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*GeneAmp In Situ PCR System 1000* (left); *Localization of varicella zoster virus (VZV) by in situ PCR in human brain tissue* (right).
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View westward of Lone Pine Peak (elevation 3945 meters), located on the southern Sierra Nevada crest 10 kilometers southeast of Mount Whitney. Differential rock uplift across the Sierra Nevada fault system has generated more than 2500 meters of relief between Lone Pine Peak and Owens Valley to the east. Erosion and deposition may be responsible for a large fraction of Cenozoic rock uplift in the Sierra Nevada. See page 277. [Photo: R. S. Anderson]

RESEARCH ARTICLE

Crystal Structure of the MATa1/MATa2 Homeodomain Heterodimer Bound to DNA
T. Li, M. R. Stark, A. D. Johnson, C. Wolberger

Altered DNA Recognition and Bending by Insertions in the α2 Tail of the Yeast α1/α2 Homeodomain Heterodimer
Y. Jin, J. Mead, T. Li, C. Wolberger, A. K. Vershon

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S. Yoon, Z. Yao, H. Dai, C. M. Liebert

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S. Labeit and B. Kolmerer

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Geomorphically Driven Late Cenozoic Rock Uplift in the Sierra Nevada, California
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Quantum computation
One approach for making smaller integrated circuits would be a quantum computer in which the logic states 0 and 1 would be replaced by wave functions and the logic operations by superpositions of quantum states. Theory suggests that quantum computers could be very powerful for tasks such as in Shor’s factorization of prime numbers. In a review, DiVincenzo (p. 255) notes that a working quantum computer would be extremely demanding and would require a huge extension of the rudimentary quantum computing possible today.

Magnetoresistive materials
In seeking new materials, combinatorial libraries can be used to synthesize and screen a large number of samples rapidly. Briceño et al. (p. 273) used this method to search for materials that exhibit strong magnetoresistance, a property of great interest for downsizing magnetic recording heads. They found a class of cobalt oxides that have large magnetoresistance, and further determined that in contrast to manganese-based compounds, the effect increases as the material is doped with larger alkaline earth ions.

Lifting mountains
What forces cause the uplift of large mountain ranges? Small and Anderson (p. 277; see cover) examine the interplay of erosion and generation of relief, which removes load and induces isostatic uplift, on the formation of the Sierra Nevada, California. Their model shows that coupled erosion along the crest of the range and deposition in the Great Valley could have produced the observed tilting of the range to the west and apparent uplift on the east. Summit elevations may have increased while the mean elevation of the range may have decreased in the past 10 million years.

Binding of homeodomain heterodimers to DNA
The MAT α2 homeodomain protein of yeast regulates transcription by binding DNA with either MAT α1 or MCM1. Each of the complexes, α1/α2 and α2/MCM1 bind to distinct sites in the yeast genome and repress transcription of the adjacent genes in a cell type–specific manner. Li et al. (p. 262; see the Perspective by Andrews and Donoviel, p. 251) present the crystal structure of the α1/α2 heterodimer bound to DNA. The α2 COOH-terminal tail is disordered when α2 binds DNA alone but becomes ordered in the ternary complex and contacts the α1 homeodomain. Such flexible protein recognition domains may mediate contact between many other heterodimeric transcription factors. Jin et al. (p. 209) examine the requirements for proper spacing between the α1/α2 DNA binding sites and the length of the α2 tail.

Glucocorticoid mechanism
Although they have been used for years as immunosuppressive and anti-inflammatory agents, little is known about the mechanism of glucocorticoid (GC) action. Scheinman et al. (p. 283) and Auphan et al. (p. 286; see news story by Marx, p. 232) show that the nuclear factor kappa B (NF-κB) transcription factor, a regulator of genes involved in the immune response, is repressed by GCs, and that GCs induce increased synthesis of IκBα, the inhibitor of NF-κB. This additional IκBα binds to NF-κB, preventing its action.

Parts of speech
Speech conveys information through both the frequency distribution of sounds (spectral information) as well as timing for making different sounds (temporal cues). Shannon et al. (p. 303) show that speech can be recognized with high accuracy even if the spectral information is highly degraded. They added white noise to spoken words and sounds in a way that preserved temporal cues but reduced frequency information into only a few broad bands. Vowels and consonants could be recognized with only three bands of modulated noise. Such results bear not only on how speech is processed in the human brain but can also be useful in designing hearing aids.
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Letters

Dioxins in Vietnam

With reestablishment of full diplomatic recognition of Vietnam by the U.S. government finally accomplished, it seems appropriate to ask why no studies of the environmental effects of dioxin (TCDD, tetrachlorodibenzo-p-dioxin) in Vietnam have been undertaken by the U.S. government. In fact, the National Academy of Sciences in 1974 recommended that studies “be started immediately” (1). This apparent lack of concern on the part of our government contrasts with actions of Canada, Japan, and other countries. Canada has an extensive pilot program operating in the south of Vietnam helping to assist and further train Vietnamese scientists in methods of assessing degrees of dioxin contamination. The Canadians calculate that Vietnam, a country one-third the size of British Columbia, was subjected to annual environmental loadings of dioxin more than 150 times greater than annual worst-case loadings to the British Columbia environment as a result of pulp mill discharges (2).

