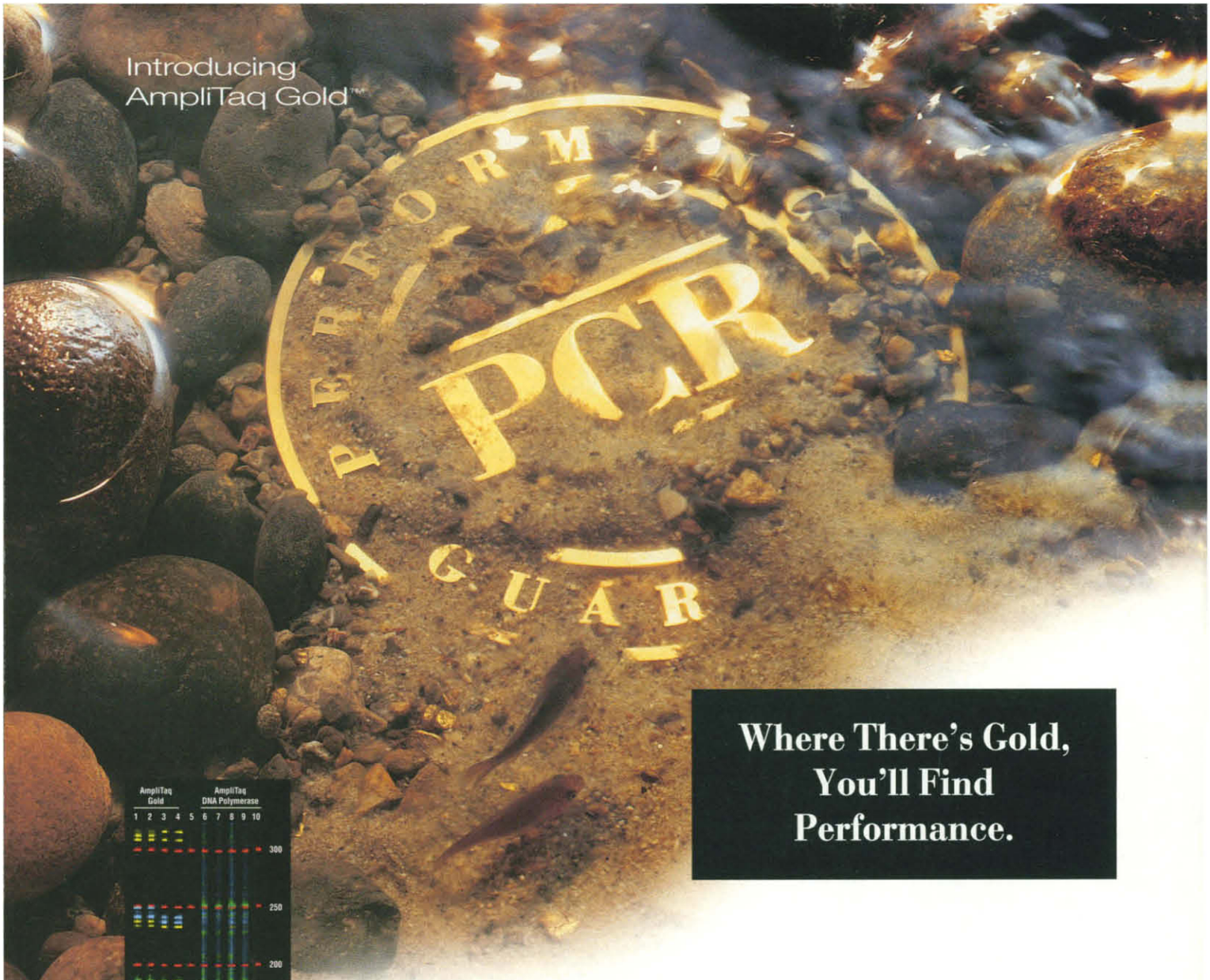

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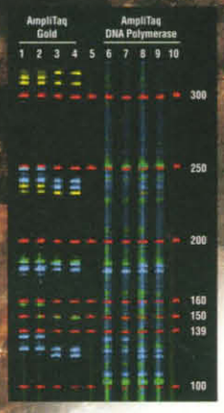
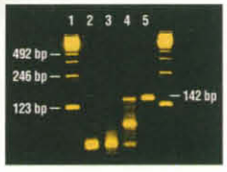


Co-amplification of 8 human STR loci. L1, 2: male control DNA; L3, 4: female control DNA; L5: AmpliTaq negative control; L6, 7: male control DNA; L8, 9: female control DNA; L10: negative control.



Amplification of HIV-1 Control DNA. L2: 0 copies, AmpliTaq DNA Polymerase, No Hot Start; L3: 10 copies, AmpliTaq DNA Polymerase, No Hot Start; L4: 10 copies, AmpliTaq DNA Polymerase, manual Hot Start; L5: 10 copies, AmpliTaq Gold.

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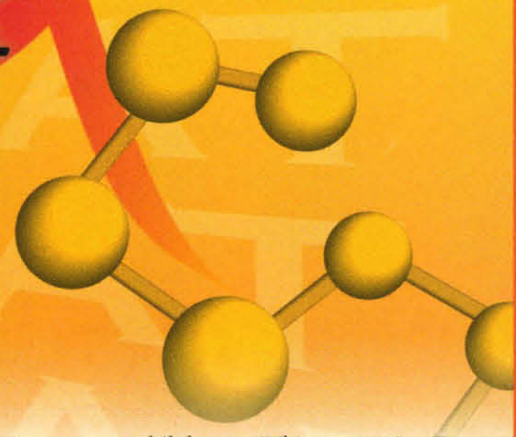
PCR: Running Hot and Fast



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The technical jargon that describes today's world of PCR applications and products has amplified to keep up with the explosive growth of the technology itself. Twelve years ago, when SCIENCE published a paper (R.K. Saiki, et al., **230**: 1350) that described how the polymerase chain reaction could be used to amplify the ß-globin gene and screen for sickle cell anemia, no one could have predicted the current state of the art.

"PCR is now being used to determine the genetic basis of complex diseases such as heart disease and diabetes," says William Nierman, director of the Rockville, MD-based American Type Culture Collection's program in molecular biology. "You can scan the whole genome to look for altered genes that are associated with the disease state."

"So many things have happened," says Richard Gibbs, associate professor in the department of molecular and human genetics at Baylor College of Medicine in Houston, TX. He cites the advent of long PCR and the ability to sequence PCR products more easily as two of the major recent advances. Thanks to a combination of the thermostable DNA polymerase, *Taq*, and a second polymerase, long PCR has made it possible to amplify DNA sequences that are many kilobases (Kb) apart. As *Taq* copies the DNA fragment of interest between two carefully chosen primer oligonucleotides, a second polymerase such as *Pfu* or Vent® — both of which have a 3′ exonuclease proofreading ability in addition to their polymerase activity — corrects point mutations that could otherwise cause *Taq* alone to stutter and stop.

