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Representation of a hexameric assembly of dendrimers (hyperbranched polymers, shown with four layers or generations). Hydrogen-bonding contacts at the core of each dendrimer and peripheral van der Waals interactions stabilize the assembly, whose size rivals that of a small protein. White, hydrogen; black, carbon; red, oxygen; and blue, nitrogen. See page 1095 and the Perspective on page 1077. [Image created by Paul A. Thiessen with PovChem (see http://ludwig.scs.uiuc.edu) on a Silicon Graphics Indigo]

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Hale-Bopp in a CO coma

Indicates accompanying feature

A few more points: The SCIENCE (ISSN 0036-8075) is published weekly on Friday, except the last week in December, by the American Association for the Advancement of Science, 1333 H Street, NW, Washington, DC 20005. Second-class postage (publication No. 484466) paid at Washington, DC, and additional mailing offices. Copyright © 1996 by the American Association for the Advancement of Science. The title SCIENCE is a registered trademark of the AAAS. Domestic individual membership and subscription (51 issues): $102 (50% allocated to subscription). Domestic institutional subscription (51 issues): $250. Foreign postage rates: Mexico, Caribbean (surface mail) $55; other countries (air assist delivery) $90. First class, airmail, student, and emeritus rates on request. Canadian rates with GST available upon request, GST #1254-80122. Printed in the U.S.A.

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Clay swelling
Some clays can swell to several times their original thickness in the presence of water, but the details of water adsorption between the layers within the clay are poorly understood. Karaborni et al. (p. 1102) present simulations of sodium-montmorillonite, an abundant clay that affects the stability of oil wells during drilling. Particularly strong swelling of this clay may result from the occurrence of two different types of stable structures, depending on the number of water layers between the clay layers. Switching between these two different stable states may facilitate the swelling of the clay.

Steps toward catalytic antibodies
Highly specific recognition of antigens by antibodies results during affinity maturation, in which an expanding population of different B cell clones compete for the same antigen. Patten et al. (p. 1086; see the Perspective by Davis, p. 1078) cloned and expressed nine affinity mutations from germline cells that occurred during the generation of an antibody that catalyzes ester hydrolysis. A kinetic analysis revealed that as the antibody evolved, its affinity for the transition-state analog increased by a factor of 10^8, and the reaction rate for the ester substrate increased by about a factor of 10^2. A crystal structure of the antibody revealed that these mutations were not in direct contact with the hapten and thus likely played a conformational role.

Listening to the air
A recently completed network of 24 Global Positioning System satellites has been used to listen to the structure of the Earth's atmosphere using radio occultation. Kurkinski et al. (p. 1107) determined preliminary vertical temperature and water vapor profiles that illustrate the enhanced resolution of this technique over limited ground-based balloon radiosonde and model data. Additional measurements should contribute to our understanding of the structure of the stratosphere and enhance weather forecasting.

Varying variegation
Locus control regions (LCRs) permit the tissue-specific expression of linked genes at high levels. Festerstein et al. (p. 1123) have studied the LCR that produces their gaseous comas when they are too cold to sublimate water-ice. Jewitt et al. (p. 1110) have determined that the bright coma of comet Hale-Bopp is due to the outgassing of CO. This rare observation of CO outgassing may be a transient brightening that will evolve into an even brighter water outgassing, visible with the naked eye, as Hale-Bopp makes its closest approach to the sun in April 1997.

CO in a comet coma
The development of sensitive millimeter-wave telescopes has allowed astronomers to observe distant comets to understand what produces their gaseous comas when they are too cold to sublimate water-ice. Jewitt et al. (p. 1110) have determined that the bright coma of comet Hale-Bopp is due to the outgassing of CO. This rare observation of CO outgassing may be a transient brightening that will evolve into an even brighter water outgassing, visible with the naked eye, as Hale-Bopp makes its closest approach to the sun in April 1997.

Regulation by release
Like other receptors, the transforming growth factor (TGF)-β receptor is expected to transmit signals to the interior of the cell through its interaction with associated proteins. Wang et al. (p. 1120) searched for proteins that interacted with the TGF-β receptor and found the α subunit of farnesyltransferase (FTN-A). FTN-A regulates the activity of small guanine nucleotide-binding proteins like Ras that participate in many signaling pathways. When TGF-β bound to its receptor, FTN-A was released. Thus, signaling by the TGF-β receptor may be mediated, at least in part, by ligand-induced release of FTN-A and consequent regulation of small guanine nucleotide-binding proteins.

