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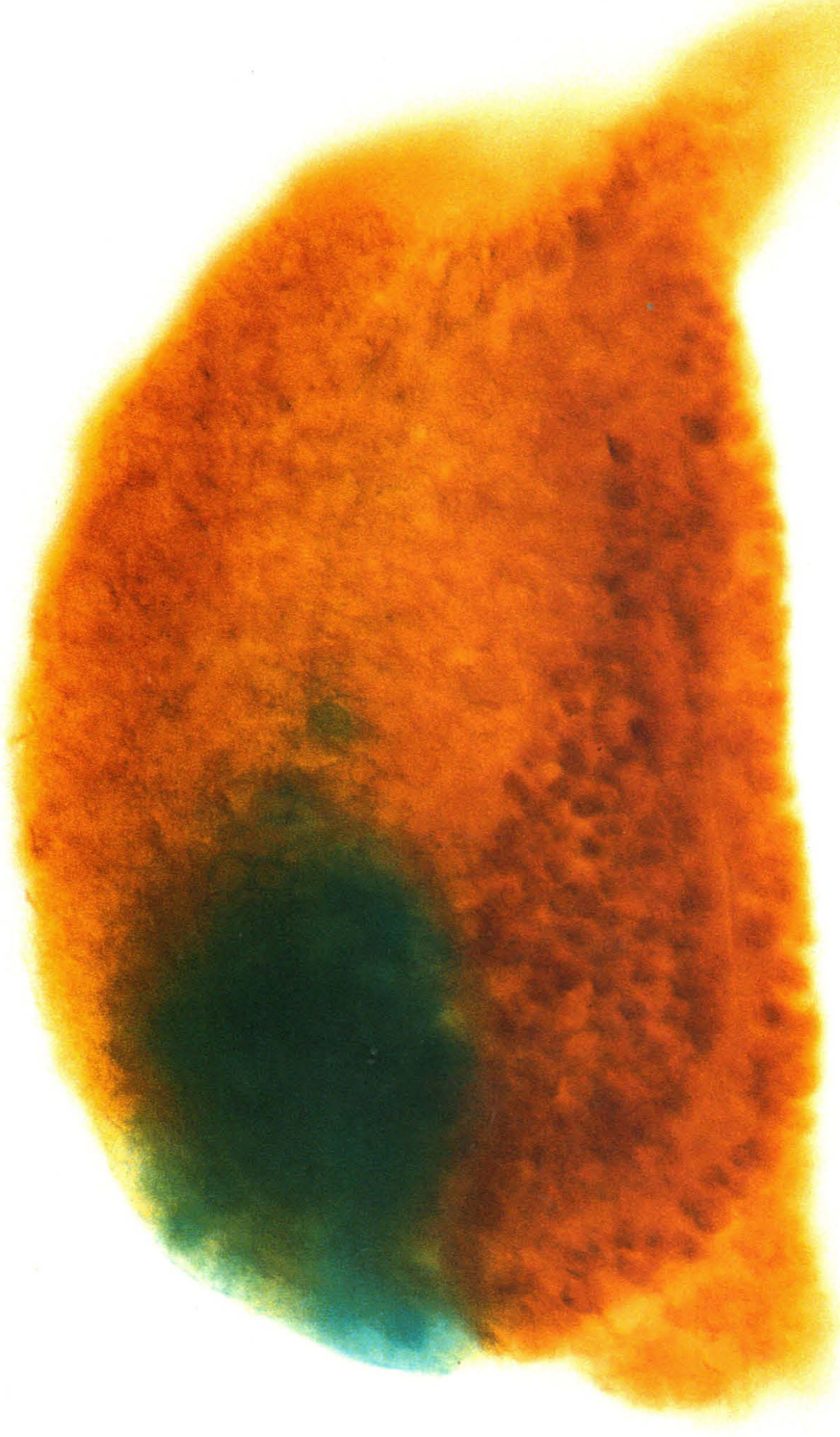
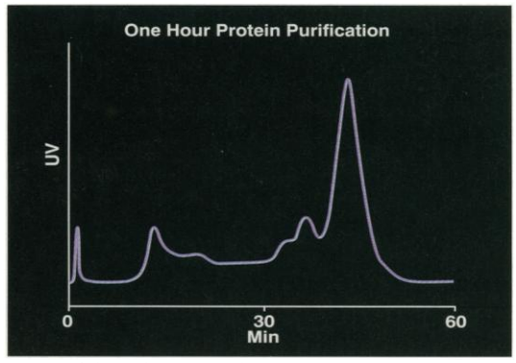
VOL. 259 • PAGES 429–568