With long PCR, researchers do not have to analyze DNA from many members of the same family to perform certain kinds of genetic analysis, says Gibbs, who is also director of the Baylor College of Medicine Human Genome Sequencing Center. Instead, they can amplify and sequence longer stretches of DNA that reveal whether two alleles are close together on the same chromosome. But the capacity of long PCR could be improved; Gibbs finds that the current technology is reliable up to 10 to 15 Kb.

Other recent advances have also enhanced existing PCR technology and applications. Researchers can now recover full-length cDNAs by using improved reverse transcriptases for the RNA-to-DNA reverse transcription process. They can even use PCR to engineer better antibodies. The process is straightforward but elegant, says Gibbs; the researcher simply clones the variable and constant regions of the gene that will yield the desired antibody, and then s/he uses PCR to amplify the entire sequence.

PCR-related spin-off technologies are making it faster to tack-

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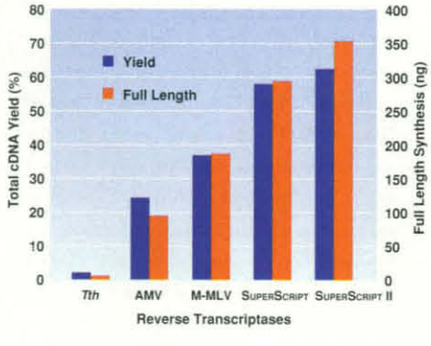

Comparison of RTs using a 7.5 kb RNA template. Each RT was used in the amount and under the conditions determined to be optimal for that enzyme.

Product	Cat. No.	Size
SUPERSCRIPT II RNase H⁻ Reverse Transcriptase	18064-014	10,000 units
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DNA Polymerase Fidelity in PCR

DNA Polymerase	*Number of Mutants*	*Total clones screened*	*Error Frequency*
***Taq* DNA Polymerase**	**116**	**10,219**	**$11.4(\pm1.8)\times10^{-6}$**
ELONGASE Enzyme Mix	**106**	**31,558**	**$2.3(\pm0.4)\times10^{-6}$**

Mutants were measured by loss of α complementation of a lac Z α-containing plasmid transformed after 35 cycles of PCR.[2] *Data are mean ± SD for 3 determinations.*

Product	Cat. No.	Size
ELONGASE Enzyme Mix	10480-010	100 reactions
	10480-028	500 reactions
ELONGASE Amplification System	10481-018	100 reactions

1. Nathan, M., Mertz, L., and Fox, D., (1995) *Focus® 17*, 78.
2. Kunkel, T.A., (1985) *J. Biol. Chem. 260*, 5787.

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Elapsed Time for 24 Reactions	
Individual Component Additions	*PCR SUPERMIX Component Additions*
Primer 1 + Primer 2 + DNA + Buffer + dNTPs + $MgCl_2$ + *Taq* DNA Polymerase	Primer 1 + Primer 2 + DNA + PCR SUPERMIX
36.1 min	***18.1 min***

Product	Cat. No.	Size
PCR SUPERMIX	10572-014	100 reactions (4 x 1.125 ml)

Consistent PCR performance for reproducible results.

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Recombinant *Taq* DNA Polymerase is purified and quality-assurance tested for dependable performance and reproducibility.

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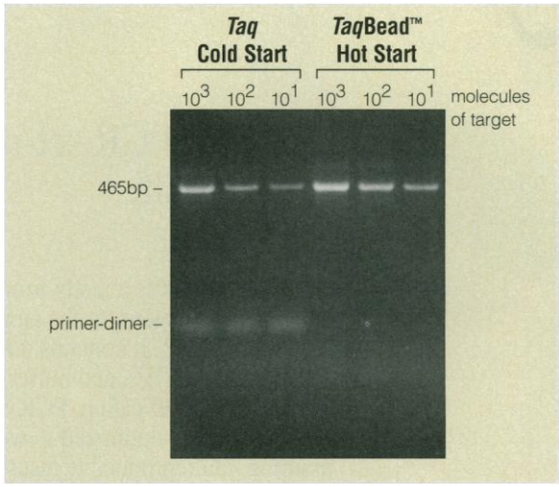
le large projects, one of which is determining the DNA sequence of the entire human genome. A key to these large-scale efforts is the technique of cycle sequencing, which — like PCR — is a DNA synthesis reaction that requires a thermostable polymerase. But unlike the exponential amplification of DNA copies that results from PCR, cycle sequencing is an arithmetic process. Only one primer tags the start of the DNA sequence to be copied, and the reaction typically proceeds until the enzyme stops working. "There are now six bacterial genomes that have been completely or almost completely sequenced," says Nierman, who regards cycle sequencing as a critical methodology in these projects. "Three are published and [Craig] Venter's operation has nearly completed another three." (Venter heads The Institute for Genomic Research, based in Rockville, MD.)

The list of PCR-based applications is itself long and growing. "There is a fairly new application for exploring differences in populations of expressed sequences," says Nierman. "For example, you can search for sequences whose expression is specific to tumor cells versus normal cells." The researcher starts with messenger RNA — which represents the genes expressed in the two populations of cells under study — and uses reverse transcriptase to convert the mRNA to cDNA. "It is really a way to monitor gene expression, even under pathologic conditions," says Nierman.

And if a researcher wants to study DNA-protein interactions by changing the sequence of the DNA in question and monitoring the consequences, PCR can help with that process, too. "If you have a protein that binds to DNA, you might be able to make a DNA fragment that binds better," says Gibbs. So the researcher creates the mutant DNA, uses PCR to amplify it, and then screens the new sequence for an altered ability to bind to the protein.

Other PCR applications capitalize on the sensitivity and specificity of the process. In situ PCR, for instance, allows a researcher to visualize the presence of a DNA or RNA sequence in cells or tissues. Sometimes the number of nucleic acid copies is quite low, so the keys to the success of this procedure are optimal amplification conditions, particularly having good primers. Ideal primers are also a prerequisite for doing multiplex PCR, in which a researcher amplifies several target DNA sequences at once.

Given all of the new applications for PCR, it comes as no surprise that a burgeoning industry supplies reagents and devices to make the researcher's job easier. Some companies tend to specialize in certain product areas, such as making the thermal cyclers that allow the reagents for PCR to be heated and cooled as efficiently as possible or making products that researchers need after the PCR process is complete. Other companies sell a vast range of PCR-related reagents, machines, cloning vectors, and services.



Hot start amplification reduces primer dimers and increases yield. Amplification of a 465bp region of the 16S ribosomal RNA gene from bacterial genomic DNA is shown comparing a cold start using Taq with a hot start using Promega TaqBead™ Hot Start Polymerase.

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LAST NOVEMBER, PROMEGA CORPORATION OF MADISON, WI, LAUNCHED *TAQ*BEAD™ HOT START POLYMERASE for a wide range of PCR users. "We recognized that a lot of people are doing hot start PCR and that they had to make too many compromises," says Rick Smith, a product manager for two interdisciplinary teams at Promega. In many hot start PCR procedures, the researcher withholds a particular reagent — usually the DNA polymerase or the magnesium — and adds it later. That can result in burned fingers and sample contamination, particularly if there are a lot of tubes to handle.