Liver-specific multidrug transporter
Formation of bile requires the secretion of bile acids from the liver through a canalicular multiorganic anion transporter (cMOAT) that has been defined physiologically but whose molecular definition has remained elusive. Deficiencies in bile acid secretion leads to disease. Paulusma et al. (p. 1126) have described the isolation of the sequence that encodes cMOAT. The protein is related to known multidrug transporters and is specifically expressed in the canalicular membrane of liver cells.

from the human CD2 gene in transgenic mice. They find that the CD2 LCR was necessary to prevent variaged expression (expression in some cells of a tissue but not others) when the gene was inserted into centromeric heterochromatin. Such variegated expression was associated with a closed chromatin configuration. They conclude that the LCR functions by establishing or maintaining an open chromatin domain.
Need for Finer, More Detailed Images Puts the Focus on Fluorescence

Until fairly recently, brightfield and phase contrast were the most popular techniques used for microscopic studies. These techniques work well for studies of individual cells, but they are not adequate for imaging smaller entities such as some cellular organelles, proteins, antibodies, microtubules, RNA and DNA. Because fluorescence permits selective imaging and analysis of these substances with resolution down to several nanometers, it is becoming increasingly popular. Recent advances in optics design promise to make it an even more powerful technique.

As biomedical researchers continue to explore smaller and smaller entities, fluorescence microscopy is proving to be an exceptionally powerful tool.

Because fluorescent dyes, or fluorochromes, are absorbed selectively by different substances within a specimen, each substance can be targeted and observed separately. This has made possible techniques such as Fluorescence in situ Hybridization (FISH), for example, which has played a key role in identifying chromosomes and determining the number, size and location of specific DNA sequences in mammalian cells.

Smaller objects, finer details

Using fluorescence, scientists can resolve images that cannot be observed with ordinary light. The diameter of a single DNA molecule, for example, is about 2nm, while the finest detail that can be resolved by optical lenses is about 200nm. However, if a fluorescent dye is conjugated with the DNA molecule and the specimen is viewed with a fluorescence microscope, the molecule can be easily detected and measured.

Although it is a very powerful and relatively easy to use tool, fluorescence places extreme demands on the microscope’s optics. The near-ultraviolet wavelengths that are used to excite the specimen are very high in energy. At the same time, the light emitted from the specimen is of much lower intensity than the light used to excite it, so the imaging optics must be designed to transmit as much light as possible. Care must also be taken to prevent autofluorescence emissions, which can mask and rob contrast from the image.

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Superconductivity Researchers

Daniel Clery (Research News, 19 Jan., p. 288) did a good job of reporting the current status of the s-wave versus d-wave controversy in the field of high-temperature superconductivity. However, one key experiment was omitted. In 1995, Fred Wellstood and his co-workers presented a convincing interferometry experiment (1) using a superconducting quantum interference device (SQUID) in favor of d-wave symmetry. Wellstood's experiment answered questions raised about crucial omissions in the earlier experiments of van Harlingen et al. (2) and Brawner and Ott (3). In addition, Wellstood was the inventor of the scanning SQUID microscope (4), which enabled Tsuei et al. to perform their beautiful tricrystal ring experiments (Research Article, 19 Jan., p. 329) (5). Wellstood's institution (the University of Maryland at College Park) has been granted the patent on the scanning SQUID microscope, which has many potential uses beyond the experiments reported by Clery.

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References

A Prediction of the Bose-Einstein Condensate

I very much enjoyed the special article “A new form of matter unveiled,” by Elizabeth Culotta (p. 1902), about the Bose-Einstein condensate as well as Floyd E. Bloom’s fine editorial “Molecule of the Year 1995” (p. 1901) in the 22 December issue. I am writing to remind your readers that the idea of the macroscopic wave function for the condensate was put forward by Fritz London, who with his younger brother had already developed the idea for superconducting electrons.

A major international physics conference held after World War II was organized at Cambridge in July 1946 by Sir Lawrence Bragg and J. F. Allen. People attended who had not seen each other for many years. There were two topics, fundamental particles and low temperatures. London, then at Duke University, gave the opening lecture of the low temperature part, which he named “the present state of the theory of liquid helium.” His first paragraph refers to superconductivity and superfluidity (1).
Apparantly these phenomena represent more than just another special subject of physics. There seems to be a good reason to suspect that they are manifestations of quantum mechanisms on a macroscopic scale. If this conjecture should prove to be true it would, of course, be a matter of fundamental significance. . . Here would be a case where quantum mechanisms would directly reach into the macroscopic world.

London would have enormously enjoyed reading about the "Molecule of the Year."