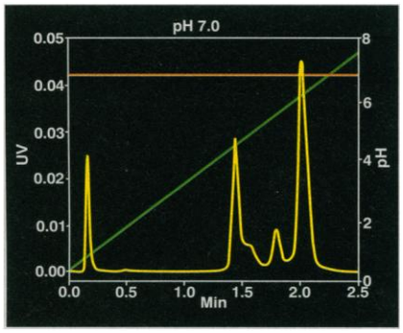


While You Spent One Hour Doing This,

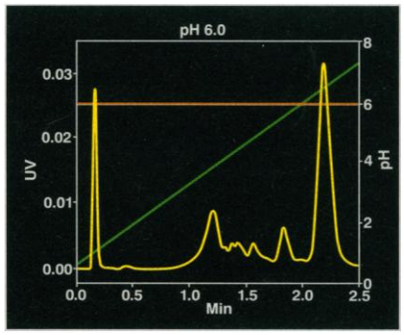


Anion exchange separation of recombinant protein with conventional LC column and instrumentation.

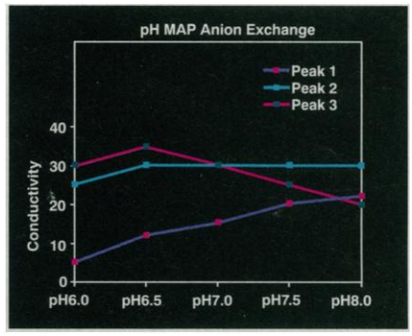
Look At All We've Been Up To.



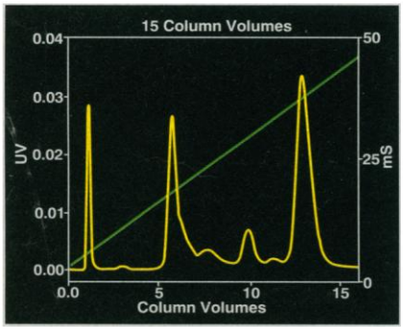
We began by running the separation at several pHs.



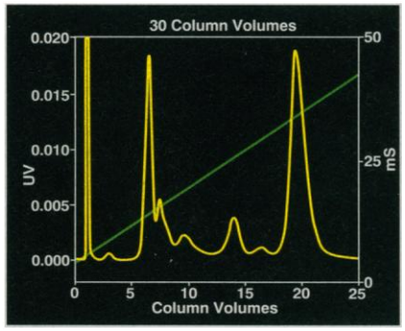
Confirmed the optimum pH at 6.0.



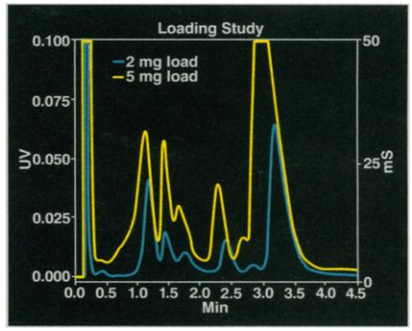
Plotted experimental results from built-in spreadsheet.



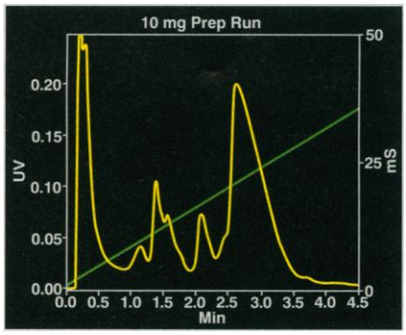
Tested gradient slopes for improved resolution.



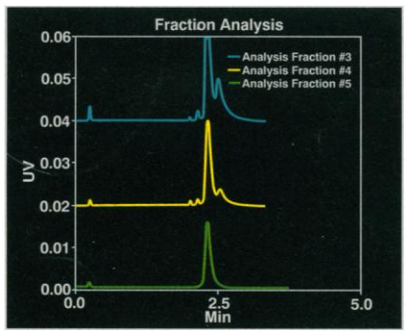
Selected 30 column volume gradient as optimum.