But with the new *Taq*Bead™, the researcher simply puts one bead into each 0.5 ml reaction tube and adds the other reagents: the DNA template to be amplified; the primers; buffer; magnesium chloride; and the four deoxynucleotide triphosphates (dNTPs), adenine (A), thymine (T), guanine (G), and cytosine (C). The bead melts at 60° C and releases *Taq* (originally isolated from the bacterium *Thermus aquaticus*), which starts the reaction.

"*Taq*Bead™ Hot Start Polymerase is a wax bead that actually encapsulates the *Taq* polymerase," says Smith. Rather than having a liquid center that contains the DNA polymerase, the *Taq*Bead™ is a solid paraffin bead, 3 mm in diameter, with 1.25 units of thermostable *Taq* homogeneously dispersed throughout.

"This product is important to users who have recognized the value of hot start PCR or the value of non-problematic PCR," says Smith. "People who use *Taq*Bead™ Hot Start Polymerase will save time and avoid many pipetting errors because the bead contains a premeasured amount of *Taq*. They will also reduce the likelihood of contamination by reducing handling steps."

The more traditional cold start PCR has

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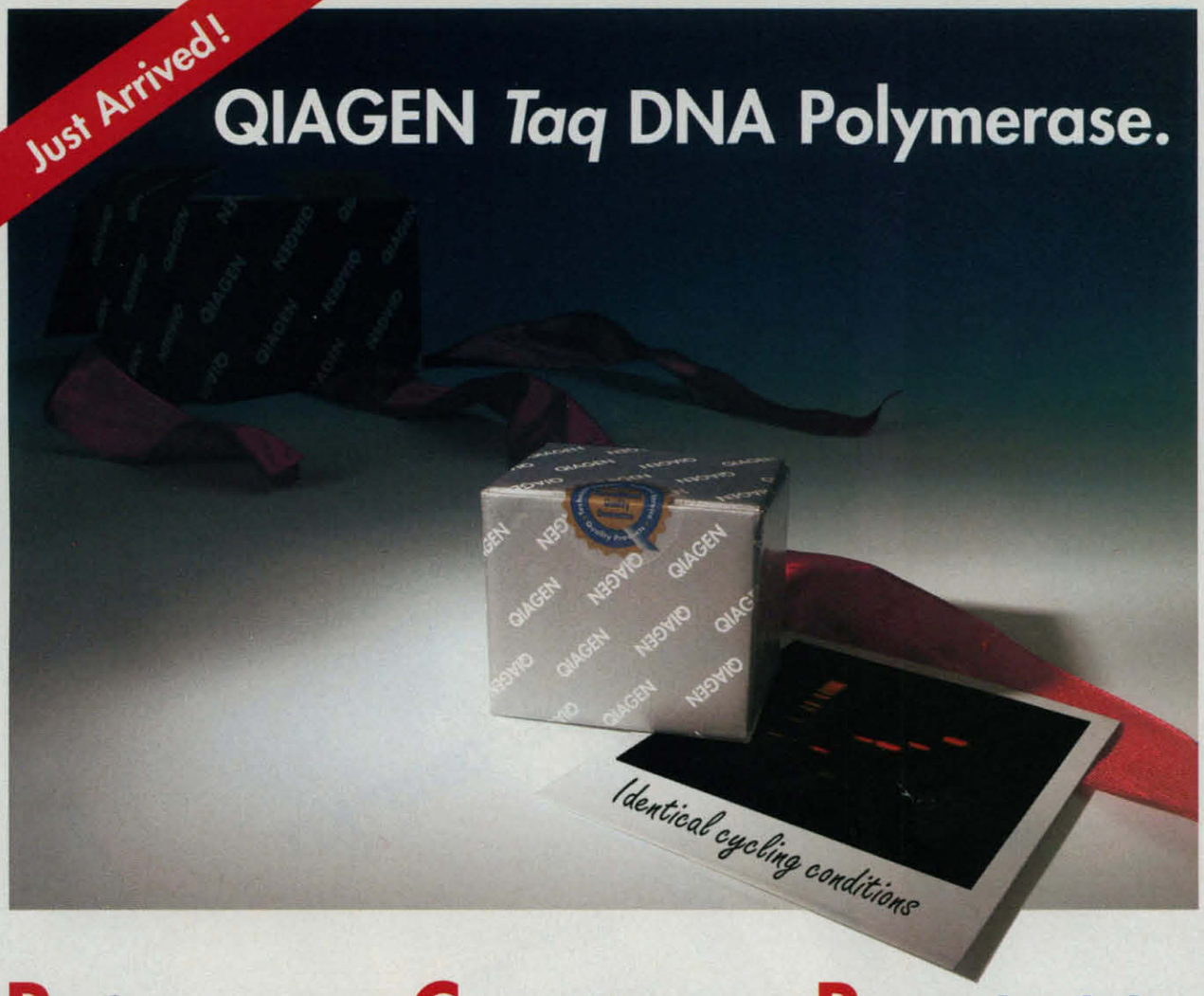

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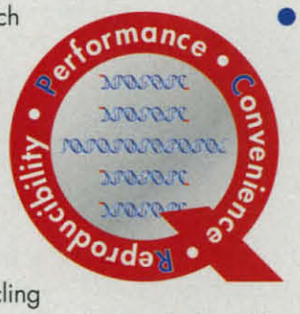

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QIAGEN *Taq* DNA Polymerase makes high yields of specific PCR product simply routine.

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some potential problems. The two biggest, says Smith, are the generation of non-specific amplification products and the formation of so-called primer dimers, in which pairs of primers that have complementary 3′ sequences mistakenly anneal to each other.

Although *Taq* is maximally active at 74° C, it has some activity below that temperature. *Taq* can extend primers that have bound to each other, or it can extend unwanted DNA templates. Another problem can also occur. *Taq* has a polymerase domain and a 5′ exonuclease domain. (It does not have a 3′ exonuclease proofreading ability.) If primers form hairpin loops, *Taq* can clip these primers behind the loops, thereby shortening them. This, of course, means that their specificity diminishes and they prime regions of DNA template that they shouldn't.

The hot start technique helps to minimize these problems because the higher starting temperatures prevent DNA primers from binding to one another or from annealing to the DNA template nonspecifically. With hot start in general, researchers can increase the sensitivity of their reactions, particularly when they are starting with a small amount of template DNA.

"We found that there was a need for a cost-effective means of doing hot start PCR that is also practical," says Smith. "So we developed a product that is reasonably priced and that also offers some significant advantages over manual methods."

Smith says that Promega will continue to focus on developing products for the amplification reaction itself using proven enzymes that perform reliably. "But we also make products used to prepare the initial DNA template, such as products used in RT-PCR, as well as products that are used post-PCR, including cloning vectors and methods for purifying the PCR products."