As a recent editorial (3) stated, “Many in the United States may feel a special responsibility to join the ongoing research efforts by inadequately funded investigators from Europe and other countries, especially those from France and the World Health Organization. It is also the case that scientific information about TCDD effects gleaned from studies in Vietnam will help industrialized nations to deal with widespread contamination by dioxin in their own environments.”

We believe the AAAS would contribute to a truly significant follow-up to the work of its Herbicide Assessment Commission by urging Congress to fund a full-scale study of dioxin in Vietnam, offering its good services as desired.

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*Former director, AAAS Herbicide Assessment Commission.
†Professor emeritus of zoology.

References
2. Hattfield Consultants, Ltd., personal communication to E. W. Pfeiffer.

Electronic Publishing

In their editorial “‘Wired’ science or whither the printed page?” (4 Aug., p. 615), Shmuel Winograd and Richard N. Zare state that the scientific community must ask “some very hard questions” about electronic publishing. One point made by Winograd and Zare may lead readers to believe that electronic publishing precludes peer-review and that this results in rapid publishing. The speed of dissemination of electronic journals comes not from bypassing the peer-review process, but from...
bypassing the print process; it can save on the order of 3 to 6 months.

This new medium allows for strictly refereed journals as well as free-wheeling discussion groups. Hence, the Web contains reviewed journals such as Psychology (http://www.princeton.edu/~harnad/psyc.html), which is reviewed to standards most print journals are hard-pressed to meet, and preprint journals, such as the high energy physics e-print archive (http://xxx.lanl.gov/), which dominates its field because of rapid dissemination and universal free access.

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My colleagues and I in the American Society for Biochemistry and Molecular Biology (ASBMB), which publishes the Journal of Biological Chemistry, welcome the timely editorial on electronic publication by Winograd and Zare. We share both the enthusiasm and the concerns expressed in the editorial about issues such as quality control, authorship, intellectual property and archivability. We also agree that technical capabilities, while impressive, are an insufficient guide to electronic presentation of scientific information. It is for this reason that our successful efforts to publish the Journal of Biological Chemistry electronically (http://www-jbc.stanford.edu/jbc/) have required a truly collaborative effort between the ASBMB, the scientist-editors of the journal, the Stanford University Libraries, Stanford Academic Information Resources, and Cadmus, publisher of the print version of the journal.

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The examples cited by Winograd and Zare as electronic publication of scientific journals online that are "already a reality" (Journal of Biological Chemistry and Astrophysical Journal Letters) are both actually expensive demonstration projects, offered free to all Internet users to evaluate the delivery technology. More realistic examples of online publications can be found at the OCLC Electronic Journals Online server (http://www.oclc.org/oj/ej/promo/ejo_list.htm), where users must be paying subscribers. A critical evaluation of the history of the Online Journal of Current Clinical Trials (sold last year by the AAAS, the publisher of Science, to Chapman and Hall) would be a valuable lesson in how economics affected a technically excellent electronic publication.

As the U.S. government involves itself with the fledgling electronic publication efforts (1), those of us attempting to make economic sense of an evolving market can only wonder what its long-term role will be.

The most important issues are no longer about technology or quality, but economics. Of the thousands of peer-reviewed research serials published in the world, only a few dozen are available in an electronic format, most on CD-ROM. Many publishers balk at spending even a small fraction of their printing budgets on the production of electronic versions and fear that electronic subscriptions will further erode revenues from their declining subscriber base. Thus, they postpone making a closer evaluation of the survival value of their product in a changing marketplace.

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Notes
1. For example, the National Science Foundation's (NSF's) grant to theoretical physicist Paul Ginsparg and his colleagues at Los Alamos National Laboratory to maintain a server of high energy physics data, the NSF grant of $450,000 to launch Astrophysical Journal Letters online, and the funding of the Mosaic program by the National Center for Supercomputing Applications.

Worthy Pursuits
In his editorial "Degrees of freedom" (18 Aug., p. 903), Don S. Doering eloquently describes the plight of new Ph.D. researchers who, in trying to adapt to a tight academic job market, face a strong prejudice against any career other than academic research. To answer his question, "How do we fix a system that...has produced many more Ph.D.'s than the market can bear?" I suggest that academic scientists who espouse that prejudice be limited to training only enough Ph.D.'s to replace themselves (or even fewer, if budgets in their field are shrinking). How can they ethically train any more than that, when they knowingly condemn the additional ones to a professional life they regard as inferior?

Academic scientists typically supervise Ph.D. theses from their thirties to their sixties; allowing for those who die early, switch to administrative positions, or otherwise leave the field sooner, each needs to train a replacement no more than once every 20 years or so. When the issue is put to academic scientists this way, some will stand by their beliefs and ease the imbalance on the supply side. The others, faced with giving up most of their cheap labor supply, will probably come to realize that for a student to pursue a career outside the academy maybe isn't so unworthy after all.