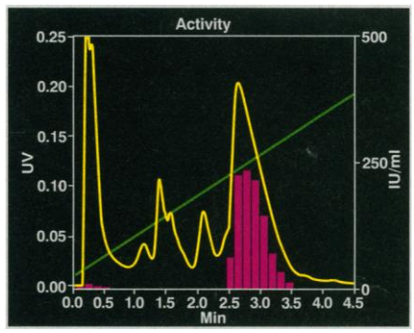
Studied the effect of loading at 2 mg and 5 mg.



Ran a 10 mg prep. Collected fractions.



Analyzed fractions by reversed phase.



Checked biological activity and purity.

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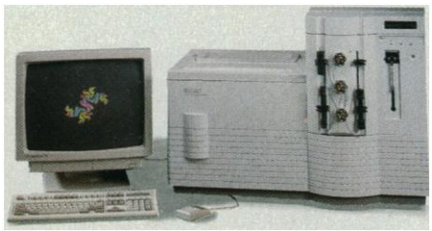

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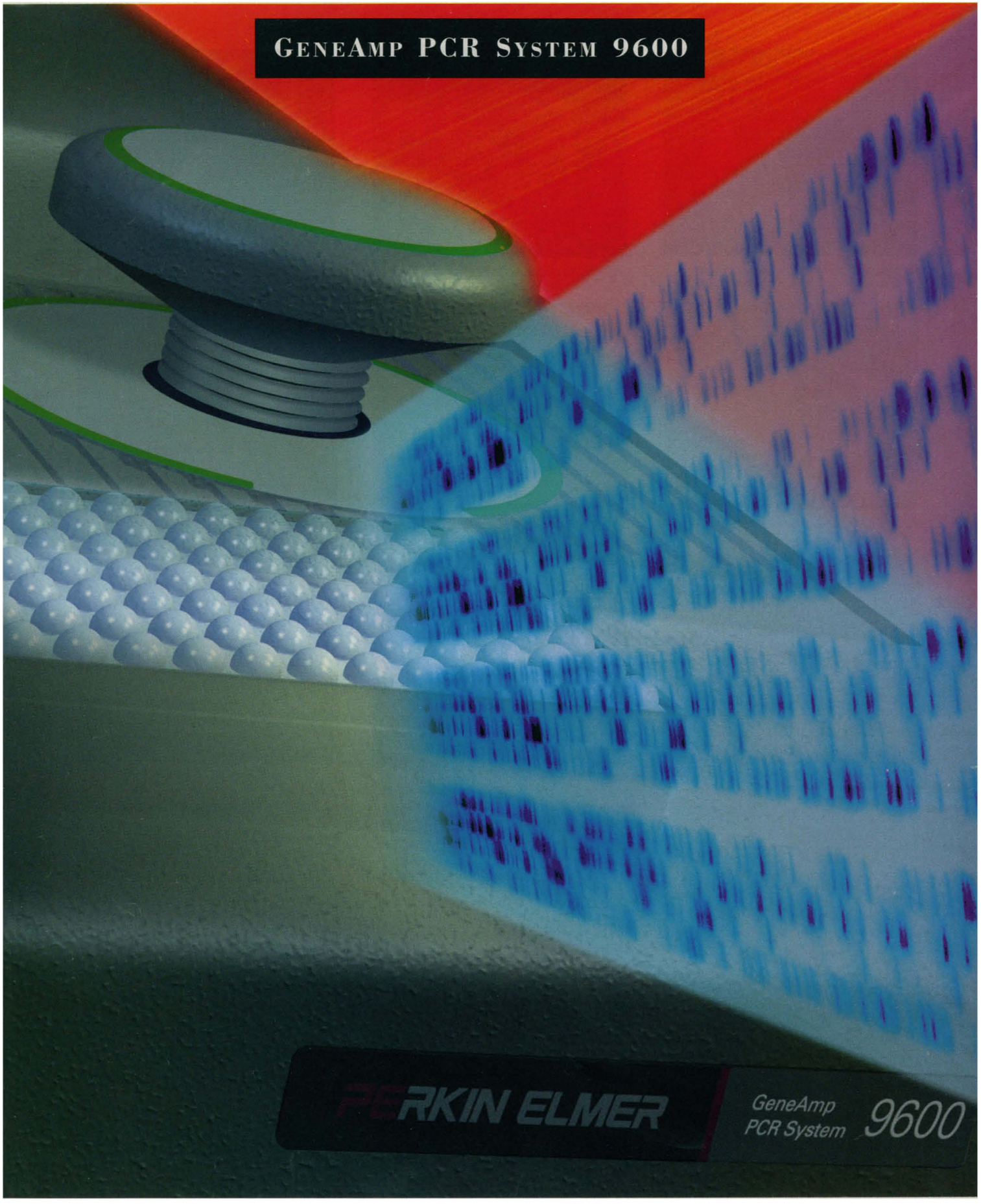