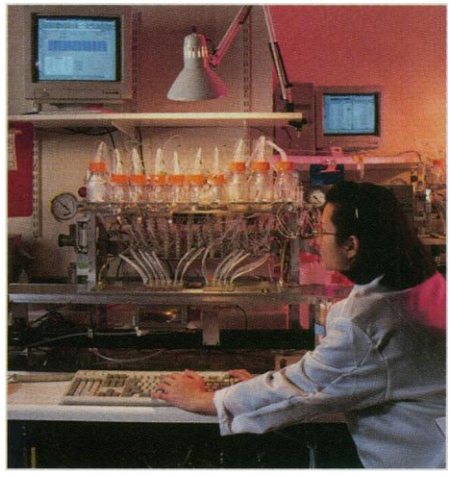
XXXXXX

Perkin-Elmer's Applied Biosystems division also markets a vast range of PCR products and instruments. Last March, the company launched a form of *Taq* DNA polymerase that is designed to simplify hot start PCR.

"OUR MOST IMPORTANT AND EXCITING NEW PRODUCT IS OUR RECENT VERSION OF *TAQ* DNA POLYMERASE, WHICH IS CALLED AMPLITAQ GOLD™," SAYS SUE ANN MOLERO, associate product manager for core PCR products at the division's headquarters in Foster City, CA. "We believe it is going to change scientists' expectations about PCR. AmpliTaq Gold™ provides a 'seamless' method for doing hot start PCR, resulting in both higher specificity and sensitivity."

Molero says that PE Applied Biosystems wanted to provide a way for scientists to do hot start PCR without having to add any ingredients to the reaction mixture after the reaction has begun. Using AmpliTaq Gold™ requires an additional preheating activation step, but once the reaction is underway there is no need to add another reagent. The customer simply programs the extra preheating step to 94–95° C and holds the temperature at that level for 9 to 12 minutes. The additional heating time ensures full denaturation of the DNA, says Molero, and activates the AmpliTaq Gold™ enzyme, which then allows the reaction to proceed only at the high temperatures specified by the user.

"Anyone who does PCR would benefit from doing hot start PCR and using this product," says Molero. In addition to its usefulness in a one-step hot start process, Molero also recommends AmpliTaq Gold™ for multiplex PCR, in which a researcher amplifies several target DNA sequences simultaneously. Researchers use multiplex PCR for a wide range of applications, including gene linkage mapping, paternity identification, and other forensic purposes. The new heat-activated enzyme should make the process more convenient, efficient,



A technician makes custom primers using LTI's Parallel Array Synthesis™ technology. The system can manufacture 96 different custom primers simultaneously.

and minimize extensive optimization procedures, says Molero. "We have also learned that scientists are probably getting a higher yield with AmpliTaq Gold™ because they are not getting unwanted side products."

PE Applied Biosystems has more plans for AmpliTaq Gold™. They will soon incorporate it into other kits — for multiplex PCR and forensic applications — and they are trying to identify the ideal reaction conditions for many different PCR applications. Company scientists are also starting to use AmpliTaq Gold™ to prepare the DNA template to be sequenced, so there is no need to clean up the PCR products at the end of the process. "AmpliTaq Gold™ really touches all of our product lines," says Molero.

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LIFE TECHNOLOGIES, INC. (LTI) OF GAITHERSBURG, MD, SELLS MANY PRODUCTS THAT ARE USED IN PCR, SAYS CASEY EITNER, vice president for new businesses. Two years ago, the company launched its custom primers business, which is based on Parallel Array Synthesis™ technology. "It's an automated DNA synthesis

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* 50 nmole scale, standard purity † some restrictions apply

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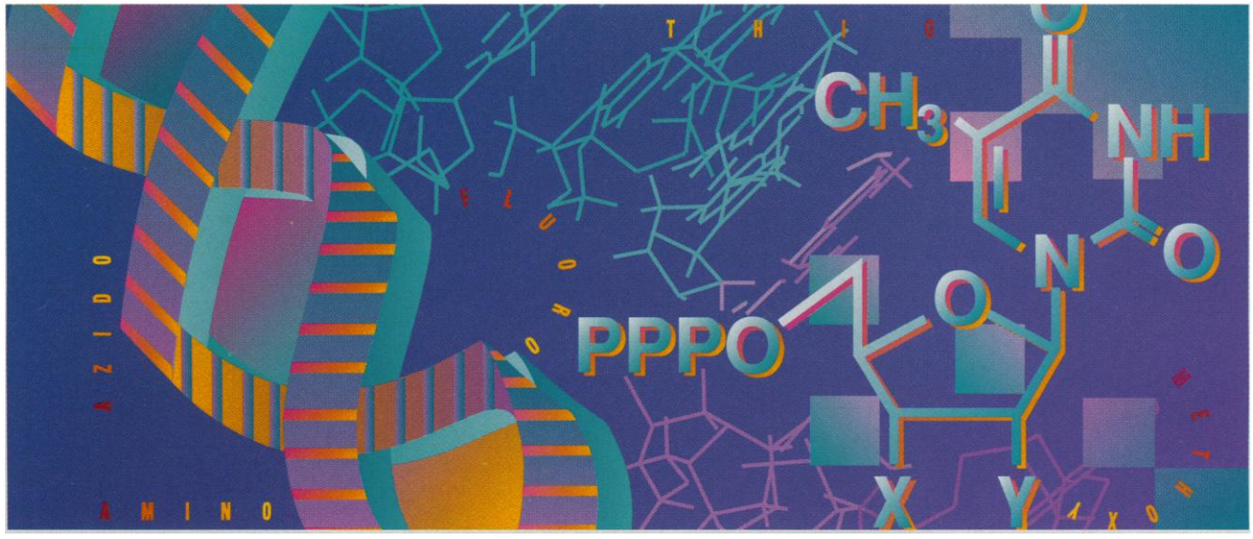
Nucleix Plus nucleotides



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For today's techniques and applications, the need for high quality reagents has never been more important. This is especially so with long PCR* where high purity nucleotides are critical; the more cycles, the greater the chance for error.

Nucleix Plus™ - Purity

- dNTPs and ddNTPs purified to ≥99% by both FPLC™ and HPLC to ensure removal of pyrophosphate.
- pyrophosphate-free confirmation by ^{31}P-NMR.

Nucleix Plus - Reliability

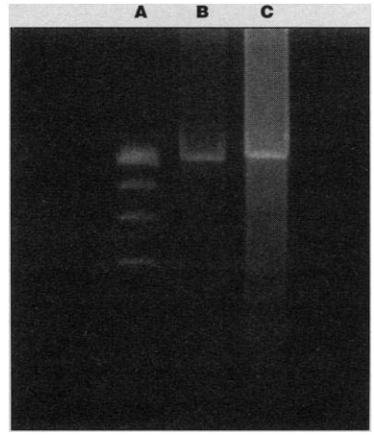
- Functionally tested in long PCR experiments to ensure the right results first time, every time.

Nucleix Plus - Convenience

- 2, 10 and 25mM dNTP blends, pre-mixed specifically for PCR.
- Full range of nucleotides available individually, at various concentrations, as well as a customisation service to meet specific requirements.

For guaranteed results, choose Nucleix Plus from Amersham™.

