

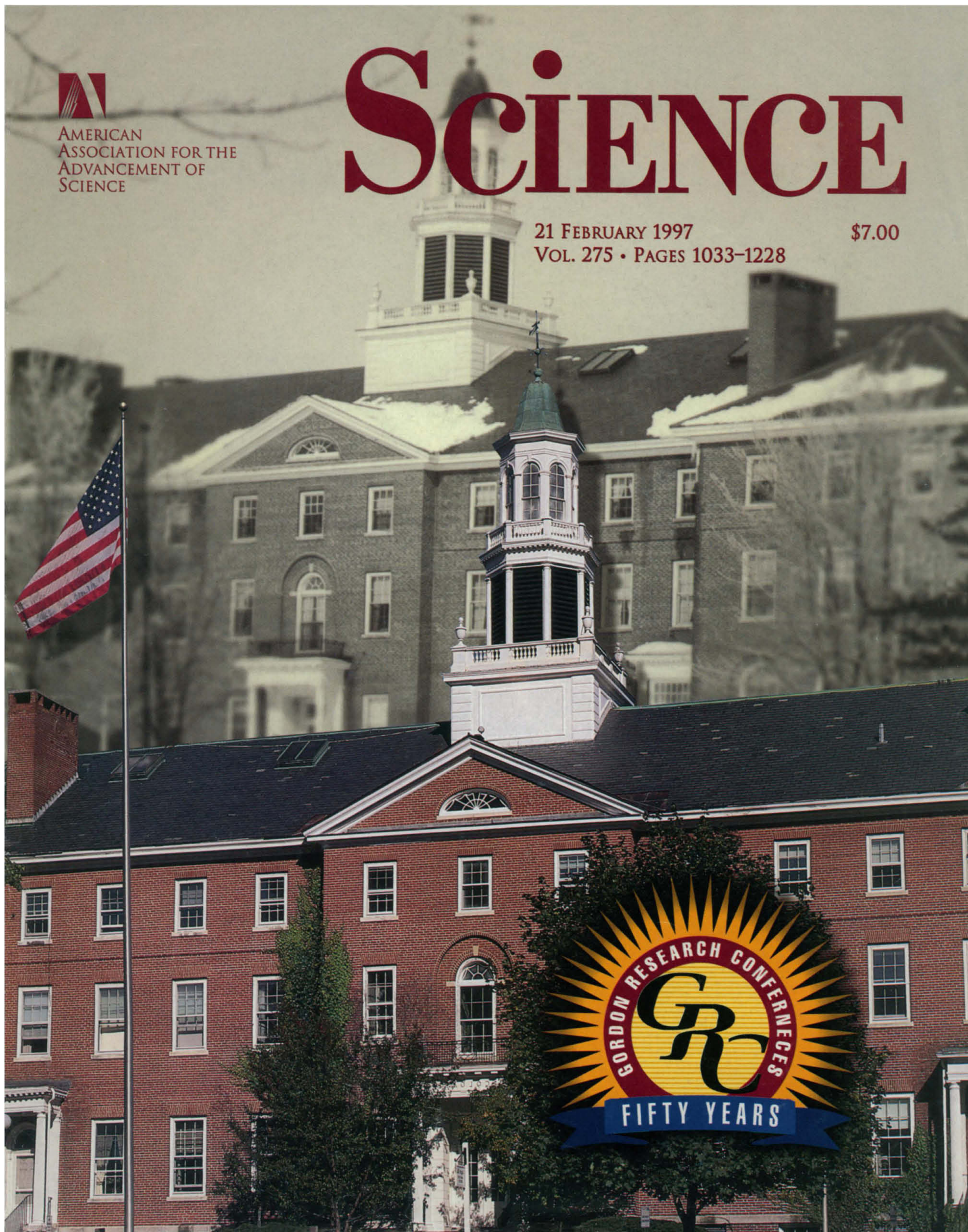


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# The Future of Microplate Assays Is Here — 384-well Radioisotopic and Luminescence Counting!