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References

Air Quality in Mexico City

D. R. Blake and F. S. Rowland, in their report "Urban leakage of liquefied petroleum gas [LPG] and its impact on Mexico City air quality" (18 Aug., p. 953), state that LPG gas leakage and incomplete combustion of LPG are major precursors of ozone, the contaminant that most frequently exceeds Mexico air quality standards. Since 1992, the Instituto Mexicano del Petróleo has sampled Mexico City air and performed detailed chemical analysis of the volatile organic compounds (VOC) following the Environmental Protection Agency TO-14 protocol (1). In order to correlate the samples with ozone formation, a 3-hour sampling period was followed, as recommended by the U.S. National Ambient Air Quality Standards (2). The VOC sampling and analysis were carried out twice a year in different locations around the Mexico City metropolitan area (MCMA). From the earliest campaign (3) to the latest, in March 1995, propane and butane have been the most abundant compounds, constituting up to 30% of the VOC in the samples. These results made us aware of the impact that LPG has on the formation of ozone. The authorities have also expressed their concern about this problem.

It has been well established that the "reactivity" or relative ozone formation potential of individual VOCs differs (4). In general, alkanes and alcohols form less ozone than an equal mass of alkenes and carbonyls. More than 15 different reactivity scales have been proposed (5). The maximum incremental reactivity, developed by W. P. L. Carter (6) and chosen for regulatory application in California, has also been applied in Mexico City, with local adaptations. However, Carter (7) has suggested that this scale might not be applicable to Mexico City conditions, as it was designed for the relatively low ratios of VOC to nitrogen oxides (NOx) typical of U.S. urban areas. In contrast, the mean VOC/NOx ratio in MCMA is about four times that value (8).

The third most abundant compound found in our samples was toluene. We also found substantial amounts of ethylene, acetylene, and isopentanes—compounds mainly associated with solvent use and vehicular emissions (9). These compounds together constitute between 25 to 45% of the total VOC in the air. High concentrations of toluene have been measured during the morning traffic rush hours using remote sensing instruments. As the toluene concentration drops significantly at about 11:00 a.m., the absence of this compound in Blake and Rowland's samples may be attributed to their sampling protocol.

We also measured ambient carbonyl compounds, using the DNPH cartridge technique followed by high-performance liquid chromatography analysis (10). Formaldehyde, acetaldheyde, methylketone, benzaldehyde, i-propylmethylketone, and hexanal were the most significant carbonyls identified. Other major hydrocarbon components of the atmospheric mixture could be corre-
lated with the emissions of the approximately 3 million vehicles in the metropolitan area. In fact, the large amounts of ethylene and acetylene were used as fingerprints of car emissions, reflecting the present vehicular fleet in the MCMA. Incomplete gasoline combustion is also a common source of alkenes, the abundance of which is reported in Blake and Rowland's table 1. Fuel consumption in the MCMA also includes fuel oil, diesel oil, and gas oil (11). Blake and Rowland propose that LPG be reformulated to increase propane and decrease other components. As stated, the implementation of such a proposal should be accompanied by a major adjustment in LPG handling. Changing the composition to mostly propane would, with the current distribution and handling systems, lead to much more leakage and an associated increase in the risk of fires and explosions.

The domestic consumption of LPG in Mexico as end-use energy is equivalent to that of electricity. Even if the leakages in distribution and handling were controlled, the fugitive emissions from such a large number of residential sources might be difficult to control. Reducing VOCs from the LPG sector would not solve the ozone problem; a drastic reduction in hydrocarbon emissions would be needed across all sectors.

In our opinion, LPG contributes significantly to ozone formation but not to the extent that Blake and Rowland state. Further research on VOC reactivity under MCMA conditions is necessary before conclusive results are reached and to ensure which efforts are directed to the most effective control measures.

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References
4. A. Russell, L. McNair, M. T. Odman, in preparation.
11. V. Samano, Unidad de Control Operativa (Pemex-Refinacin, Mexico, 1995).

Response: We agree with Guzmán, Ruiz, and Vega that a drastic reduction in hydrocarbon emissions is needed across all sectors and that reducing volatile organic compounds from the LPG sector alone would not solve the Mexico City ozone problem. However, reductions in hydrocarbons from the transportation and industrial sectors alone would also not solve the ozone problem because of the significant presence of the hydrocarbons from LPG leakage. This point is particularly pertinent because the 1994 MARI joint report (1) from the Instituto Mexicano del Petroleo and Los Alamos National Laboratory lists 67 steps for improving Mexico City's air quality (1, vol. 5, pp. 7–8), none of them directed toward reducing LPG contributions. The only one that involves LPG is number 8, "convert public vehicles and delivery trucks to LP gas and install catalytic converters," which would tend, if anything, to increase the.