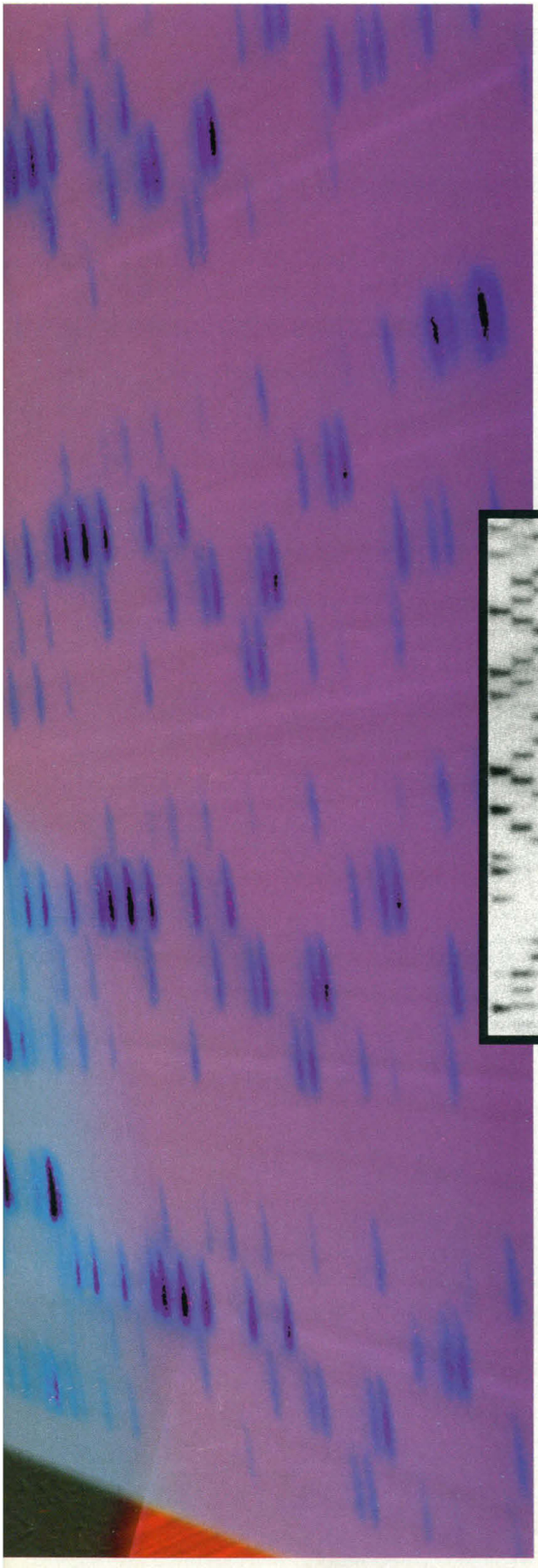

DNA SEQUENCING OF RETROVIRAL LTR USING PCR PRODUCTS AMPLIFIED FROM NIH 3T3 FIBROBLAST CELL LINE ON THE GENEAMP PCR SYSTEM 9600. COURTESY OF PIA MARIA CHALLITA, CHILDREN'S HOSPITAL, LOS ANGELES, CALIFORNIA.