* The Polymerase Chain Reaction (PCR) is covered by patents owned by Roche Molecular Systems and F Hoffmann-LaRoche Ltd. A license to use the PCR process for certain research and development activities accompanies the purchase of certain reagents from licensed suppliers such as Amersham International plc and Affiliates when used in conjunction with an authorized thermal cycler.



PCR of a 28Kb section of Lambda DNA using Nucleix Plus nucleotides (B) and unqualified nucleotides (C). Lane A is Lambda *Hind* III markers, 23.1Kb, 9.4Kb, 6.5Kb and 4.35Kb.

Nucleix Plus

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Little Chalfont
Buckinghamshire
HP7 9NA England

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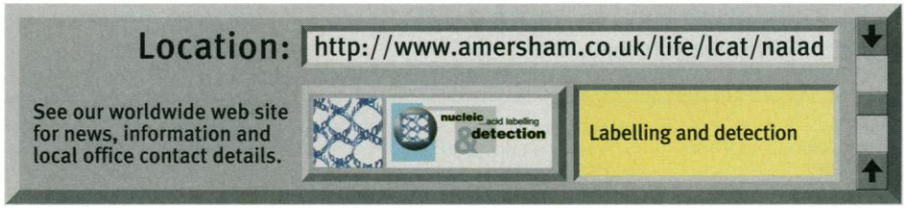
USA (800) 323 9750
Japan (03) 59 92 3422



MNXP

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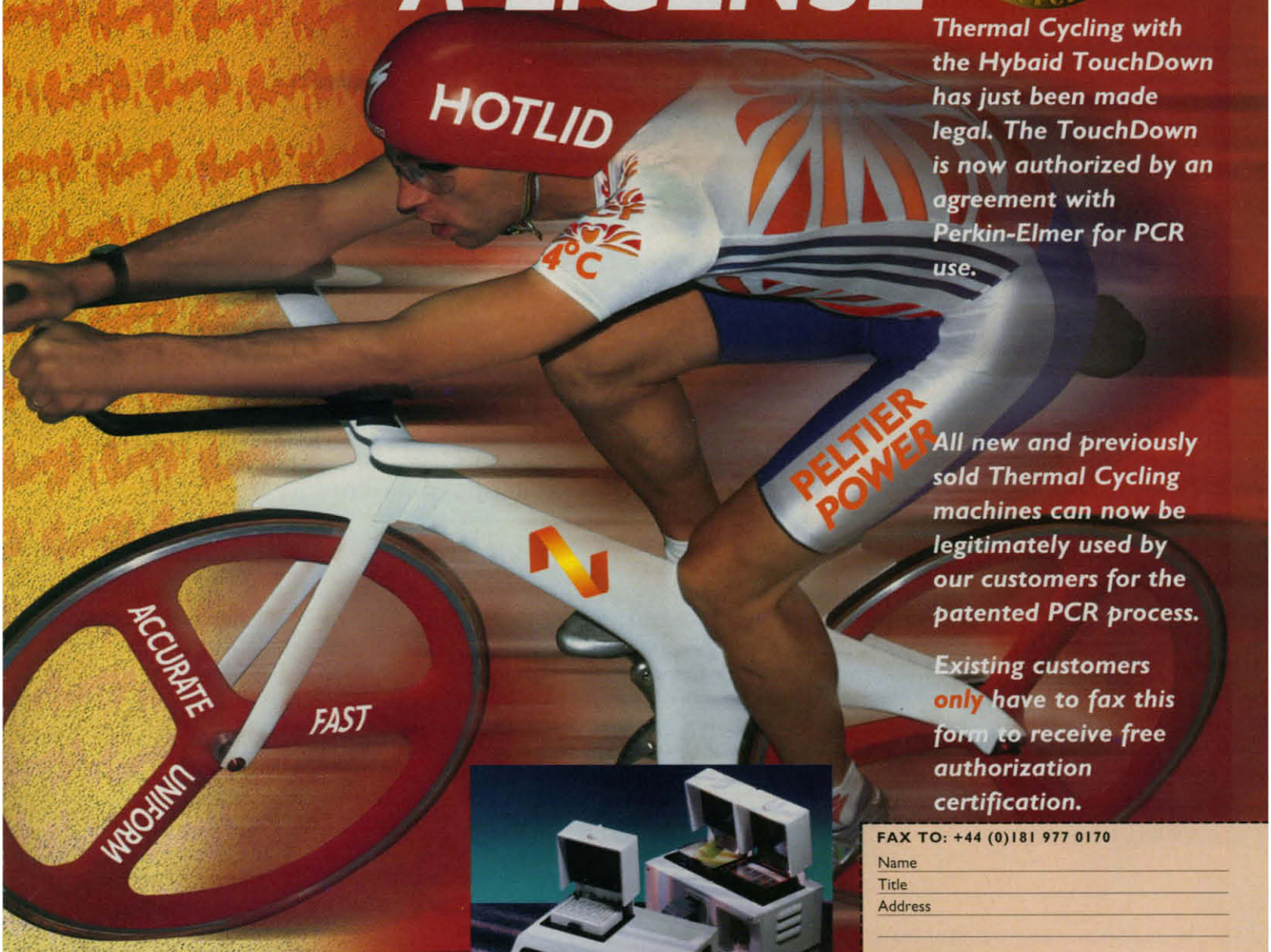

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technology wherein each machine makes 96 different custom oligonucleotides at the same time," says Eitner.

The greater efficiency in making primers has dramatically reduced their cost, which accounts for most of the expense of PCR — about 80–90 percent, says Eitner. Just a few years ago, the price of a single nucleotide in a custom primer was $2 to $3, making the total expense of a typical, 20-nucleotide primer $40 to $60. But many companies, including LTI, have reduced that cost by 50 percent or more, resulting in a greatly decreased overall expense for PCR. Lower costs are obviously important to everyone, particularly for large gene-sequencing projects.

Still, most of the custom primers that LTI makes are for the company's 'smaller' customers. "We knew that custom DNA was an important area that was right at the heart of our customers' needs," says Eitner. "We wanted to provide a cost advantage to our customers." Researchers use LTI's custom primers in a variety of applications, including PCR-based amplification, DNA sequencing, genotyping, and cloning.

LTI is now expanding its ability to make specialty-feature primers, which are more highly purified or have a label attached to them. "Scientists can use them any time they need high DNA purity," says Eitner.

XXXXXX

Within the past several years, researchers have begun to use RNA as a starting template for PCR. This approach is known as RT-PCR because it requires the use of reverse transcriptase (RT) to make a cDNA copy of the starting RNA template.

"WE HAVE A NEW PRODUCT FOR RT-PCR, THE TITAN™ ONE-TUBE RT-PCR SYSTEM," SAYS BERNIE JANOSON, man-

Status Report: Taq *Patent Dispute*

Who first purified the full-length, thermostable, native *Taq* DNA polymerase and when? The question is the crux of a continuing legal battle in the United States and was the pivotal issue in a recent decision by the European Patent Office (EPO). How the case is ultimately decided here and abroad will affect a broad range of patents on other native thermostable polymerases of roughly the same molecular weight as full-length *Taq* that are central to performing the polymerase chain reaction (PCR) and related technologies.