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Asymmetrical Ability
Oliver Sacks (Letters, 5 May, p. 621) suggests that the development of exceptional musical abilities in some individuals with neurodevelopmental disorders such as autism and Williams syndrome constitutes a "savant" talent and as such might represent a "neuromodule." He speculates that the exaggerated leftward asymmetry of the planum temporale area of the brain recently reported in a group of professional musicians by Gottfried Schlaug et al. (Reports, 3 Feb., p. 699) may reflect the neuromorphological substrate of such a neuromodule.

In fact, we have carried out analyses (1) of the planum temporale in individuals with Williams syndrome. The surface area of the left and right planum temporale of four subjects was measured with magnetic resonance images (MRI) with the same anatomical criteria used by Schlaug et al. The planum temporale asymmetry for these individuals with Williams syndrome was on par with that of the group of musicians studied by Schlaug et al. (mean, −0.23; standard deviation, 0.24). Three of the four individuals with Williams syndrome had greater asymmetry than that of the musicians, but less than that of musicians with perfect pitch. In contrast, five normal control subjects had an asymmetry coefficient that was consistent with the nonmusician control group in the study by Schlaug et al. (mean, −0.34; standard deviation, 0.14). In addition, subjects with Williams syndrome did not differ from normal subjects in total planum temporale surface area (1000.8 versus 962.1 square millimeters, respectively), despite significant overall reduction of cerebral volume reported in subjects with Williams syndrome (1), suggesting dispro-

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portionate growth of the entire posterior supratemporal region.

These preliminary data suggest that disproportionate growth, and perhaps exaggerated asymmetry, occur in the posterior supratemporal region in individuals with Williams syndrome. However, establishing whether this asymmetry is a source of musical ability will have to await more detailed analyses. Also, the fact that individuals with Williams syndrome typically possess exceptional language abilities relative to other cognitive domains and despite mental retardation (2) introduces the possibility that planum temporale asymmetry is related to linguistic abilities rather than, or as well as, musical abilities.

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References

Fusion Progress

We disagree strongly with the letter by David Montgomery (8 Sept., p. 1328) in which he criticizes the fusion program for an alleged lack of scientific culture and content. He characterizes the field as it was in its infancy, approximately 20 years ago. He does not acknowledge the program's success and degree of scientific maturation in the intervening two decades.

It is important to understand the implications of the fact that the fusion process requires high temperatures, on the order of 10 kilovolts, and that the behavior of matter at these temperatures takes on special properties, well outside those typical of terrestrial experience. Investigating these properties has led to the development of the subfield of high-temperature plasma physics. Facilities have been developed that are capable of producing plasmas of fusion temperature and density, and, as well, the science governing the behavior of these plasmas has also been developed. This science base has three parts: (i) a much increased and continually expanding understanding of the underlying physics; (ii) an ability to test this understanding with specialized diagnostics routinely producing detailed time-resolved profiles of density, temperature, magnetic field, current, and so forth; and (iii) the development of sophisticated computer codes that translate fundamental understanding into practical tools for experimental testing of theory and for fusion facility design.

Montgomery criticizes, in particular, fusion plasma diagnostics. His characterization is out of date. Diagnostic instruments have been developed and widely deployed to measure the spatial and temporal profiles of all the internal plasma variables he says are largely lacking. Comparison of these measurements with theory indicates a mature, first-principles understanding of plasma stability, control, and current flow. Plasma transport, being driven by low-level turbulent processes, is less well understood from first principles and is the subject of intense current research. An empirical description is also being developed through a "wind tunnel" approach to design new machines.

Montgomery also criticizes the technical review processes of the fusion program. However, with the increased internationalization of fusion research over the past two decades, American plasma physics and fusion research have experienced much wider and more intense assessments than could be had earlier through the "rough-and-tumble

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CO Binding and Bending Energies

Robert F. Service (Research News, 18 Aug., p. 920) provides a lively sketch of the debate over the geometry of carbon monoxide (CO) binding to myoglobin and its importance for understanding the protein's ability to discriminate CO from O2. While Service focuses on the conflicting structural interpretations of spectroscopic and x-ray diffraction data, I would like to highlight the argument from energetics. Because electronic forces strongly favor an upright geometry, it takes more energy to bend the Fe-CO bond significantly than the protein can muster through steric forces. The estimation of this energy from vibrational spectroscopy (1) was one of the first of the “chinks . . . in the armor” of the bent-CO dogma.

The energy argument has an important corollary: The absence of significant bending does not mean that steric forces play no role in discriminating between CO and O2 (2). Precisely because of CO's strong preference for upright binding, steric forces may well lower the CO affinity, even if they are not strong enough to bend the CO once it binds. Site-directed mutagenesis provides some support for this view. When the distal histidine residue, the side chain of which is positioned to interfere with upright binding, is replaced (3) by the sterically undemanding glycine, the CO affinity increases, by 1.0 kilocalories per mole. At the same time, the O2 affinity decreases, by 1.6 kilocalories per mole, reflecting the importance of the attractive force of the hydrogen bond, mentioned by Service, between the distal histidine and the bound O2. These changes suggest that steric repulsion of CO and H-bond attraction of O2 are both important in discriminating CO from O2. However, other influences may also be at play, including changes in the occupancy of the binding pocket by water molecules (4). Further work is needed to delineate the various contributions to the binding energies.