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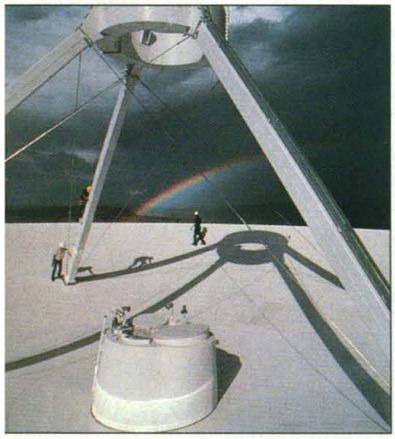

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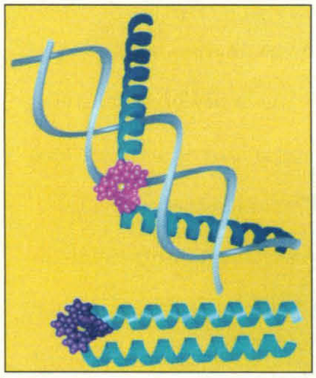

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COVER

Leg imaginal disc from a *Drosophila* early third instar larva, stained to show the sectorial pattern of expression of the *wingless* (blue) and *engrailed* (brown) genes. During limb development, these genes are expressed in adjacent sectors of the imaginal discs. These sectors provide positional references for a polar coordinate system that functions in the generation of patterns along the proximodistal axis. See page 484 and the Perspective on page 471. [Photograph: J. P. Couso]

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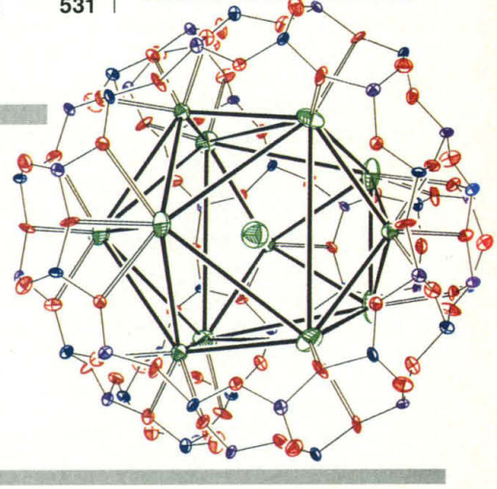

◩ Indicates accompanying feature

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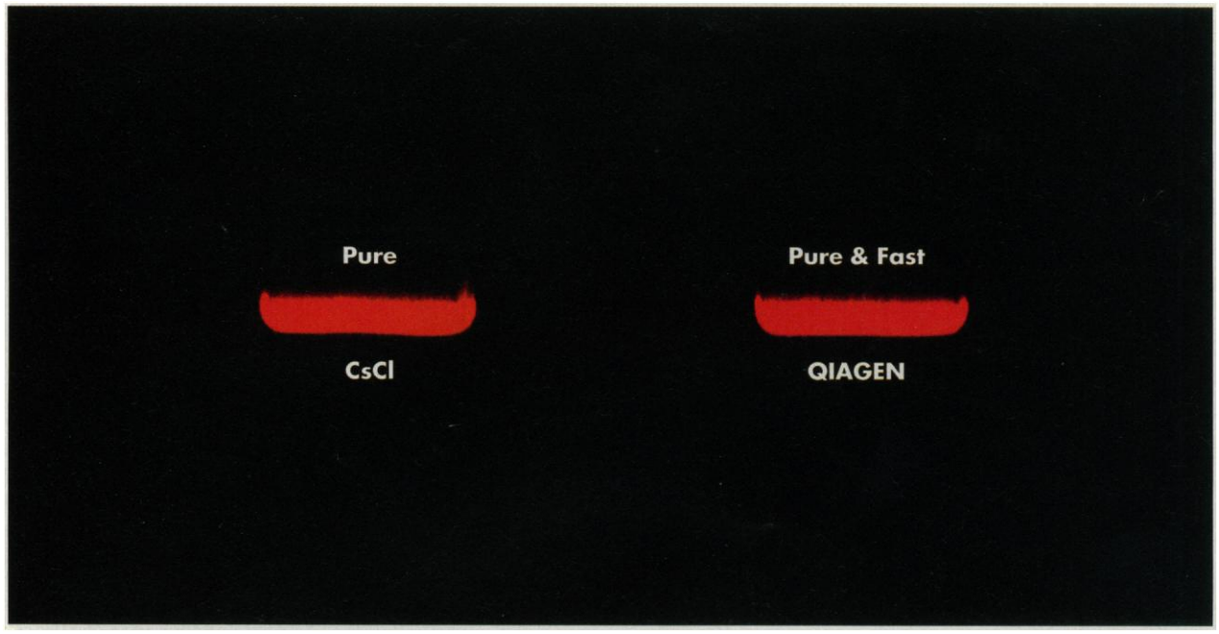