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The diagram illustrates the role of IL-5 in eosinophil migration and activation. It shows a sequence of events starting from the bone marrow, where IL-5 is present. IL-5 promotes the maturation and migration of eosinophils from the bone marrow into the tissue. In the tissue, eosinophils are activated by various factors, including IL-4, IL-5, and IL-13, which bind to receptors on their surface. This activation leads to the release of cytotoxic granules (containing major basic protein, eosinophil peroxidase, and eosinophil cationic protein) and the production of reactive oxygen species. The diagram also shows the interaction of eosinophils with other cells, such as macrophages and mast cells, which can further modulate their activity. The overall process is regulated by a complex network of cytokines and chemokines, including IL-1, IL-2, IL-3, IL-4, IL-5, IL-6, IL-7, IL-8, IL-9, IL-10, IL-11, IL-12, IL-13, IL-14, IL-15, IL-16, IL-17, IL-18, IL-19, IL-20, IL-21, IL-22, IL-23, IL-24, IL-25, IL-26, IL-27, IL-28, IL-29, IL-30, IL-31, IL-32, IL-33, IL-34, IL-35, IL-36, IL-37, IL-38, IL-39, IL-40, IL-41, IL-42, IL-43, IL-44, IL-45, IL-46, IL-47, IL-48, IL-49, IL-50, IL-51, IL-52, IL-53, IL-54, IL-55, IL-56, IL-57, IL-58, IL-59, IL-60, IL-61, IL-62, IL-63, IL-64, IL-65, IL-66, IL-67, IL-68, IL-69, IL-70, IL-71, IL-72, IL-73, IL-74, IL-75, IL-76, IL-77, IL-78, IL-79, IL-80, IL-81, IL-82, IL-83, IL-84, IL-85, IL-86, IL-87, IL-88, IL-89, IL-90, IL-91, IL-92, IL-93, IL-94, IL-95, IL-96, IL-97, IL-98, IL-99, IL-100, IL-101, IL-102, IL-103, IL-104, IL-105, IL-106, IL-107, IL-108, IL-109, IL-110, IL-111, IL-112, IL-113, IL-114, IL-115, IL-116, IL-117, IL-118, IL-119, IL-120, IL-121, IL-122, IL-123, IL-124, IL-125, IL-126, IL-127, 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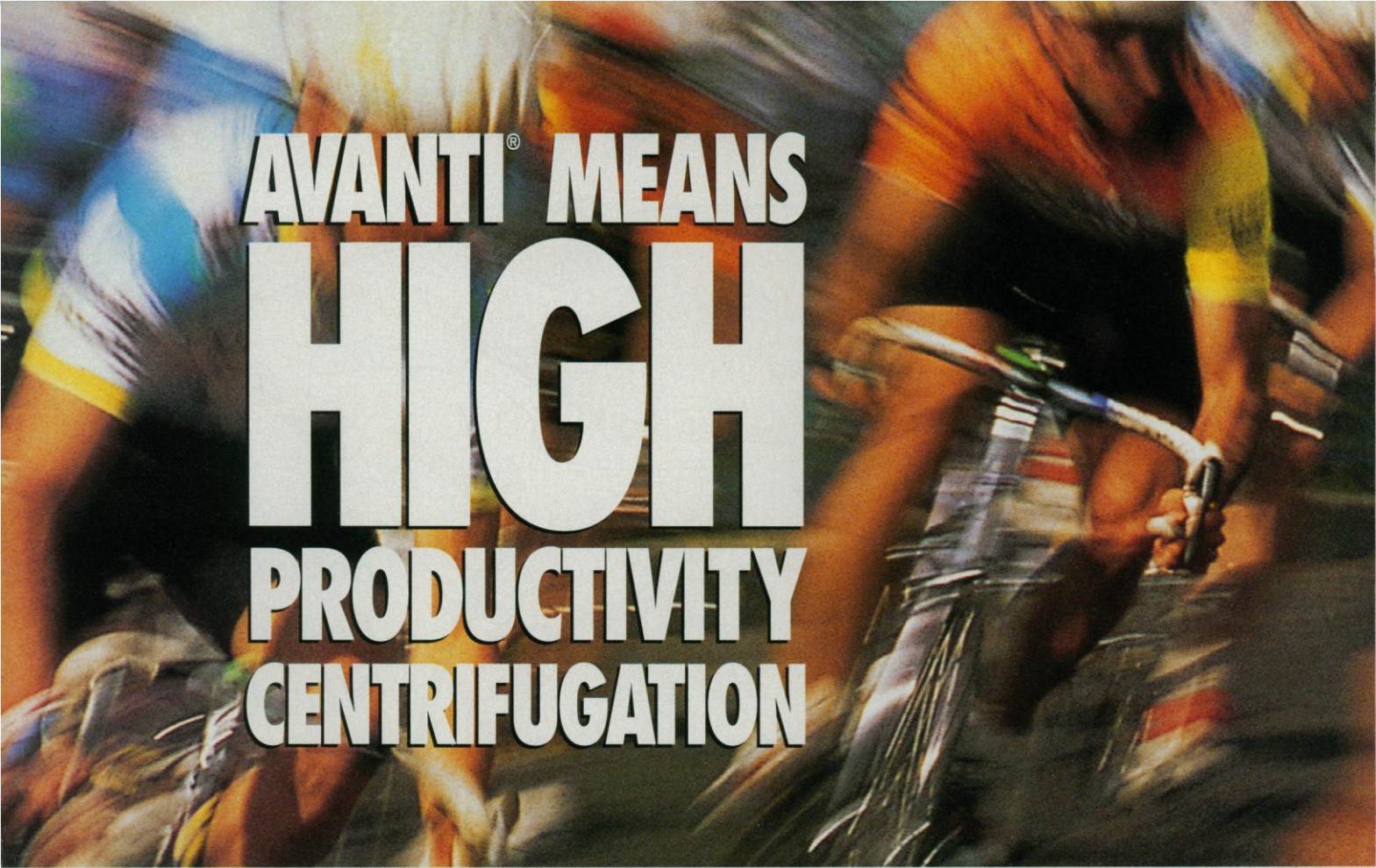
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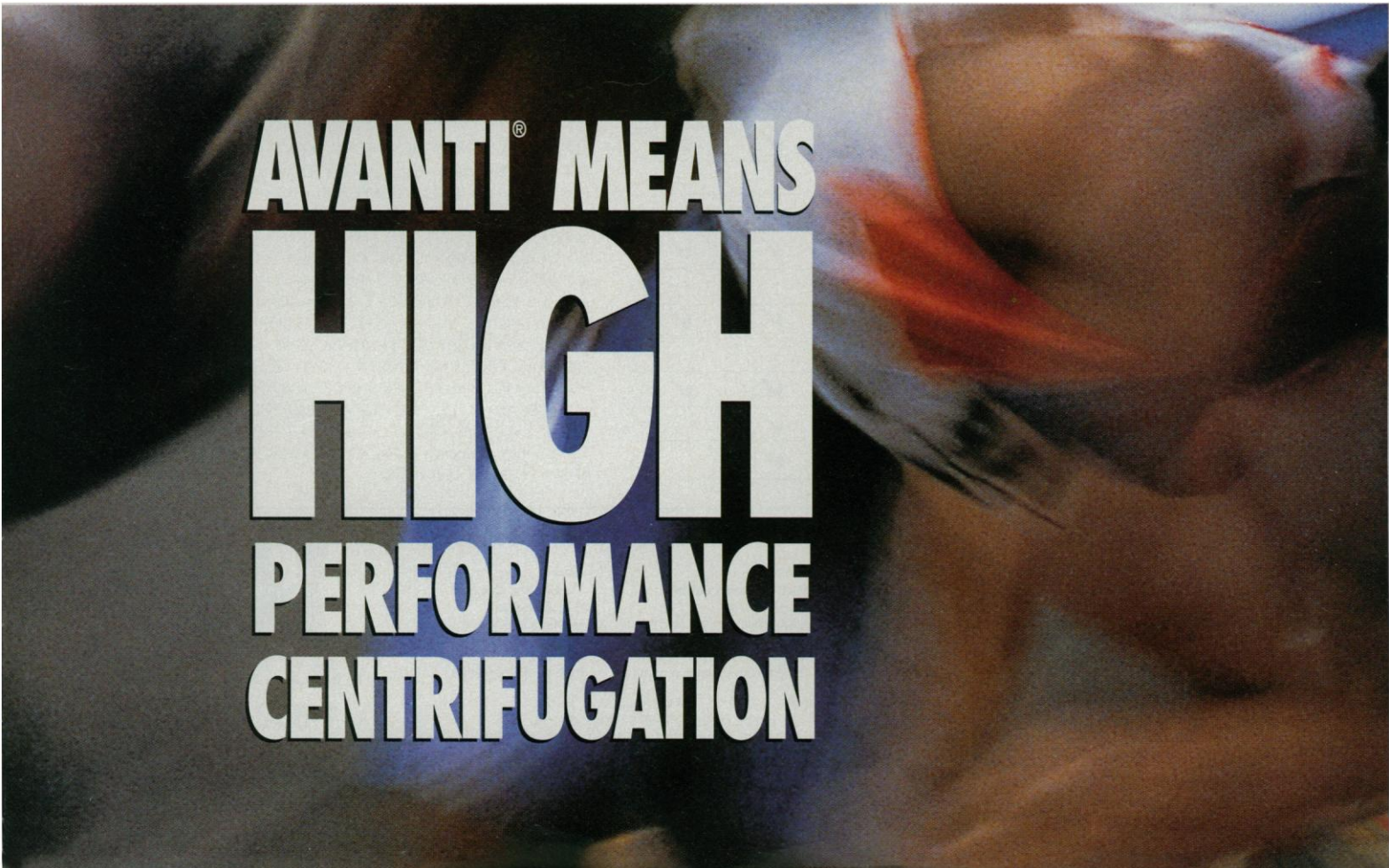
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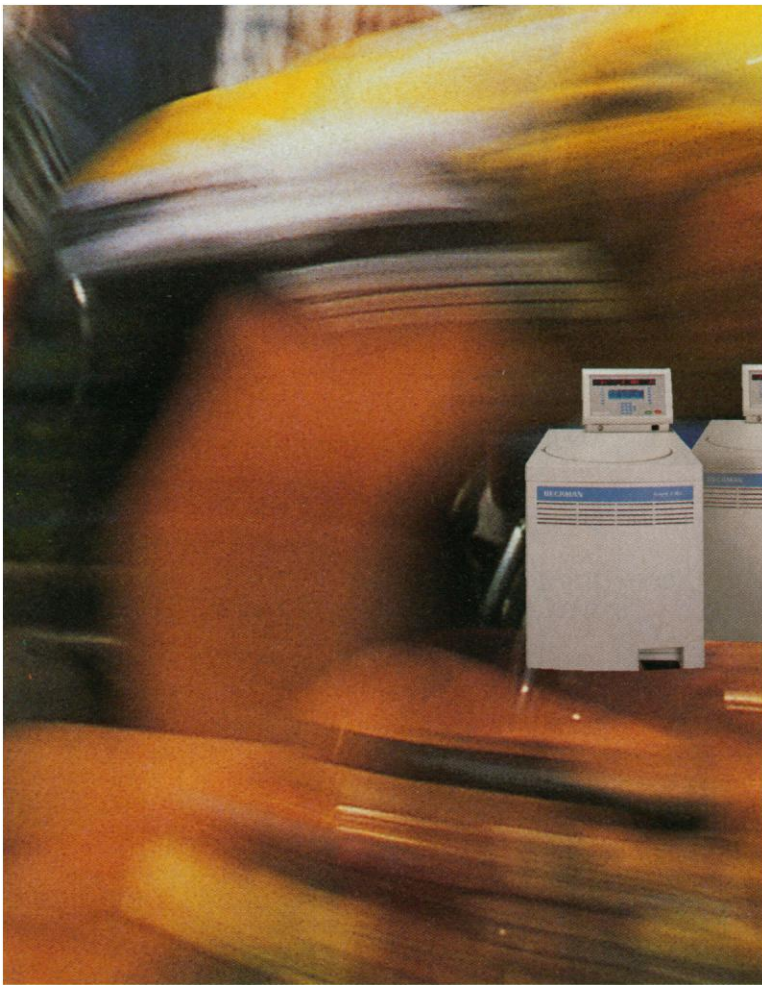