What does ÄKTA" (pronounced eckta) mean? If you speak Swedish well, you know that ÄKTA is a word with many meanings. If your Swedish isn't so good, don't worry. Life scientists, Swedish or not, will see what makes ÄKTA an essential research tool on February 29.

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LPG content of Mexico City air.

We are aware that the Instituto del Petróleo scientists had identified propane as a significant hydrocarbon in their earlier studies (reference 3 in their comment is reference 7 in our report) and that they had also qualitatively identified LPG as a source for propane (reference 9 in their comment). Nevertheless, as we discussed in our report, the 1994 MARI report (which cites both references 3 and 9 of their comment) states (1, vol. 3, p. 82), without any mention of LPG emissions, that

[The major sources of VOCs in the atmosphere include exhaust and evaporative emissions from motor vehicles, evaporative emissions from chemical and petroleum industries. Recently, the importance of biogenic emissions (emissions from vegetation) has been pointed out as a major source of VOCs.

The most prominent LPG alkane in our data is propane, and there is no mention of measured propane concentrations in Mexico City anywhere in the five-volume report. The MARI report also provides an emissions inventory for VOCs in which "residential combustion" accounts for 331.2 metric tons per year out of a total of 624,954.3 metric tons per year (1, vol. 3, p. 88). We commented in our report that this 1994 MARI estimate of 331 metric tons from "residential combustion" seemed much too small for an area with annual sales exceeding 2 million tons and that LPG leakage needed to be included in the calculations. We agree that further research on the composition and reactivity of all of the hydrocarbons in Mexico City air is urgently needed if major progress is to be made toward solution of their serious air pollution problem.

The statement at the end of the third paragraph of their comment—"the absence of this compound [toluene] in Blake and Rowland's samples may be attributed to their sampling protocol"—is puzzling, because toluene was present in all of our samples and was so reported. Our table 1 reported the measured abundances of 25 hydrocarbons in four typical samples from our 1993 experiments, and toluene was reported as present in all of them. Indeed, when expressed in the units "ppbC" used in the MARI reports, toluene is the third most abundant hydrocarbon after methane and propane in the nighttime Zocalo sample of table 1 in our report. However, the trend in our own data for toluene does not support the statement that "toluene concentration drops significantly at about 11:00 a.m." We have regularly observed more toluene at noon than at 6:00 a.m., as noted in our report. This difference could be the result of a more complicated diurnal dependence, as well as our use of samples, each collected in less than 1 minute rather than 3 hours. We prefer the near instantaneous collection procedure because we are greatly interested in the correlations among the individual hydrocarbon concentrations and believe the mixing of aliquots of air collected over several hours tends to complicate these signals.

As everyone recognizes, changing the composition of LPG gas toward higher total vapor pressure (for example, toward more propane) and lower chemical reactivity is not likely to be helpful with an overall system that already has a high rate of leakage. Our recommended reduction in the butene composition does not have this problem because the vapor pressures of the butanes and butenes are similar. If the composition of LPG sample M134 in table 3 of our report were hypothetically altered by substitution of n-butane for all of the C4 unsaturated compounds, then the total hydrocarbon reactivity would be reduced by about a factor of 2. For major overall hydrocarbon reduction in the LPG sector, however, the loss of unburned LPG at all stages of its handling must be addressed. This is obviously a difficult task because it involves about 5 million individual heating and cooking sources.

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References and Notes
1. The Mexico City Air Quality Initiative (MARI) is described in a five-volume study produced by a collaboration between the Los Alamos National Laboratory and the Instituto Mexicano del Petróleo and published as Los Alamos Rep. LA-12699 (1994).

Climate Change Consensus

I would like to reply to a letter by S. Fred Singer (2 Feb., p. 581). I also attended the Madrid meeting of the United Nations-sponsored Intergovernmental Panel on Climate Change (IPCC) in November 1995 and remember Singer's presence. As a nongovernmental organization (NGO) representative along with others in the environmental- and industry-sponsored lobbying groups, he was invited to attend and allowed to participate. Although he disputes the records of temperature change in his letter, I remember him asking only one question on ozone depletion and ultraviolet-B. He had full access to all meetings and on several occasions sought for and was given one-on-one meetings with several of the scientists present.