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References

Letters to the Editor

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Chimp Finally Shows AIDS Symptoms

Another AIDS truism is heading for the trashbin: the belief that no animal other than humans develops AIDS from HIV infection.

According to two well-connected AIDS researchers, a chimpanzee at Atlanta's Yerkes Regional Primate Research Center that was first infected with HIV in 1986 has become seriously ill with symptomatic AIDS. Although it's unclear what impact if any this will have on attempts by AIDS researchers to use chimps to understand and prevent the disease, the finding may alter how people view existing data from HIV-infected chimps.

As first reported in the 9 October U.S. News and World Report, a chimpanzee named Jerome has developed acute diarrhea and critically low levels of CD4 cells, the key immune system warriors that steadily decline in HIV-infected people. A spokesperson says Yerkes researchers decline to discuss Jerome until they present their data in a scientific forum.

The news is no surprise to the University of Alabama, Birmingham's, Patricia Fultz, who works with HIV in chimps and who first infected Jerome 9 years ago when she was at the Centers for Disease Control and Prevention. Fultz co-wrote a paper in the March 1991 Journal of Infectious Disease that described how HIV was unraveling Jerome's immune system, predicting that he would succumb to AIDS.

Now that her prediction appears correct, Fultz believes the finding "will add weight to the studies that have tested HIV vaccines in chimps. Yet she cautions that the 9-year lag between infection and disease suggests the chimp model still has serious drawbacks. "I don't think it will make any difference at all on vaccine development," she concludes. For similar reasons, she doubts that chimps can illuminate human HIV pathogenesis.

Still, as Fultz acknowledges, those truisms could change, too, if a strain of HIV is found that causes disease in chimps more quickly. Fultz and other scientists are searching for such strains.

Summit Aims to Save Ukrainian Science

Hoping to rescue his fellow scientists from calamity, a prominent Ukrainian cell biologist has organized an international summit next month to propose reforms in Ukraine's science establishment.

Ukrainian scientists are growing desperate. The National Academy of Sciences of Ukraine (UNAS), which pays the bills for Ukraine's 150-odd research institutes, since April has received almost none of the $54 million budget the government has promised. Yet there is a "frightening apathy within the academy," writes summit organizer Yuri Gleba in a 17 September letter to invitees. Most Ukrainian researchers agree that the UNAS "cannot continue in its present form, but... no proposals for change or calls for reforms have been forthcoming," says Gleba, head of the International Institute of Cell Biology in Kiev and a senior researcher at American Cyanamid in Princeton, New Jersey.

Gleba hopes to jump-start reform in talks between Ukrainian science leaders and about a dozen Westerners—including Sherwood Rowland, foreign secretary of the U.S. National Academy of Sciences, and British pharmacologist

Newt's Science Breakfast Club?

Now that Congress has abolished its science think tank, House Speaker Newt Gingrich (R-GA) may be looking for a way to create a new one. The Office of Technology Assessment (OTA), a policy analysis shop, officially went out of business on 1 October, but it's already missed.

Gingrich is thinking about inviting some of his colleagues to a breakfast later this fall to talk science, says an aide to Representative Amo Houghton (R-NY). The purpose, the aide says, would be "to discuss what the House should do in place of" the OTA. Former OTA Director Roger Hellwig said last month that Houghton, an OTA champion, had spoken with him about the meeting, but that the agenda "is up to the Speaker."

According to an OTA source, Hellwig recently asked senior staffers to suggest policy experts to speak at what apparently could become a series of breakfast meetings. Not a bad idea, the ex-staffer says—except that Hellwig indicated Gingrich would likely nix some obvious choices and would favor conservative themes. Says one OTA staffer, "It would make a great tombstone: OTA, 1972–1995, replaced by the Science Breakfast Club. No liberals need apply."

Help wanted. Scientists are seeking advice on budget crisis at Ukraine's National Academy of Sciences.

Sir Arnold Burgen, former president of Academia Europaea. The meeting, set for 6 to 7 November, may influence a new Special Commission on Science of the Ukrainian government. Gleba, a commission member himself, warns that "without some external pressure," the bureaucratic panel may do little to avert the crisis.

At least one Ukrainian scientist believes Gleba's summit—sponsored by the Soros Foundation and endorsed by the UNAS—is on the right track. "I totally support his approach," says biophysicist Oleg Krishtal, who will attend the meeting. How to reform Ukrainian science, he says, "is a question of the historical future of Ukraine."

Agencies Envision Unified Grant System

Navigating the federal bureaucracy to win research grants is no easy matter. But now a small band of bureaucrats say they want to help. Officials from the three armed services, the National Science Foundation (NSF), the Department of Energy, the National Institutes of Health, and other agencies are quietly putting together a plan to simplify the way universities conduct business with the federal government.