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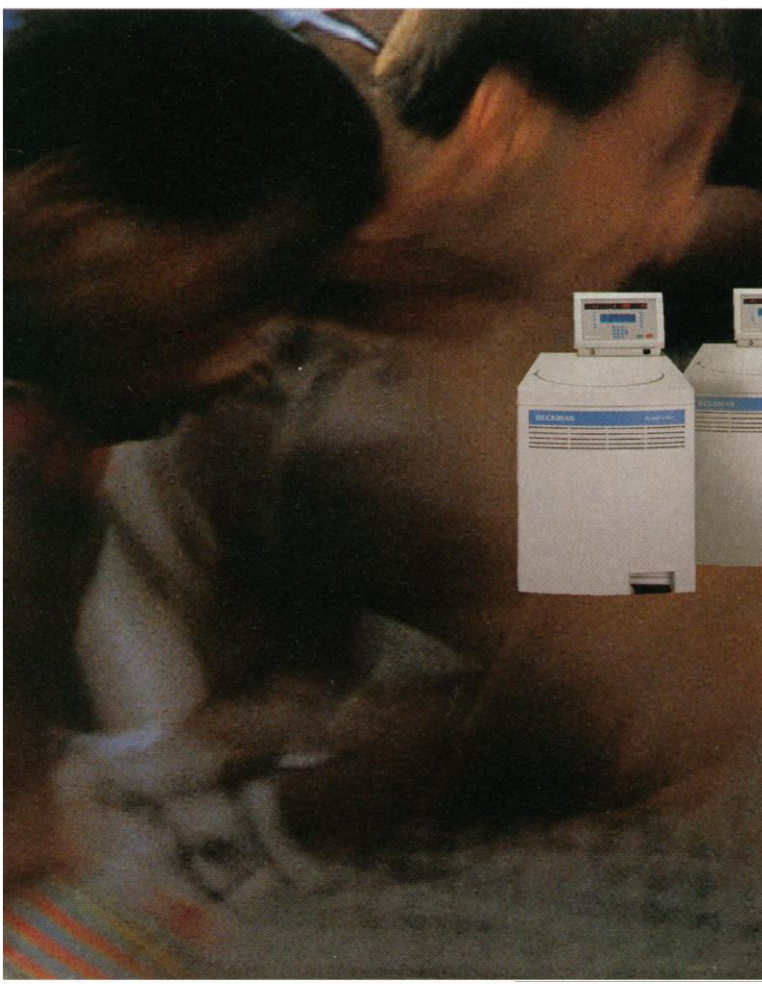
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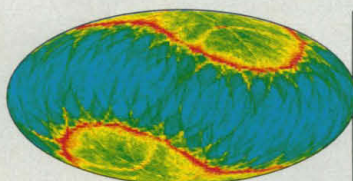
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Celestial mountainmaker