The IPCC summary is indeed a summary and does not include every piece of information that went into the full report. Much more supporting material, including most of the eclectic collection of facts highlighted
by Singer are noted, referenced, and used by the scientists in drawing their conclusions. The supporting technical document (not formally approved by the IPCC) was reviewed by more than a hundred scientists worldwide as well as the governments participating in IPCC and the NGOs like Singer’s. The brief summary document of Working Group I from Madrid in this case involves a choice of wordings agreed upon by the scientists and governments present.

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HIV Viral Load Assay

The splendid Article “Toward an understanding of the correlates of protective immunity to HIV infection” by Barton F. Haynes et al. (19 Jan., p. 324) states (p. 327) that “More sensitive and inexpensive assays of HIV viral load are needed to determine the level of HIV infection in various tissues.” A sensitive, inexpensive (on a scale of magnetic resonance imaging scans) method for estimates of viral RNA in tissues (1) has been available for several years (Fuji Medical Systems USA, Stanford, Connecticut). Other nonradioactive assays of viral amplification including proviral DNA are under intensive development.

Cecil H. Fox
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E-mail: jugibbs@us.net.com

References

Response: We appreciate Fox bringing this assay to our attention. This and related assays need consideration and further study in clinical research studies.

Barton F. Haynes
Department of Medicine, Duke University Medical Center, Durham, NC 27710, USA

Letters to the Editor

Letters may be submitted by e-mail (at science_letters@aaas.org), fax (202-289-7562), or regular mail (Science, 1333 H Street, NW, Washington, DC 20005, USA). Letters are not routinely acknowledged. Full addresses, signatures, and daytime phone numbers should be included. Letters should be brief (300 words or less) and may be edited for reasons of clarity or space. Letter writers are not consulted before publication.
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0 10 30 60 180

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- p42 MAPK

B. control MAPK Ab
- p44 MAPK
- p42 MAPK

Control

EGF

Western Blotting of cell extracts from Saos cells treated with Hydroxyurea (G1/S) or Nocodizate (G2/M) with A. phospho-cdc2 (Tyr15) B. control cdc2 antibody.
Scientists Not Worth Wooing?
Researchers like Representative Robert Walker (PA), who chairs the House Science Committee, dismiss Vice President Al Gore's recent blitz of science and technology speeches as political posturing with an eye on the November elections. But last week in a brief roundtable with reporters, Gore sought to lay to rest the charge that the White House is wooing the science community's votes—and showed a certain cynicism about the importance of the science vote.

"Yeah, those scientists are a major political bloc," Gore said sarcastically. "In places like Iowa and New Hampshire, you can just see them out there turning the tide." Instead, Gore insists that his recent defense of the Administration's R&D plan is for a purer purpose: "We think it is the right thing for the country."

Agencies Debate Safe Mercury Levels in Fish
The Environmental Protection Agency (EPA) and other agencies are sparring over a pending report to Congress that suggests stronger controls on mercury exposure may be needed, and the debate may only escalate in view of new studies that reach different conclusions about the hazards of mercury in fish.

The report, mandated by the 1990 Clean Air Act, describes U.S. mercury emissions and sums up their effects on health. When EPA released a draft last fall, the Food and Drug Administration became concerned that EPA's health risk estimate could cause FDA to adopt a more stringent standard.

Feeling fine. Seychelles study has found no mercury effects in kids whose mothers eat lots of fish.

"action level" for safe levels of methylmercury, a potent neurotoxin, in fish. FDA inspects seafood based on this level, now one part per million, and many states rely on it to restrict fishing.

The risk estimate in EPA's draft implied that FDA's action level should be three to five times lower, says FDA toxicologist Michael Bolger. FDA charged that the EPA's analysis relied too heavily on extrapolations from a study involving the Seychelles. To date, no mercury effects in kids whose mothers eat lots of fish have been found.

Panel to Review British Universities
The British government, facing a deepening crisis in the quality of higher education, this week launched a review of the country's universities that may lead to major institutional changes by the end of the decade. The scale of the agenda—covering the system's purpose, size, and funding—"exceeds anything facing higher education since the early 1960s," says Gillian Shephard, education and employment secretary.

Pressures on universities have mounted since the government expanded student enrollment 3 years ago while continuing funding cuts that have reduced spending per student by one-third since 1989 (Science, 2 February, p. 688). Deteriorating staff salaries and conditions have paid for the expansion, and quality is suffering, says a spokesperson for the Committee of Vice Chancellors and Principals. Universities are threatening to impose a $450 surcharge on new students next year unless the cuts are reversed.