The goal, says one NSF manager, is to create an electronic database that would allow universities to make proposals to any federal research office using a common set of rules. Such interagency coordination could be a boon to university researchers and accountants overwhelmed by the paperwork required to handle grants from different sources, as it would lead to a single accounting system for all federally funded extramural research, he says.

The automated system would also have a spin-off benefit for investigators: If a proposal didn't meet the mission of the agency to which it was submitted, it could be routed to one pursuing that line of research, says Helmut Hellwig, director of the Air Force Office of Scientific Research: "Right now, there is no formal interagency coordination to do this."

Gerald Iafriate, director of the Army Research Office, adds that referrals today depend on personal relationships among research directors. Backers say the system could also save time and money by resulting in more joint projects, thereby eliminating duplication of research.

Proponents of the idea will meet in November to work out details of their plan, which then must win approval from agency chiefs. For now, they want to keep a low profile, lest they get caught up in the unwieldy bureaucracy that typically orchestrates such interagency initiatives. "If it gets political, it will fall apart," says one.


**Sensing Music**

Playing music has transformative powers, not only on those listening to it, but also on the brains of the performers—especially, it appears, on the malleable brains of child musicians. On page 305, Thomas Elbert of the University of Konstanz in Germany and Edward Taub of the University of Alabama report that the agile left hands of string musicians—especially those who began training before age 12—are represented by larger brain areas than are the left hands of nonmusicians. The researchers used a technique called magnetic source imaging to measure brain activity when a light touch was applied to the fingers of six violinists, two cellists, and a guitarist. Touching the left fingers of the string players activated a larger portion of the somatosensory brain area in the musicians than it did in a control group of six nonmusicians.

The difference suggests that musicians’ brains had reorganized to devote more neurons to receiving sensations from the left fingers. Just how many more the researchers couldn’t determine, but their data suggest it could be two to three times as many. What’s more, musicians who started before the age of 12 showed an effect twice as large as did their peers.

An “interesting twist here is the youth,” says neuroscientist Tim Pons of the Bowman Gray School of Medicine in Winston-Salem, North Carolina. “If you get them relatively young, you have this increased expansion.” Taub says, though, that it is equally important that “plasticity has not disappeared in the older individual. It is just reduced.”

This study adds to other work on reorganization of the brain following the learning of a skill. In 1993, for example, neuroscientist Alvaro Pasqual-Leone of the National Institute of Neurological Disorders and Stroke reported an expansion of the brain area receiving sensations from the Braille-reading finger in blind people. And Avi Kam, Leslie Ungerleider, and colleagues at the National Institutes of Health have shown in the brain’s motor area what Elbert and Taub found for sensory neurons: When people tap out a well-practised sequence with their fingers, they activate a greater area of the motor cortex than when tapping an unpractised sequence (Science, 2 December 1994, p. 1475; the study was published in the 14 September Nature).

Does having all that cortex devoted to musical—and manual—dexterity make you a better player? “Presumably,” says Taub. But “we haven’t proved it.”

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**Ready for battle. Maybe. Mantis shrimp performs threat display, baring dark purple spots on its appendages, to defend its home.**

**The Bluffing Shrimp**

There are shrimp that fight and shrimp that lie. Twelve years ago researchers at the University of California (UC), Berkeley, reported that weaklings among the mantis shrimp *Gonodactylus breddini* bluff their way out of confrontations by putting on a threat display. Not only were other shrimp confused by the display—it scared them off—but researchers were puzzled as well. If the behavior is successful, they reasoned, all the shrimp would evolve to use it, and then no one would pay any attention to it. Useless, bluffing would be disregarded.

Now behavioral ecologist Eldridge Adams of the University of Rochester thinks he’s learned why bluffing persists. In a paper published in the August issue of the *Journal of Theoretical Biology*, Adams and Michael Mesterton-Gibbons of Florida State University explain that the threat display is only cost-effective for some members of the species, and its intermittent use leads to its persistence.

Adams, who has observed more than 500 shrimp fights, explains that the threat display—which involves spreading “raptorial appendages” and showing off big spots on them—offers a large potential benefit for molting shrimp which, having soft shells, would lose any battle they get into. But there are also costs: Making a threat makes you more vulnerable to injury in the event (continued on page 239)

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**The Violent Side of Low Cholesterol?**

Numerous studies have shown that low levels of the neurotransmitter serotonin are associated with suicidal and other forms of impulsive violent behavior. But in just the past few years, researchers have fingered a possible third party in the picture: low cholesterol. Low cholesterol levels tied to violence? It’s “an issue which is real for sure and one that has been overlooked by the cardiovascular people to some extent,” says psychiatrist Mark Linnola of the National Institute on Alcohol Abuse and Alcoholism. That reality is debatable, however: “I’m skeptical about it,” says epidemiologist David Gordon of the National Heart, Lung, and Blood Institute.

In the most extensive review to date of relevant literature (to be presented next month at a meeting of the Robert Wood Johnson clinical scholars), neurobiologist Beatrice A. Golomb of the University of California, Los Angeles, claims that “Low cholesterol may...promote violence,” and that this link may be mediated by serotonin.