1080 & 1116

Spawning seaweed

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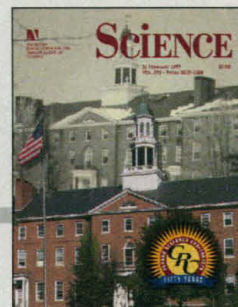
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## COVER

In 1947, after 16 years of meetings in the Maryland Chesapeake Bay region, the Gordon Research Conferences moved to Colby Junior College (now Colby-Sawyer College) in New London, New Hampshire. Of the 10 Gordon Conferences that met in the summer of 1947,

seven will meet this year. The meetings will take place in California, New Hampshire, Rhode Island, and France and are noted with a "50 Years" symbol in the schedule announcement beginning on page 1143. [Photos: Colby-Sawyer College. Photo collage: Tracy Keaton Drew]



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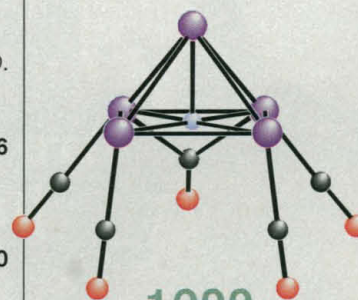
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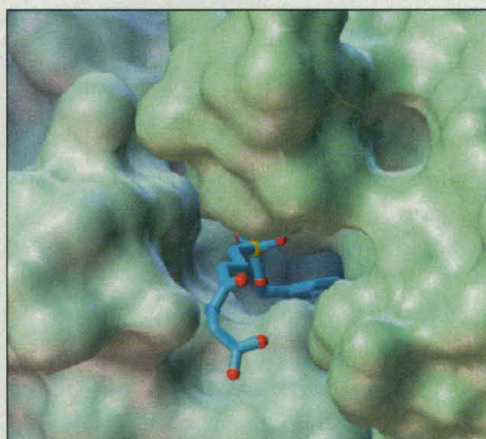
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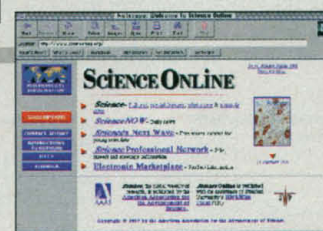
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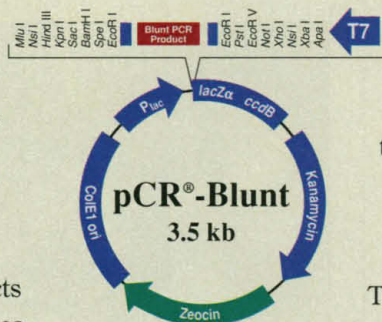
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# THIS WEEK IN SCIENCE

edited by PHIL SZUROMI

## Superconductivity and symmetry

There is still no complete model that explains why electrons form Cooper pairs in the high-temperature superconductors and cease to do so above their transition temperature. Zhang (p. 1089) now presents a theory which uses rotational symmetry in five dimensions,  $SO(5)$ , to relate the  $d$ -wave superconducting state to antiferromagnetism in the higher temperature insulating state. Generalized phase diagrams can be constructed with the model to relate transitions to the chemical potential (doping level) of these oxide materials. In a Perspective, Nagaosa (p. 1078) discusses how this theory relates to previous models and outlines the challenges still to be met in understanding high-temperature superconductors.