In response, Shephard has set up an independent review, to be chaired by Ron Dearing, chair of the School Curriculum and Assessment Authority. The review is expected to result in recommendations to Parliament on coping with the funding crisis. The panel will also look "at the balance between teaching and research," Shephard says. Funding cuts have hit science departments directly, with money for new equipment and buildings slashed by 30% in November. Last week, Shephard also invited vice chancellors to join a separate investigation of the effects of the November budget and government efforts to increase private investment in universities.

One option the Dearing panel may recommend is scrapping Britain's principle of providing free tuition to most students. But the electorate isn't likely to welcome such a measure, and the panel will not release its report until mid-1997, after the election has been held.

Reaching Out to Eastern European Telecom Scientists
The Iron Curtain may be history, but try sending a message to Central and Eastern Europe (C&EE). Much of the region relies on antiquated telecommunications equipment that complicates long-distance calling and limits Internet access to e-mail. To address this problem, the European Union (EU) is stepping up efforts to involve C&EE researchers in an ambitious new telecommunications research program.

The 5-year program, called Advanced Communications Technologies and Services (ACTS), supports groups of partners studying telecommunications technologies such as satellite systems, "virtual" Internet work environments, and interactive television. Last year, the EU committed 432 million ECU ($540 million) for a first round of peer-reviewed ACTS projects. But of 119 projects selected for funding so far, only one has a C&EE partner—Russia's Rubin Research Institute, C&EE scientists "may just not have had the means to go and look for partners or invest in traveling," says former ACTS Director Roland Hübner, who retired this month. Another problem, claims Yorri Arzoumanian, a dean at the State University of Telecommunications in St. Petersburg, Russia, is that Western European telecom scientists "don't believe they can find something interesting in Russia."

ACTS officials held a workshop in Budapest last November in hopes of encouraging more C&EE proposals before the 1 March deadline for a second round of awards, and this time about 6 million ECU has been set aside for C&EE projects. That's good news for researchers like St. Petersburg State Technical University radiophysicist Yuri Yavon, who has submitted a proposal on mobile microwave communications. Says Yavon: "No funding or support from the Russian government [for such research] is available now, and I have no [other] hopes."
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- Presented abstracts at American Society for Cell Biology Conferences, Symposium of the Protein Society, Annual Meeting of The American Society for Virology, and International Symposium on Column Liquid Chromatography.
- Prior to Sigma, worked five years in a molecular biology group in the pharmaceutical industry.
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For two centuries, nobody has been able to think of the era of the sciences without referring to what happened, albeit unseen, during the French Revolution, when the scientists quite plainly took power. An astronomer was Mayor of Paris, the inventor of topology was at the head of the Committee for Public Health, the scholars occupied the institutions before the people did and in their place, and a geometrician, although a minor, gained the title of Emperor. The nobility and the clergy collapsed, society no longer lived according to the same divisions or the same offices, scientists at last formed a class or a genus, replacing the clerics and forming a new Church.


Perhaps Roi Soleil (a.k.a. Louis XIV) would have called himself the Proton King or DNA King had he known about the nuclei of atoms or cells. Sexually he was surely the Alpha Baboon King.

—Tyler Volk, in Metapatterns, Across Space, Time, and Mind (Columbia University Press)

Phosphorylators

Protein Kinases. JAMES ROBERT WOODGETT, Ed. IRL (Oxford University Press), New York, 1995. xvi, 273 pp., illus. $85 or £55; paper, $46 or £29.50. Frontiers in Molecular Biology.

Since the discovery more than 40 years ago that enzyme activity could be regulated by phosphorylation, the protein kinase field continues to grow at a remarkable pace. In the early years attention was focused on regulation of specific processes with the sequential discoveries of phosphorylase, phosphofructokinase, glycogen synthase, and pyruvate dehydrogenase phosphorylation. However, in the late 1960s the target for the ubiquitous second-messenger cyclic AMP was identified as a protein kinase with broad substrate specificity, ushering in what was regarded as an explosion of information on protein phosphorylation mechanisms and regulatory schemes involving a variety of cellular processes. By 1980 this field was composed of a relatively few, biochemically identified protein serine/threonine kinases. About 50 enzymic and nonenzymic proteins were reported to undergo phosphorylation-dephosphorylation reactions. Phosphorylation schemes involved contractile, membrane, ribosomal, nuclear, and cytoskeletal proteins in addition to metabolic pathways.