The picture is still patchy. The evidence Golomb cites comes from research with both monkeys and humans. Work by Jay Kaplan of Bowman Gray School of Medicine in Winston-Salem, North Carolina, indicates that lowering dietary cholesterol in monkeys brings out more aggressive, less affiliative behavior.

Serotonin levels also go down, he says. In humans, a meta-analysis of six large studies of cholesterol-lowering drugs, done by clinical pharmacologist Matthew Muldoon and colleagues at the University of Pittsburgh, found that people taking medication actually had the same death rates as the controls—compensating for fewer heart-related deaths with more violent deaths.

One explanation for this connection, says Golomb, is that fatty acids in the blood (related to cholesterol) compete with the serotonin precursor tryptophan for binding to serum albumin. Thus, the less fat in the blood, the more tryptophan binds to albumin, and the less tryptophan is available to get to the brain.

Skeptics such as Gordon, however, point out that the effect may not be real at all. The evidence gained was “post-hoc,” he says, and was found only in primary and not secondary prevention trials—that is, trials with subjects who already have heart disease. Gordon says, however, that he hopes for more definitive evidence from a trial Muldoon is now just starting, which is specifically designed to evaluate the neurobehavioral correlates of low or lowered cholesterol.

It’s a touchy subject, says Muldoon: “So many people have made their career on identifying what’s bad about cholesterol.”
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Thus only the strongest have persisted. "What the behavior of the actions of school districts will do is that they will try to figure out how to be better off using threats," Adams says.

Robert Gibson, behavioral ecologist at UC Los Angeles, calls the case of the fighting shrimp "one of the few well-documented cases of intraspecific deception." What the researchers found, he says, is that its persistence "can be explained by individual variation in costs and benefits."

Report From School Science Front

Those who are pressing for public schools to join the information age may be discouraged to learn that in the U.S. "the average public school spent only $50 on scientific computer software and $100 on mathematics software in 1993-94." So says a report released last week, "State Indicators of Science and Mathematics Education."* A biennial production of the Council of Chief State School Officers. It goes on to state that yearly expenditures for science supplies are generally less than $1 per student.

The report is designed to take the pulse of public science education through various indicators, including student achievement scores, course offerings and enrollments, and teacher qualifications. The picture that emerges is a mixed one, although the numbers reflect some of the actions that have been taken following the dire reports about science education and public science illiteracy that have come out during the past decade.

Among the findings, for example, are that "enrollments in science and mathematics have risen significantly from 1982 to 1992" (see chart). And the percentage of high school graduates who have taken math and science courses has gone up as well—from 48% to 70% in geometry, for example, and 32% to 56% in chemistry. "The reform process obviously is resulting in the diminution of low-level courses like 'consumer math' and transition to serious courses regardless of whether students are on an academic or vocational track," says Luther Williams, director of the education directorate of the National Science Foundation, which funded the report.

The report identifies factors it considers most important for student success: They include time spent doing textbook problems ("time on task"), "moderate" testing (somewhere in between daily and never), and "frequent use of calculators." But some indicators don't always tie in with student achievement: In 1994, for example, the District of Columbia led the nation in number of certified math teachers per 1000 students. But its 8th graders were at the bottom of the list on math proficiency.

Bending Light in Einstein Crosses

Operating in what astronomers call the "serendipity mode," the Hubble Space Telescope (HST) has discovered two gravitational lenses known as Einstein crosses, in which the light from a distant galaxy bends around a second galaxy, creating four images of the galaxy when the light reaches Earth. The four-lobed patterns should eventually prove useful for testing cosmological parameters such as the rate at which the universe is expanding.

"HST is the clear winner right now" in its ability to detect such crosses, says John Huchra of the Harvard-Smithsonian Center for Astrophysics, who discovered the first Einstein cross from the ground in 1984. With its penetrating vision, the orbiting telescope could eventually double or triple the "dozen good and dozen not-so-good" gravitational lenses known now, he says.

The two crosses were found by Kavan Ratnatunga, Eric Ostender, Richard Griffiths, and Myungshin Im of Johns Hopkins University, who will report their results in the 1 November Astrophysical Journal Letters. The telescope detected the crosses when in serendipity mode, meaning the optical telescope searches star fields that happen to be in its view while other instruments are doing scheduled studies.

By combining measurements of the lobes' angular separation with other information—such as the speed at which both the source and lensing galaxy are receding from Earth—researchers can use the crosses to derive new estimates of the universe's expansion rate.

The Hopkins team still must follow up with ground-based spectroscopic measurements of the cross in order to verify that the four lobes in a given cross indeed come from the same galaxy. And follow-up, says Ratnatunga, will be "tough—even with the best [telescopes] in the world," as the crosses would likely never have been spotted in the first place without Hubble's keen vision.
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**Figure** Lane 1: 8.9 kb full-length RT-PCR product of APC transcript from 500 ng of total HeLa RNA isolated using TRIzol Reagent; lane 2: 1 kb DNA Ladder.