## Copper decorations

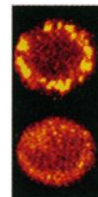
The scanning tunneling microscope has been used to place small copper clusters onto the surface of a gold electrode. Kolb *et al.* (p. 1097) deposited copper electrochemically from solution onto the end of the tip. The tip is given a controlled voltage pulse that causes it to touch the surface momentarily and transfer a small cluster. Patterns and arrays can be formed by repeating the process.

## Singling out molecules

Two reports focus on single molecule measurements. Monitoring the diffusion of single molecules in free solution requires high temporal and spatial resolution. Xu and Yeung (p. 1106) show that fluorescence

## Molecular connections in apoptosis

Insights into the role played by molecules that interact to regulate programmed cell death, or apoptosis, are presented in four reports (see also the Perspective by Golstein, p. 1081). Studies on the nematode (*Caenorhabditis elegans*) have shown that CED-9 (which corresponds to Bcl-2 in mammals) can protect cells from death induced by CED-3 (which corresponds to ICE, or interleukin- $1\beta$ -converting enzyme, in mammals) and CED-4, but the mechanism for this inhibition has been unclear. Chinnaiyan *et al.* (p. 1122) show that CED-4 can simultaneously bind both CED-3 and CED-9, and Wu *et al.* (p. 1126) show that CED-9 localized CED-4 to intracellular membranes, thus removing it from the cytosol. Another role for Bcl-2 was identified by Yang *et al.* (p. 1129) and Kluck *et al.* (p. 1132), who showed that Bcl-2 can block apoptosis by preventing the release of cytochrome *c* from the mitochondria.



images of a thin layer of solution recorded with an intensified charge-coupled-device camera allows continuous monitoring of single molecules at submillisecond time scales. The diffusion coefficients of the molecules could be determined from these measurements. Nie and Emory (p. 1102) present a technique that provides complementary information to the methods that are conventionally used in single-molecule studies, such as laser-induced fluorescence. Surface-induced Raman scattering of single molecules that were attached to nanoparticles showed enormous enhancements of their scattering efficiency for selected nanoparticles; the signals are more intense and stable than those obtained by fluorescence measurements.

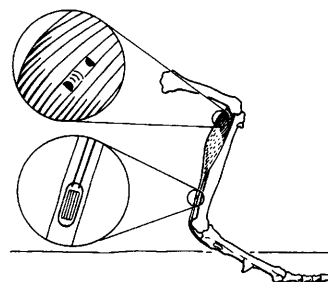
## Five-coordinate hydrogen

Hydrogen is usually coordinated to only one or two atoms, but in a few rare cases, coordination numbers of three and six have been observed. Bau *et al.*

(p. 1099) have synthesized a compound in which hydrogen is coordinated to five rhodium atoms in a metal cluster compound. The hydrogen atoms are located in square-pyramidal sites on the surface of the cluster. Only two of the six square pyramidal sites are occupied.

## Turkey trot

Running takes a lot of energy, but for turkeys running on level ground, contracting muscles are not doing a lot of work. Roberts *et al.* (p. 1113; see the news story by Pennisi, p. 1067) im-



planted fiber-length and strain gauges to measure muscle force in the large calf muscles of running wild turkeys. The stretching and recoiling of tendons and the extended muscle

(which acts as a spring) do most of the work. Active contracted muscle produces the high force needed to keep the turkey standing (and thus consumes metabolic energy), but contracts only a short distance and thus produces little work.

## Mass survival

The origin and early evolution of birds has been widely debated, as has the effect of the extinction at the end of the Cretaceous, which marked the demise of the dinosaurs. Cooper and Penny (p. 1109) used molecular data from modern birds and estimates from the fossil record of minimum divergence times of pairs of related birds to estimate the number of modern bird lineages that survived through this extinction. Their analysis suggests that many lineages survived. Some of the implications and uncertainties related to the selection of the fossil pairs are discussed in a news story by Gibbons, p. 1068.