It turns out that this period could be better described as a pop than an explosion. With the recognition of a striking sequence similarity in the catalytic cores of both protein serine/threonine kinases and newly discovered protein tyrosine kinases, molecular cloning has led to the identification of more than 175 different kinase genes in the eukaryotic protein kinase superfamily. Additionally, investigations have shown that it borders on the unusual for a cellular protein not to be phosphorylated. Although a catalog of the basic properties of individual protein kinases has recently been completed, under the title The Protein Kinase FactsBook (G. Hardie and S. Hanks, Eds.; Academic Press, 1995), the identification of additional protein kinase genes is expected to continue at a brisk pace.

One aim of the book entitled Protein Kinases is “to create a manageable resource, a compilation of protein kinase information in an accessible form,” and it includes eight chapters written by experts in their respective fields. In contrast to the Protein Kinase FactsBook, this book is not meant to be an encyclopedic database but “to take stock of this extended family before we are all overwhelmed by sheer complexity” by focusing on the general properties of the more prevalent families. Frankly, many of us already feel overwhelmed. The book takes good “stock” of the field, starting with a chapter on the biochemical properties and crystal structure of the catalytic subunit of cyclic AMP-dependent protein kinase, a prototypical kinase that has provided molecular insights into the operation of many members of the protein kinase superfamily. This chapter is followed by one on the structural aspects of substrate and pseudosubstrate interactions with the catalytic cores of cyclic AMP-dependent protein kinase and other kinases. The subsequent chapters deal with family members of the superfamily including protein kinase C, S6 and MAP kinases, cyclin-dependent protein kinases, receptor protein tyrosine kinases, nonreceptor protein tyrosine kinases, and genetic approaches to protein kinase functions in lower eukaryotes. In general the authors have succeeded in taking a valuable snapshot of these families, but because the literature was reviewed only up to 1993 the treatment of some areas is now out of date. Strengths found in most chapters include description of historical developments for particular families and liberal use of tables and figures to explain confusing terminology and nomenclature. A surprising theme to emerge in some chapters is how little we know about the regulation of many protein kinases in vivo and about the identity of physiologically important substrates for kinases that have been around for a long time. It appears that we are still in the exponential phase of the information growth curve on protein kinases.

There are a few things to quibble about in the presentations. It would have been useful to have a conclusion and perspective section at the end of each chapter. The shorter chapters are a bit too sparse and could have benefited from inclusion of more examples of regulation and substrate recognition in biological systems. However, the book certainly makes a significant contribution and will serve as a valuable resource for students, teachers, and investigators who have either a casual or vested interest in protein kinases.

James T. Stull
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Books Received


Constitutional Resistance to Infection. Cees M. Verduin et al., Eds. Springer-Verlag, New York, and Landes, Austin, TX, 1995 (distributor, CRC Press, Boca Raton, FL), xvii, 191 pp., illus. $79. Medical Intelligence Unit.


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U.S. Eases Scientific Access to Cuba

U.S. scientists now have greater opportunities for research and exchange with their counterparts in Cuba, as part of recent U.S. policy changes that eased the economic embargo on this Caribbean nation. The new regulations were described by U.S. officials in a panel at the AAAS annual meeting in Baltimore this month.

The United States has had an economic embargo on Cuba since the early 1960s. U.S. scientists could work there with restrictions, but access was tightened in 1994 after the Cuban raft migration. Last October, as part of bilateral negotiations, President Clinton issued a new policy on Cuba that eased the economic embargo. It opens access to Cuba for U.S. scientists and permits more extensive scientific cooperation between the two countries.

In line with the changes, AAAS is exploring ways of strengthening U.S.-Cuban scientific interaction, according to Jeff Stann, head of the Association's Western Hemisphere Program. He met with scientists and government officials in Cuba last month during a trip organized by the Center for Marine Conservation (CMC), a U.S. non-governmental organization. CMC, the Smithsonian Institution, and a handful of other groups have been doing limited research in Cuba, mainly in biodiversity and environmental issues. The new U.S. policy should expand such work and open up other areas of mutual scientific interest, Stann said.

AAAS can help boost U.S.-Cuban cooperation, he said, by promoting exchange between scientific societies in the two countries, improving access to scientific information in Cuba, and aiding the distribution of much-needed scientific equipment. "Cuba has a strong tradition of learning and leadership of knowledge in Latin America," Stann said, "it's crippled without access to what's going on in the rest of the world."

For information, call Stann at 202-326-6657 or send a message by E-mail to: <jstann@aaas.org>.