F. Hoffmann-La Roche Ltd of Basel, Switzerland, and its U.S. subsidiary Roche Molecular Systems, Inc. of Branchburg, NJ, claim that scientists at the now-defunct Cetus Corporation were the first to purify full-length, native *Taq*. Roche acquired the patent from Cetus in 1991. "We have over 70 patents on PCR and its various applications," says Thomas White, vice president for research and development at Roche Molecular Systems."There is one patent involved in this dispute with Promega. We feel that Promega is infringing on other patents as well."

Promega Corporation of Madison, WI, claims that scientists at the University of Cincinnati first purified full-length, native *Taq* in the 1970s, which would mean that Cetus' discovery was not novel and that Roche's patent on *Taq* is invalid. "Our position is that Cetus tried to patent an enzyme that was in the prior art," says Randall Dimond of Promega. "It is our belief that *Taq* polymerase was discovered in John Trella's laboratory and was reported in papers published in 1974 and 1976." No one involved in this early research sought a patent on their discovery.

"I think the key scientific point is that there is no evidence in the prior art that they [scientists outside Cetus] isolated a full-length enzyme," says White. "In all cases, they isolated a lower molecular weight enzyme."

"We have gone back and redone the purification," says Dimond. "The evidence is very clear. Everybody has always been purifying the same enzyme."

As of late January, Roche continued to hold the U.S. patent on native *Taq* and other patents on recombinant forms of the enzyme. Promega continued to sell *Taq* for PCR without obtaining a license from Roche to do so. The U.S. District Court for the Northern District of California in San Francisco was scheduled to hold a hearing in February to consider motions for summary judgment and oral arguments from Roche and Promega on the validity of Roche's patent on *Taq*. Also, the judge was expected to set a date for a trial that would determine whether Cetus had intentionally misrepresented or omitted information about the original *Taq* patent. (See previous articles in *Science*, 23 August 1996, p. 1039; and 15 November 1996, p. 1071.)

In Europe, Roche expects to be issued a broad patent that covers the full-length, native *Taq* polymerase; recombinant *Taq*; and full-length DNA polymerases from other bacteria of the *Thermus* genus (*Taq* was isolated from *Thermus aquaticus*) as well as other full-length, thermostable DNA polymerases from different bacterial species that have a molecular weight in the same range as that of full-length *Taq*, says White. The other DNA polymerases covered by the European patent would include *Pfu* and Vent®, which are now marketed as alternative thermostable DNA polymerases by several companies. The EPO announced its decision to issue the broad patent in November 1996, and Roche anticipates the issuance within the next several months.

If the EPO patent issues, a so-called opposition period will follow, which lasts for nine months. During that time, other parties may file objections to the EPO's decision.

- J.S.G.

To see where we're going, look where we've been.

1985
- First publication of polymerase chain reaction by Cetus Corporation in *Science* (R. Saiki*, S. Scharf, F. Faloona, K. Mullis, G. Horn, H. Erlich*, N. Arnheim).

1989
- The thermostable DNA polymerase, *Taq*, (enabling automation of PCR) declared "Molecule of the Year" by *Science*.
- Hoffmann-La Roche Inc. and Cetus agree to begin development of diagnostic applications for PCR.

1990
- Cetus scientists Gelfand* and Stoffel* named inventors of the year for purifying *Taq* DNA polymerase.
- First forensic PCR kit HLA DQA

1991
- First publication of *TaqMan*® method by Cetus.
- Hoffmann-La Roche Inc. acquires from Cetus worldwide rights and patents to PCR.
- Roche Molecular Systems, exclusively devoted to development of PCR, is founded.
- RT-PCR is developed using a single thermostable polymerase, *rTth*, facilitating diagnostic tests for RNA viruses.

1992
- First standardized DNA PCR kits:
  AMPLICOR® *C. trachomatis*†
  AMPLICOR® HIV-1†

1993
- First standardized RNA PCR kit:
  AMPLICOR® HCV†
- Kary Mullis receives Japan Prize and shares Nobel Prize in Chemistry for conceiving PCR.

1994
- Roche scientists continue contributions to the research community through development of "Long PCR" amplifying up to 40,000 base pairs.

1995
- COBAS AMPLICOR™, first automated system for routine diagnostic PCR, launched.†
- First standardized quantitative PCR kits:
  AMPLICOR HIV-1 MONITOR™**†
  AMPLICOR HCV MONITOR™†
- AMPLICOR HIV-1 MONITOR™† test used in accelerated trials of protease inhibitors.

1996
- AMPLICOR HIV-1 MONITOR™** test launched.††
- AMPLICOR® *M. tuberculosis*** test launched.††
- AMPLICOR® Enterovirus test launched.†

* *Currently Roche Molecular Systems Scientists.*

** *Commercially available in the United States. All other products for Research Use Only. Not for use in diagnostic procedures.*

† *European launch*

†† *US launch*

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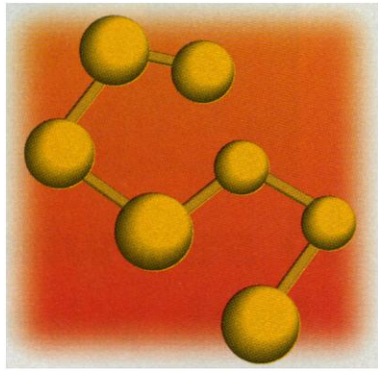
ager of the marketing department at Boehringer Mannheim in Indianapolis, IN. "It allows researchers to perform an RT-PCR reaction in a single step and can be used in basic and applied research labs with any RNA template."

Boehringer Mannheim developed the Titan™ One-Tube RT-PCR System to replace the traditional two-step methods. Those techniques present a problem, says Janoson, because two-step methods require different buffers and temperatures to perform RT-PCR. The researcher first performs the reverse transcriptase step in one tube; stops the reaction; then adds different components, including a thermostable DNA polymerase, for the PCR step. These multiple manipulations increase the chance of contamination.

Boehringer Mannheim's Titan™ One-Tube RT-PCR System, which the company launched in October, 1996, is designed to make RT-PCR more convenient and efficient. The key factors in its development, says Janoson, are the company's technology and expertise in creating enzyme blends that enhance RT-PCR performance. The product consists of a unique blend of AMV reverse transcriptase (originally isolated from avian myeloblastosis virus) and Boehringer Mannheim's Expand™ High Fidelity enzyme mix. The PCR enzyme mix includes *Taq* DNA polymerase and the thermostable *Pwo* polymerase (isolated from the bacterium *Pyrococcus woesei*) along with reaction buffers. To perform the RT-PCR procedure, the scientist combines the reaction ingredients, places the reaction tubes in a programmed thermal cycler, and leaves the reaction to run without interruption.