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**Figure** Comparison of mRNA quality purified by three different methods. Amount of GAPDH mRNA was compared to amount of rRNA remaining in each preparation. Supplier A: mRNA isolated by a guanidine isothiocyanate method and single-selection with oligo(dT) cellulose. Supplier B: mRNA isolated by a proteinase K-SDS method and single-selection with oligo(dT) cellulose. 1 and 2: mRNA isolated with the MessageMaker System and single or double selection with oligo(dT) cellulose.

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**Figure** Lane 1: λ DNA/Hind III Fragments; lane 2: 100 ng genomic DNA isolated from rabbit blood using DNAzol Reagent; lane 3: 500 ng genomic DNA, cut with EcoRI; lane 4: 1.3 kb rabbit globin PCR product from genomic DNA isolated using DNAzol Reagent; lane 5: 1 kb DNA Ladder.

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Tadashi Imagami, Chair
Pierre Corvil, Vice Chair
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K. Bernstein
K. Bernstein / J. H. Exton / M. Taubman / B. Berk
ANGIOTENSIN RECEPTORS
T. W. Schwartz
V. Kon / M. Stoll / J. Saavedra
REGULATION OF ADHESION MOLECULES BY ANGIOTENSIN
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M. Kirby / E. Olson / R. Nagai
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K. Baker
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A. Hamilton / D. Reinhardt
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D. Walt
J. Kauer / T. Lu
MICROANALYSIS
M. Wightman
A. Michael / K. Mitchell
NONSPECIFIC TRANSDUCTION
R. Jorgenson
J. Gimzewski / O. Hammil

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CLINICAL MOLECULAR CYTOGENETICS
M. Ferguson-Smith

RARE EVENT DETECTION
J. Gray

MOLECULAR EVOLUTION (NEW)
COLONY HARBORTOWN
VENTURA, CA
JANUARY 28 – FEBRUARY 2, 1996
William R. Atchley, Chair
Walter M. Fitch, Vice Chair

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F. Doolittle / M. Hasegawa

GENOME AND ORGANELLE EVOLUTION
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P. Tucker / J. Palmer / J. Doebley

NON-TREE-LIKE EVOLUTION
R. Milkman
W. Fitch / Speaker TBA

EVOLUTION OF DEVELOPMENT
ANDY CLARK
R. Raff / D. Tautz / W. Atchley

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J J Bull
D. Hillis

MOLECULAR POPULATION GENETICS
M. Goodman
M. Ruvo / C. Aquadro / D. Powers

STATISTICAL INFERENCE
B. Weir
N. Goldman / Speaker TBA

VIRAL EVOLUTION
M. Kidwelly
P. Sharp / S. Wessler

PATTERN AND FUNCTION
J. Thorne
N. Maizels / M. McClure

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IL CIOCCO
BARGA, ITALY
APRIL 28 – MAY 3, 1996
David Colman, Chair
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R. Bansal / C. French-Constant / J. Grinspan / B. Zale

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M. Chao
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DISORDERS OF MYELINATED AXONS
J. Griffin
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J. Salzer
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G. Jeserich
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I. Duncan / K. Ikenaka
K. Nave / A. Messing / W. Seeffel / D. Weinstein / P. Braun

THE NODE OF RHAVIER
B. Barres
M. Ellisman / P. Shraga / B. Trapp / V. Bennett / K. Smith

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J. C. Scott / M. Galvin

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C. Knobler / G. Fuller

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D. Johannmann / N. Abbott

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B. Lotz

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A. Kanawaroti
S. Miller / A. Weiner

POLYMERS OF LIFE
A. Schwartz
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CHEMICAL SELF-REPLICATION
G. Joyce
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RNA-BASED EVOLUTION
A. Ellington
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J. Rummel
P. L. Luisi / W. F. Doolittle

DEEP MOLECULAR PHYLOGENY
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EARTH'S EARLIEST BIOSPHERE
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J. Kerridge
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A PLANETARY BASIS FOR LIFE
W. Irvine
R. Brown / J. Kasting

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DOUBLETREE HOTEL
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Charles M. Deber / John A. Smith, Co-Chairs

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P. G. Schulz / S. K. Burley

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J. P. Tam
D. H. Rich / B. Imperiali / K. B. Sharpless / M. Goodman

RECEPTOR-LIGAND INTERACTIONS
T. K. Sauyer
T. Reisine / T. Somers / P. W. Schiller

COMBINATORIAL DRUG DISCOVERY
A. M. Felix

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K. D. Kopple
A. F. Spanola / V. J. Hruby / M. R. Ghadiri

PEPTIDE DESIGN
T. M. Kubisak
A. Hamilton / J. Chmielewski / D. F. Veber / J. A. Wells

PEPTIDES IN IMMUNOBIOLOGY AND INFLAMMATION
J. A. Smith
M. M. Davis / H. L. Ploegh / D. K. Miller

PEPTIDES AS STRUCTURAL MODELS
M. Bodansky
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PINEAL CELL BIOLOGY

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Mark Rollag, Chair
Steven M. Reppert, Vice Chair

RETINA AS MODEL FOR PINEAL
C. Craft
M. Iuvone / C. Green

PINEALOCYTE SIGNAL TRANSDUCTION
C. Chik
Y. Morita / S. Dryer / H. Korf / R. Baler