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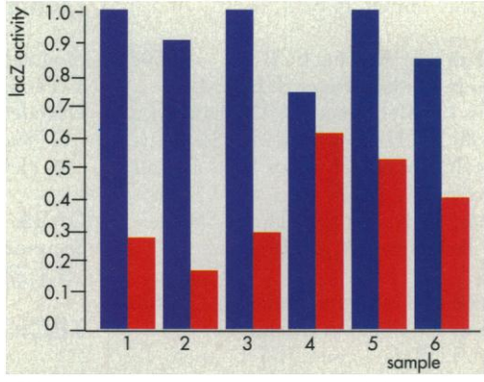

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The weight of Eurasia

Until recently, land-based gravity data from the Soviet Union, that is, most of northern Eurasia, have been unavailable. Regional gravity data can provide information on how dynamic processes in the Earth, such as subduction along the western Pacific margin, affect crustal density and topography. Kogan and McNutt (p. 473) analyze more than 10 million gravity measurements collected and recently released by the Armed Forces of the former Soviet Union. The data reveal a contrast in the sign of the gravity anomalies between eastern and western Eurasia that may be related to a low-viscosity zone in the mantle beneath eastern Eurasia.

■

Turing patterns made easier

Under the appropriate conditions, stable, stationary patterns can form when chemical reactions are coupled by diffusion; Turing's theoretical prediction has led to work on pattern formation and symmetry breaking in a number of fields. Turing's prediction has been verified in open gel reactors in which concentration gradients are imposed on the chlorite–iodide–malonic acid system, but his model predicted pattern formation even in systems with uniform concentrations. Lengyel *et al.* (p. 493) now show that transient Turing-type structures can be obtained using this reaction in a simpler closed system. Such closed systems should also be simpler to treat theoretically.

■

Squeezing Denali

Denali, North America's highest mountain, lies just south of a bend in the Denali fault zone, a major fault zone that extends east to west across Alaska and into Canada. Fitzgerald *et al.* (p. 497) used apatite fission-track analysis of samples collected in a traverse to the summit to show that rapid uplift forming the massif began about 6 million years ago. The cause of the uplift was most likely a change in the motion of the Pacific Plate, which increased compression near the fault bend.

■

Cell orienteering

A critical issue in development is how cells recognize their position in the embryo and follow a developmental program appropriate for such a position. The positional reference system has been described for many embryos in terms of a Cartesian coordinate system. For example, in the *Drosophila* embryo, positional information is determined by the expression of a series of genes along the anterior-posterior and dorsal-ventral axes. This Cartesian system cannot explain defects observed in adult structures after a loss of expression of some positional information genes, however. Couso *et al.* (p. 484) and Bryant in a Perspective (p. 471) suggest instead that a polar coordinate model better describes how positional information is defined during development of limbs and wings in *Drosophila*. Couso *et al.* show that during limb development the *wingless* gene provides key positional information.

Cleaning up PCBs

Polychlorinated biphenyls (PCBs) pollute several river and ground-water systems. One strategy for their removal is bioremediation by bacteria; most field studies have so far concentrated on anaerobic bacteria. Harkness *et al.* (p. 503) now report results of a field study in the Hudson River that show that the indigenous aerobic microorganisms can degrade PCBs. The 73-day experiment involved six caissons set into the river bed to allow a variety of treatments. Addition of nutrients, biphenyls, and oxygen enhanced loss of PCBs, as did mixing, whereas addition of a purified bacterium had a negligible effect.