Janoson says that researchers who use the Titan™ One-Tube RT-PCR system also see increased yields and greater sensitivity. The higher yields result from the ability of the *Taq/Pwo* enzyme blend to amplify the target cDNA sequence and simultaneously proofread it for misincorporated nucleotides. The Titan™ system's higher sensitivity is due to the ability of AMV RT to read more transcripts from even rare RNA species. Also, the enzyme functions at higher temperatures — it is active up to 60° C — than other reverse transcriptases. (Previously, the maximum temperature at which a reverse transcriptase could remain active was 55° C.) The higher temperatures cause the secondary structure of the template RNA (which often loops back on itself) to melt away more readily, thus removing or relaxing the secondary structures. As a result, the RT reaction proceeds more efficiently, which in turn improves the yield of the subsequent PCR reaction.



As for the future of the Titan™ One-Tube RT-PCR System, Janoson is keeping company secrets secret. "Right now, there are not that many forms of RT-PCR available," he says. "We may be able to optimize other enzyme blends in the future."

Boehringer Mannheim markets a range of PCR-related products internationally. "Our strength is the entire group of products that we bring to PCR technology," says Janoson. "We believe that we have the most extensive line of nucleic acid isolation and purification products for both pre- and post-PCR use, which are a natural complement to our nucleic acid amplification products."

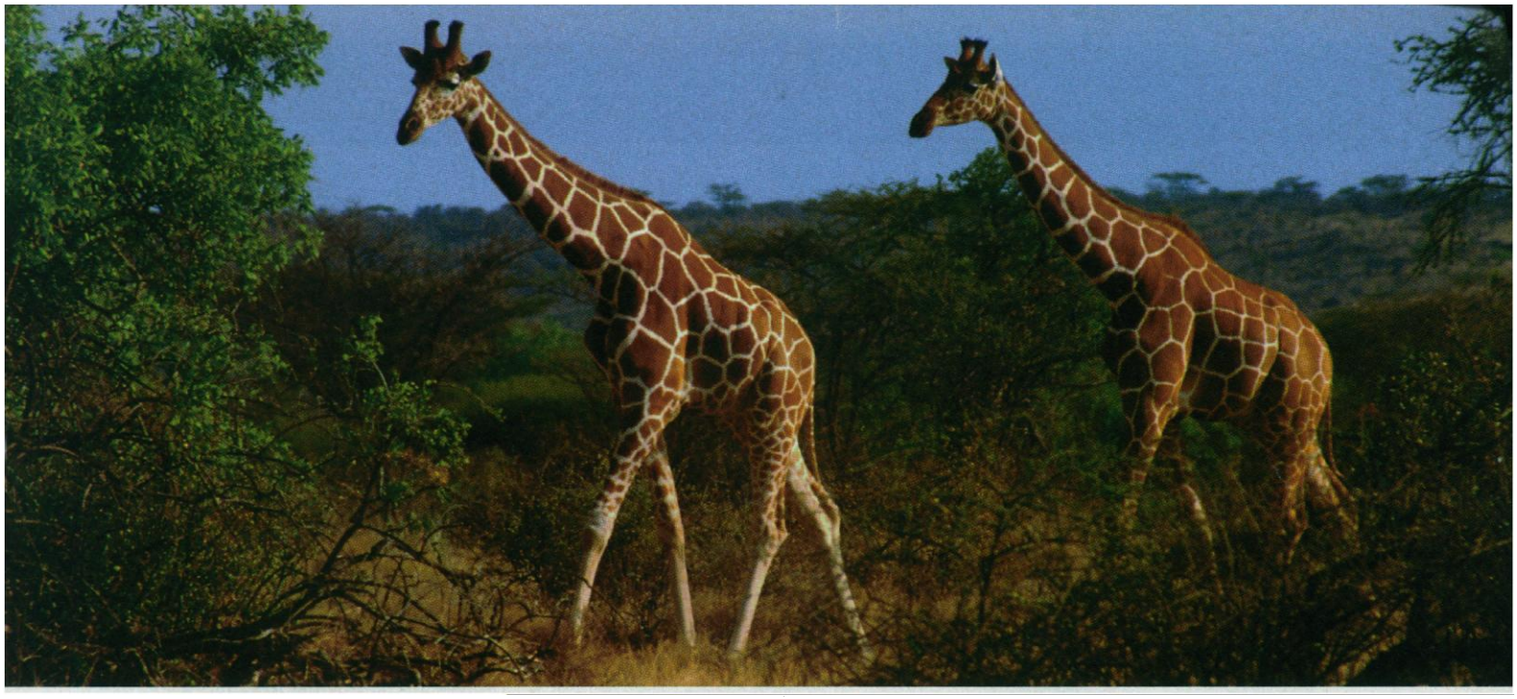
XXXXXX

In addition to thermostable enzymes and other reagents, PCR depends on instruments called thermal cyclers, which, in their most basic form, are incubators that can change temperature accurately and rapidly, typically between 50° C and 92° C. By running though many cycles, a researcher can amplify a few copies of a DNA template a million-fold.

MJ RESEARCH, BASED IN WATERTOWN, MA, MAKES INSTRUMENTS FOR PCR AND CYCLE SEQUENCING as well as reaction tubes, microplates, reagents, and other accessories. "We have two hot new products," says John Hansen, vice president for communications. The first is the PTC-200 DNA Engine™ — PTC stands for Peltier-effect Thermal Cycler — and second is the PTC-225 DNA Engine Tetrad™. Thanks to a new, interchangeable block called the Twin Towers™ that holds slides, the PTC-200 is ideal for in situ PCR and PRINS (primed in situ hybridization). The second instrument, the PTC-225 DNA Engine Tetrad™, has a larger capacity than the PTC-200 and includes four independent blocks for heating and cooling the reaction tubes. MJ Research has designed many of the components to be interchangeable between the two machines, so as the needs of a researcher change s/he needs only to replace a component rather than the entire instrument.

"The part that remains the same in both instruments is the chassis," says Hansen. "It contains the power supply, key pad, microprocessor, and the user and computer interfaces." The changeable components are the Alpha™ module, which includes the Peltier heat pump and the sensors (which detect temperature), and the Hot Bonnet™, a heated-lid apparatus that prevents the evaporation of samples.

The design of the thermal cyclers made by MJ Research differs markedly from that of heat-only thermal cyclers, which depend on passive cooling rather than an active cooling method to switch from

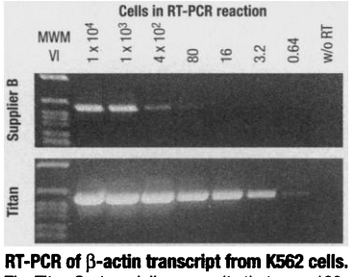


Titan™ One Tube RT-PCR System . . . Take RT-PCR Sensitivity and Convenience to New Heights

Like to top the RT-PCR performance you're getting from M-MuLV RNase H⁻ Reverse Transcriptase and *Taq*? With higher yields and no requirement to change buffers between the RT and PCR steps? By switching to Boehringer Mannheim's Titan™ One Tube RT-PCR System, now you can!

Exceed the sensitivity limits of the two-step RT-PCR method

In side-by-side comparisons, the Titan System delivers superior sensitivity, detecting mRNAs in a single cell equivalent, while the traditional two-step method using an RNase H⁻ RT and *Taq* requires 400 cell equivalents for detection!