## Busy terminal

The TATA-box binding protein (TBP) is required by all three RNA polymerases. The function of its nonconserved amino-terminal end has been unknown and its conserved carboxyl-terminal end can usually substitute for the full-length protein. Mittal and Hernandez (p. 1136) show that the nonconserved amino terminal mediates activity at the RNA polymerase III U6 small nuclear RNA (snRNA) promoter and recruits the snRNA activating protein complex to this site. It can also down-regulate TBP binding to the U6 TATA box and enhance U6 transcription.



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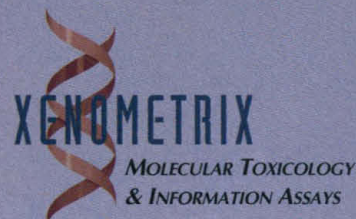
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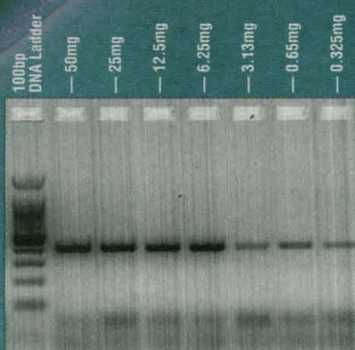
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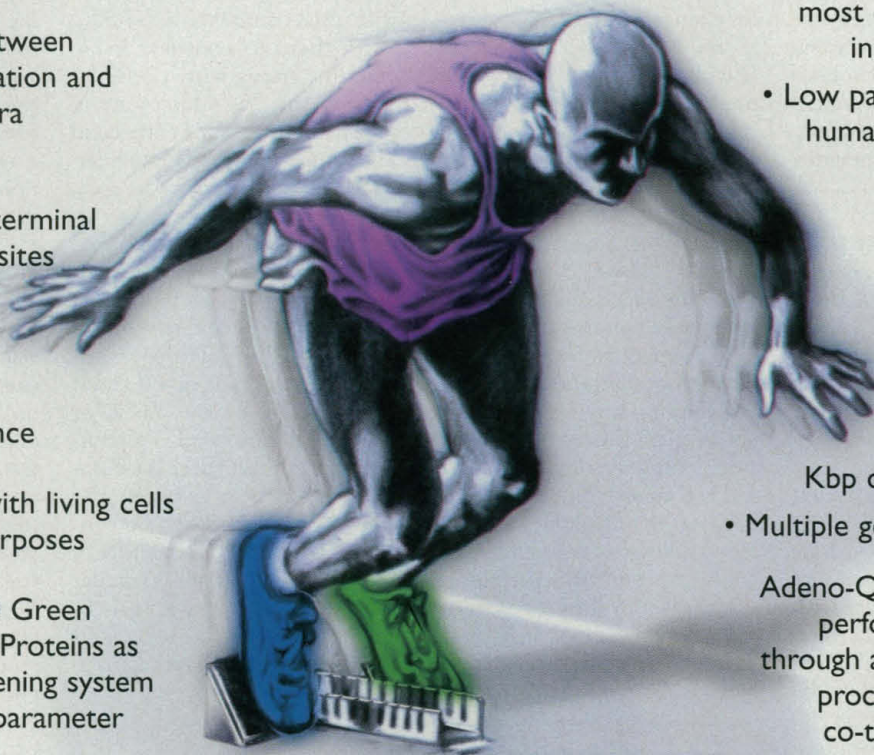
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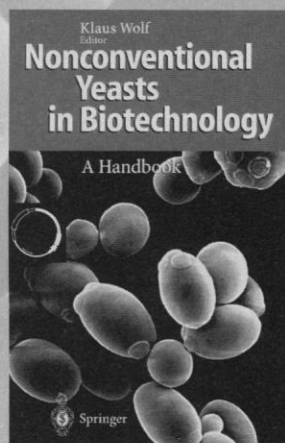
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J. F. Zayas  
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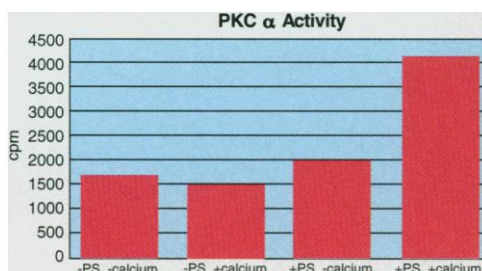
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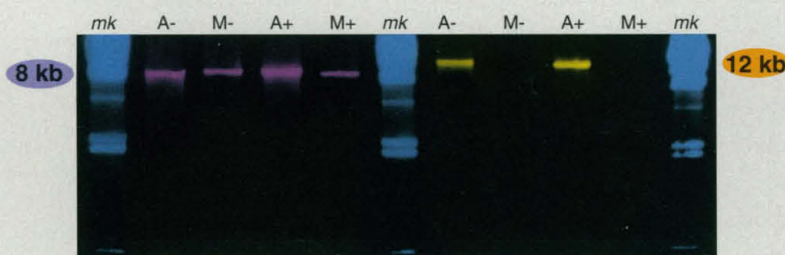
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### Comparison for Long RT-PCR: cDNA Amplification from Dystrophin mRNA