Upfront View of Downsizing and S&T

Prospects for science and technology in an era of downsizing is the focus of the 21st AAAS Colloquium on Science and Technology Policy, scheduled for 17 to 19 April at the Omni Shoreham Hotel in Washington, D.C. The colloquium, which comes after the release of the President's budget but before final congressional action, will provide an overview of the federal funding picture and examine consequences for science and technology (S&T). John H. Gibbons, assistant to the President for science and technology, is the keynote speaker. Presentations will include a look at new models of S&T's role in the economy, conservatives' views of S&T issues, criteria for federal support, and U.S. S&T policies in a global context.

Registration information is available at AAAS's World Wide Web site at <http://www.aaas.org>; by E-mail at <snelson@aaas.org>; or by phone at 202-326-6600.

Association Honors Major Contributors to Science

Recipients of AAAS awards for 1995-96 were honored 10 February at the annual meeting in Baltimore. The winners, who represent a cross section of the scientific and engineering communities, were selected for excellence and achievement in their chosen fields.

AAAS Award for Public Understanding of Science and Technology
Cornell University professor and astronomer Carl Sagan received the award for devoting much of his nearly 30-year career to conveying the excitement and importance of scientific findings to a broad public.

AAAS Philip Hauge Abelson prize
The recipient was William O. Baker, retired board chairman of AT&T Bell Laboratories, Inc., for his exceptional career in advancing science and technology, as well as his efforts in applying science and technology to meet national needs, in reforming the educational system, and in promoting government-industry-university cooperation.

Scientific Freedom and Responsibility Award
Hastings Center co-founder Daniel Callahan was honored for fostering an understanding of ethical challenges posed by progress in biomedical science, initiating dialogue between humanists and scientists, and establishing a forum for continuation of that dialogue.

AAAS Mentor Award
Diana Cox-Foster, an assistant professor of entomology, received the award for outstanding accomplishment in guiding young women into science during her 8 years at Pennsylvania State University.

AAAS Mentor Award for Lifetime Achievement
University of North Carolina entomology professor Lawrence Irwin Gilbert was honored for his 35-year commitment to mentoring and for fostering diversity at his institution.

AAAS Hilliard Roderick Prize in Science, Arms Control, and International Security
The chairman of the Russian Duma's Subcommittee on International Security and Arms Control, Alexei Arbatov, received the prize for his leadership, analysis, and public advocacy in controversial arms control issues, which has helped to advance important international arms control agreements.

AAAS Newcomb Cleveland Prize
This prize recognizes excellence of a paper published in Science. The award was given to co-authors Georg Halder,

AAAS Science Journalism Awards


- Magazines: The winner in this category was Alan Burdick for "Invasion of the Nature Snatchers," published in the 19 November 1994 New York Times Magazine. It examined the effects that alien species can have on certain environments.

- Television: Nebraska ETV Network's Gary Hochman was honored for producing "Buried in Ash," aired 29 November 1994 on public television's "NOVA," which traced the painstaking process of paleontological discovery.


DNA Synthesis Chemistries
UltraFAST DNA synthesis chemistries, for use with ABI synthesizers from Perkin-Elmer, significantly reduce the time for post-synthesis cleavage and deprotection, which makes up the largest block of oligonucleotide processing time. Users can reduce the time for on-line cleavage and off-line deprotection from 2.5 hours to 10 min. Beckman Instruments. Circle 133.

Reversible Gel Stain
The 5 Minute Reversible Gel Stain is a single-step protocol for staining protein bands in sodium dodecyl sulfate-polycrylamide gel electrophoresis gels. Destaining is not necessary to see the protein bands. The stain is based on copper ions that produce colorless images of protein bands against a semi-opaque background. The stain has greater sensitivity than Coomassie blue, and gels can be destained for transfer or electrophoretic. Geno Technology. Circle 134.

Cloning Kits
The 3G Blue Cloning Kit is a prokaryotic system to assist in cloning polymerase chain reaction (PCR) products quickly and efficiently. It is based on the creation of heteroduplex PCR products with a 5’-GGG overhang. The heteroduplex is easily generated with sets of related PCR primer pairs supplied by the manufacturer. The TC Blue Cloning Kit is based on the T-A principle with an enhancement to the low efficiencies associated with Taq-generated 3’ G or 3’ C overhangs. This new design provides a greater assurance of positive transformants and more convenient post-cloning manipulations. National Biosciences, Inc. Circle 135.

Laminar Flow Enclosure
The VL24 is a low-cost polymerase chain reaction work environment that provides laminar flow protection and ultraviolet lighting to prevent the contamination of nucleic acid samples by airborne particulates or earlier experiments. The ultraviolet lighting inactivates DNA and RNA contamination within minutes to ensure reliable results during sample preparation for nucleic acid amplification. Sample protection is provided.