trimmed. Personal foibles can play a role, too: A professor who agrees that number-crunching skills would be useful might still be loath to admit ignorance. "Most faculty have trouble saying, 'I don't know much about this topic, but you should,' " says chemist Ronald Breslow of Columbia University in New York City.

**Now hear this.** New report emphasizes hands-on activities over lectures for undergraduates.

CREDIT: PATRICK WARD/CORBIS

One way to achieve change is by sweetening the pot. Toward that end, next week HHMI will award $1 million over 4 years to each of 20 senior faculty members who have proposed ways to improve undergraduate biology education at their institutions. The idea is to provide role models as well as the necessary resources. That approach makes good sense to Stryer, who says that energetic leadership is a key ingredient in making the panel's recommendations a reality.

–ERIK STOKSTAD

INFORMATICS

## The Genome Chose Its Alphabet With Care

Of all the nucleotide bases available, why did nature pick the four we know as A, T, G, and C for the genomic alphabet? Researchers have long put it down to the composition of the primordial soup in which the first life arose. But Dónall Mac Dónaill of Trinity College Dublin says the answer is much more interesting. He believes that the choice of A, T, G, and C incorporates a tactic for minimizing the occurrence of errors in the pairing of bases, in the same way that error-coding systems are incorporated into ISBNs on books, credit card numbers, bank accounts, and airline tickets. "The answer may lie partly in the error-coding aspects of information transfer," he says.

There are 16 possible nucleotide bases that could pair up to make DNA, and researchers have created strands of synthetic DNA using all the combinations. Informatics might be the key to why nature ignored all but four of these possibilities, Mac Dónaill suspected, and he built on the structural work of biologist Eörs Szathmáry of the Collegium Budapest in Hungary to test his hunch.

In the error-coding theory first developed in 1950 by Bell Telephone Laboratories researcher Richard Hamming, a so-called parity bit is added to the end of digital numbers to make the digits add up to an even number. For example, when transmitting the number 100110, you would add an extra 1 onto the end (100110,1), and the number 100001 would have a zero added (100001,0). The most likely transmission error is a single digit changed from 1 to 0 or vice versa. Such a change would cause the sum of the digits to be odd, and the recipient of that number can assume that it was incorrectly transmitted.

Mac Dónaill asserts, in a forthcoming issue of *Chemical Communications*, that a similar process was at work in the choice of bases in the genetic alphabet. First he represented each nucleotide as a four-digit binary number. The first three digits represent the

* *BIO2010: Undergraduate Education to Prepare Biomedical Research Scientists* (National Academy Press, 2002).