RT reactions were carried out under optimum conditions for each enzyme, AMV RTase and MMLV RTase, in duplicate. One sample from each pair was followed by RNase H treatment. Then using two different primer pairs for 8 kb and 12 kb amplification, PCR was performed with *TaKaRa LA Taq* for AMV RTase products and Long distance DNA polymerase for MMLV RTase products respectively. No full length cDNA of 12 kb was detected with MMLV RTase.

mk  $\lambda$  Hind III marker  
A+ AMV RTase reaction followed by RNase H treatment  
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A- AMV RTase reaction only prior to PCR  
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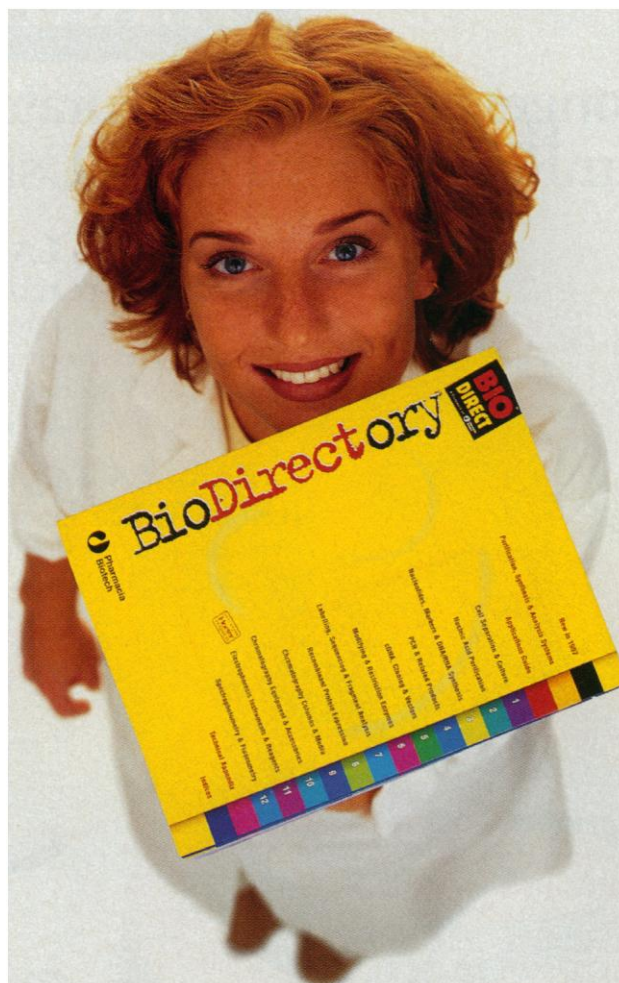
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Fig. 1. Multicolor detection using TSA-Direct.  
Courtesy of Kevin Roth, M.D., Washington University  
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Fig. 1.

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Fig. 2

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b. TSA-Enhanced fluorescent detection.

c. Standard chromogenic ISH.

d. TSA-Enhanced chromogenic ISH.

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Figs. 2 a-b. Fluorescent detection of chromosome centromere probes in metaphase spreads.  
Figs. 2 c-d. In situ chromogenic detection of oxytocin in rat brain tissue sections.

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Fig. 3

a. Anti-EBA dilution is 1:25.

b. Anti-EBV dilution is 1:25,000. Enhanced by TSA.

Figs. 3 a-b. IHC of EBV antigen in Hodgkin's Lymphoma of mixed cellularity.  
Courtesy of R. Von Wasielewski and S. Gignac, Pathologisches Institut der  
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