PINEALOCYTE TRANSCRIPTIONAL REGULATION
P. Voisin
P. Sassone-Corsi / D. Klein

MELATONIN ACTION
D. Blask
W. Warren / P. Morgan / C. Mahle / R. Reiter

MELATONIN ACTION IN HUMANS
J. Arendt
I. Zhidanova / A. Lewy

PINEALOCYTE ENTRAINMENT
Y. Morita
Y. Fukada / M. Max / M. Zatz / R. Barrett

RETINA-PINEAL LINKAGE
G. Brainard
I. Morgan / J. Mikkelsen

MELATONIN RECEPTORS
V. Cassone
M. Dubocovich / S. Reppert / M. Becker-Andre

MELATONIN ANALOGS
S. Reppert
B. Guardiola-Lemaitre / D. Sugden

PROLACTIN

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THE RELATIVE ROLES OF PRL AND GH IN PROLIFERATION AND DIFFERENTIATION WITHIN THE MAMMARY GLAND
D. Kleinberg / D. Flint / J. Rosen / B. Vonderhaar / S. Galosy

PROLACTIN AND RELATED MOLECULE SIGNALING
B. Groner / Y.-F. Wang / H. Rui / S. Frank

PROLACTIN-RECEPTOR INTERACTIONS
K. Young / A. Gertler / C. Ormandy

PROLACTIN IN THE IMMUNE SYSTEM
M. Dardenne / K. Kelly / S. Walker / A. Buckley

REGULATION OF PROLACTIN RELEASE
I. Clarke / K. Gregerson / M. Lorenson

PROLACTIN AND BEHAVIOR
J. Buntin / R. Bridges

REGULATION OF PROLACTIN AND GENE EXPRESSION
R. Day / A. Guttierrez-Hartman / J.-M. Boutin / E. Stanley

CLINICALLY IMPORTANT EFFECTS OF PROLACTIN AND RELATED MOLECULES
D. Linzer / A. Klibanski / C. Nicoll

BANQUET LECTURE

Sensory Transduction in Microorganisms

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MEET THE ORGANISMS
S. Parkinson
S. Parkinson / G. Sprague / J. Van Houten / R. Bourret

RECEPTORS I: STIMULUS DETECTION
J. Spadich
K. Heilingwerf / J. Spudich / M. Manson / P. Devreotes

RECEPTORS II: TRANSMEMBRANE SIGNALING
J. Hazelbauer
C. Kung / J. Falke

RECEPTORS III: SIGNALING AND ADAPTATION
P. Devreotes
G. Ordal / J. Stock

CIRCUITS I: KINASES AND PHOSPHATASES
R. Dabhoussi
R. Firtel / M. Simon

CIRCUITS II: SIGNAL PROCESSING
K. Borkovich
K. Borkovich / J. Dunlap / D. Fraga / J. Armitage

RESPONSES I: MOTILITY
S. Block
C. Aizawa / Howard Berg / J. Spudich / J. Howard

RESPONSES II: MOVEMENT CONTROL
J. Segall
G. Gerisch / M. Eisenbach / P. Matsumura

RESPONSES III: COMMUNICATION & DEVELOPMENT
J. Adler
R. Losick / D. Kaiser

REGULATION OF PROLACTIN VIRULENCE
L. Stamm
R. Cevenini / A. Weinberg / V. Tryon

HOST RESPONSES TO SPIROCHETES
S. Lukehart
J. Weiss / M. Simon / E. Fikrig / R. Montgomery

INTERACTIONS OF SPIROCHETES WITH HOST CELLS
M. Lovett
B. Guo / M. Klompner / R. Isaacs / U. Munderloh

EVOLUTION AND GENETICS OF SPIROCHETES
S. Norris
Y. Yanagihara / I. Schwartz / S. Casjens

VIRULENCE FACTORS OF SPIROCHETES
J. Benach
N. Charon / B. Adler / D. Bianco / J. Radolf

THROMBOLYSIS

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FIBRINOLYSIS AND VASCULAR DISEASE
K. Robbins
A. Hamsten / M. Reidy / M. B. Grant

GENETIC MANIPULATION AND FIBRINOLYSIS IN MICE
P. Carmeliet
J. Degan / D. Ginsburg / S. Strickland

FIBRINOlytic REGULATION
D. Loskutoff
S. Kosjima / W. D. Schleuning

STRUCTURE/ FUNCTION OF FIBRINOlytic PROTEINS
H. Pannekoek
P. J. Declerck / D. Lawrence / E. Madison

THROMBOLYTIC THERAPY
D. Collen
B. Credo / T. Love

CELLULAR RECEPTORS AND FIBRINOLYSIS
K. Hajjar
J. Menell / H. Chapman / F. Blasi

ANGIOGENESIS AND CANCER
B. M. Mueller
E. Rosen / M. S. Pepper / M. S. O'Reilly

NEW APPROACHES TO FIBRINOLYSIS
B. Sobel
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1996-97

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All application deadlines are January 15, 1996.

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