Salt tolerance in plants

As agricultural fields are repeatedly irrigated, salt accumulates in the soil. This increased salt content can limit growth of crop plants and reduce productivity. In response to increased salinity in their environment, some plants synthesize small, osmotically active compounds such as mannitol. To determine whether mannitol functions as an osmoprotectant, Tarczynski *et al.* (p. 508) used transgenic tobacco into which a metabolic branch point had been introduced that resulted in production of mannitol. The transgenic plants were better able to withstand salinity stress than were untransformed plants. Osmoprotectants may also help protect plants against drought and low temperatures.

■

Elusive virus sequence

Despite the prevalence of infectious nonbacterial gastroenteritis in humans, the causative agent of this disease, the small round-structured viruses, or Norwalk viruses, have been extremely difficult to characterize. Clinical samples contain only small amounts of virus, and there is no animal model or in vitro culture system. Lambden *et al.* (p. 516) report the complete nucleotide sequence of the single-stranded RNA genome of one member of this family of viruses, Southampton virus. This sequence information should aid in the development of diagnostic assays and will be useful in epidemiological studies.

■

GAP essentials

The functioning of Ras signal transduction pathways that control cell differentiation and growth requires the guanosine triphosphatase activating protein (GAP). GAP interacts with Ras and stimulates the GTPase activity of Ras. Duchesne *et al.* (p. 525) have mapped regions of GAP necessary for Ras-GAP–mediated signal transduction and find that a domain containing the Src homology region 3 (SH3) was essential. A monoclonal antibody to this region inhibited a Ras pathway in *Xenopus* oocytes.

■

Anxiety and neuropeptide Y

High concentrations of neuropeptide Y (NPY) are found in the hypothalamus, limbic system, and cortex of mammals. Although NPY can affect food intake and cause symptoms of depression, its role has been difficult to pinpoint because of a lack of specific NPY antagonists. Wahlestedt *et al.* (p. 528) constructed an antisense oligodeoxynucleotide to the amino terminus of the NPY-Y1 receptor and added it to cultures of rat neurons. This treatment decreased the number of Y1 receptors. Injection of this antisense molecule into the lateral cerebral ventricle of rats produced behavioral signs of anxiety, as measured by a maze test.

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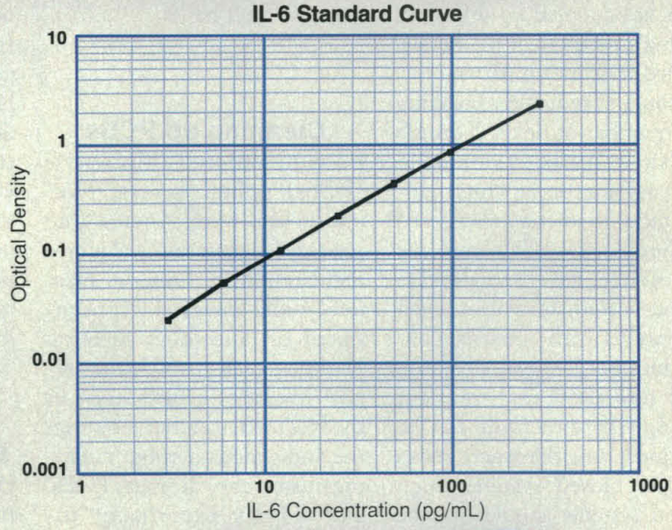

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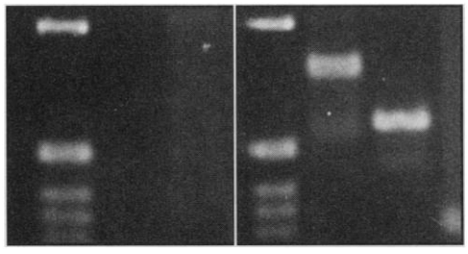

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* PCR is covered by U.S. Patent No. 4,683,202 issued to Cetus Corporation.

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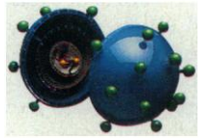

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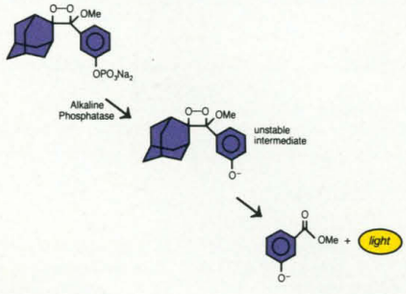
New information identifies ideal techniques for nonradioactive labeling and detection.

Scientists reluctant to incorporate nonradioactive labeling and detection into their research techniques have historically accused nonradioactive products of lacking sufficient levels of sensitivity. However, recent technological advancements — chemiluminescent detection, to be exact — have allowed select products to meet or exceed the sensitivity levels achievable with ^{32}P labeling and detection.

Those products, part of the Genius™ System with Lumi-Phos™ 530 from Boehringer Mannheim, guarantee detection of 0.1 pg of target nucleic acid in less than one hour. In addition, they allow detection of single-copy genes in human DNA in less than 30 minutes when used in Southern blotting techniques.



Molecular structure of the active ingredient in Lumi-Phos 530

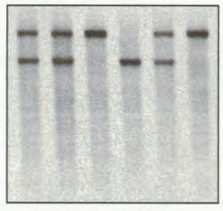
The Genius products rely on the very same procedures already used for radioactive labeling, yet provide results not just hours earlier, but *days* earlier.

Results can be recorded on X-ray film and, because the chemiluminescence lasts more than 48 hours, multiple exposures are possible. Those films can be easily scanned and quantified by densitometry.

Southern blotting: single-copy gene detection in 30 minutes

The accepted wait for accurate single-copy gene detection using ^{32}P labeled probes has always been one to three days. Now identical results can be achieved in 30 minutes with the Genius System and its chemiluminescent substrate.

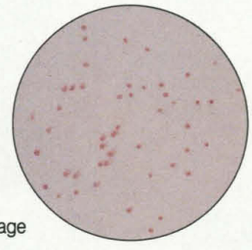
In addition, the probes are stable, allowing researchers to reuse them multiple times without relabeling. Furthermore, Southern blots developed with the Genius System can be repeatedly stripped and reprobed using the same procedures as the older radioactive method.



Human genomic Southern blot (RFLP) showing chemiluminescent detection of single-copy genes following a 2.5 minute X-ray film exposure

Library screening: positive colonies visible in one hour

Using probes labeled with the Genius System, researchers are detecting positive colonies and plaques within one hour versus the overnight exposures required with radioactive techniques.

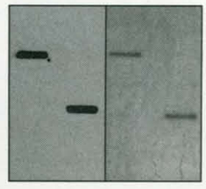


Colorimetric detection of recombinant lambda gt 10 phage

Because the Genius System can use DNA, RNA or oligonucleotide probes, many research needs can be met with a single system. Probe labeling utilizes the same techniques currently employed to prepare radioactive probes, and multiple filters can be processed simultaneously.

Dot blots: guaranteed results in under one hour

With exposure times reduced from overnight to 30-60 minutes, critical answers are relayed quickly, helping research progress as soon as possible.



Comparison of slot blot hybridizations using Genius-labeled oligonucleotide probe (left panel, 60 minute film exposure) and ^{32}P-labeled probe (right panel, overnight film exposure)

Performance is guaranteed as the Genius System products are function tested in dot blot (also referred to as slot blot) assays.

The unique digoxigenin-labeled probes are stable for at least one year and can be reused multiple times, offering savings in terms of the time and money normally spent relabeling decayed radioactive probes. By using the same probe, experimental variables are reduced and reproducibility between experiments is provided.

0.1 pg DNA Guaranteed

Technique-specific information and bibliography available upon request

To receive additional information about the Genius System products, their applications and specifications, or to receive a bibliography of publication references, call Boehringer Mannheim at **800-428-5433**.

If you would like to speak directly with a specialist about your individual research needs, call **800-262-4911**.

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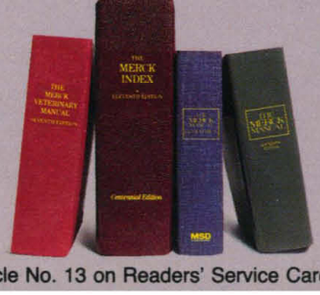

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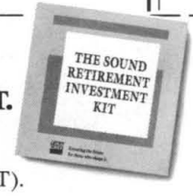

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