RT-PCR of β-actin transcript from K562 cells. The Titan System delivers results that are >100 times more sensitive than those of Supplier B's M-MuLV RNase H⁻ + *Taq* RT-PCR method.

Achieve better results with less effort

- **specificity**–Perform RT reactions at elevated temperatures (50-60°C) to overcome problems arising from complex secondary structures. By minimizing false priming, this ensures better PCR specificity.
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Switch to the Titan System today!

Enjoy improved results and productivity by ordering a trial size (Cat. No. 1888 382, 25 reactions) of the Titan™ One Tube RT-PCR System from Boehringer Mannheim–your Partner for Premium Performance RT-PCR.

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Fig. 1. PCR of the human ApoE gene (75% GC). Lane 1, standard PCR (Taq); lanes A-L, PCR with each of the 12 *MasterAmp* 2X PCR PreMixes using *AmpliTherm* DNA Polymerase.

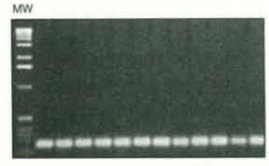

Fig. 2. Repeated PCR of the ApoE gene using *MasterAmp* PCR PreMix K (lane K, Fig. 1) and *AmpliTherm* DNA Polymerase.

Quickly optimize amplification conditions using the *MasterAmp* PCR Optimization Kit.

- It's easy! Just add a mixture of template, primers, and PCR-Qualified enzyme to each ready-to-use PCR PreMix, and cycle. (Fig. 1)
- Once the optimal PCR PreMix is identified, it can be conveniently purchased separately for consistently high yields. (Fig. 2)

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*** Patents pending.*

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high temperatures to lower ones, and the vapor-compression heat pump configuration. Instead, the operation of MJ Research's thermal cyclers are based on principles described by Jean Peltier, a French physicist of the 19th century.

"Our machines use a method of temperature control that depends on passing current through semi-conductor crystals," says Hansen. "The method lends tremendous precision and accuracy to the instrument. Peltier-based technology is also used in fiber optic communication, interplanetary space probes, and heat-seeking missiles."

The PTC-225 Tetrad™ instrument system holds four, dual-module units called Alphas™. "It can accommodate any application of PCR or cycle sequencing or any PCR-related technique that the world has to offer," says Hansen. The large chassis can hold up to 1536 reaction tubes, which is ideal for researchers who need a high throughput thermal cycler.

MJ Research developed the Twin Towers™ block for the PTC-200 instrument to make it easier for researchers to do in situ PCR. The technique involves fixing whole cells or tissue slices, and amplifying a typically low-abundance DNA sequence or an RNA signal that is present. The researcher hybridizes the nucleic acid with a labelled probe that allows the signal to be visualized with an ordinary light microscope.

MJ Research has also tackled a major technical problem that often occurs with in situ PCR, namely that water vapor escapes from the sample. The PTC-200 system with Twin Towers™ includes a reagent called Self-Seal™, an inert cocktail of polymers that the researcher adds to the reaction mixture. "We ship it as a 2X solution; you just throw it into the cocktail and the slides seal themselves," says Hansen.

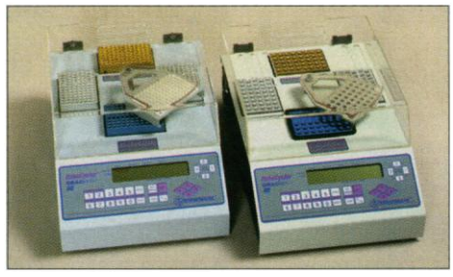
The chassis of the PTC-200 and the PTC-225 will accommodate future Alpha™ modules, too, says Hansen. "We can also customize the instruments to meet consumer needs. We tried to design a system that would not become obsolete; all you need to do is buy a new component."

XXXXXX

"A COUPLE OF THINGS ARE UNIQUE TO STRATAGENE," SAYS PRODUCT MANAGER DOUGLAS DRAKE. "One product is the RoboCycler® Gradient Temperature Cycler, which has a robotic arm that picks up the sample tubes and moves them from one heated block to another." Stratagene, of La Jolla, CA, makes two new versions of the thermal cyclers, the RoboCycler® Gradient 40 and the Gradient 96 temperature cycler, named for their 40- or 96-well formats.

"A key advantage of using the RoboCycler® is increased speed," says Drake. "The researcher does not have to wait for the block to reach a new temperature. Instead, the robotic arm simply moves the sample tubes to the next temperature environment, which the researcher has programmed. Also, the technology offers greater well-to-well temperature consistency, and the two newest models have hot tops that prevent evaporation from the sample tubes."

PCR relies on different temperatures to denature the DNA template, anneal the oligonucleotide primers to the template, and copy the DNA sequence of interest. Because each primer-template combination anneals at a unique temperature, researchers need to identify this optimal temperature. Both RoboCyclers® are designed to make the optimization process more efficient. Researchers can program the heating element used for the annealing step to create a thermal gradient across the block, so the temperature of each column of reaction tubes varies by as much as 2° C. The RoboCycler® Gradient 40 can maintain a gradient of up to 14° C; the maximum gradient for the RoboCycler® Gradient 96 is 22° C.

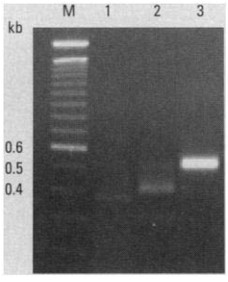


Stratagene's Robocycler® 40 and 96 Gradient temperature cyclers with the unique gradient annealing block feature allow accurate and quick identification of the correct primer/template annealing temperature for successful PCR.

After the optimization process is complete, the RoboCycler® instruments also reduce the overall PCR cycling time and allow higher throughput than conventional cyclers, says Drake. The researcher programs each block for the optimal temperatures for denaturation, annealing, template extension, and sample storage (as cold as –6° C). A robotic arm attached to a central spindle picks up the reaction tubes from one thermal block and moves them to the next in less than three seconds.

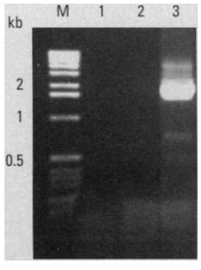
The RoboCycler® 40 has an accessory robotic arm that can be adapted for in situ PCR. It can carry up to three slides that hold paraffin-embedded tissue slices or accommodate 40 thin-walled reaction tubes. The robotic arm for in situ PCR can be attached quickly with a hex screw.

"The newest feature of the RoboCycler® is the Hot Top Assembly, which heats the tops of the reaction tubes," says Drake. "This addresses another problem. With all



Amplification of a 510-bp, 90%-GC portion of the IGFR II cDNA sequence using the Advantage-GC cDNA PCR Kit. The shorter fragment in Lane 2 is due to an ~100-bp deletion caused by polymerases "skipping" over an especially GC-rich region.

Lane 1: standard PCR buffer
Lane 2: Advantage-GC buffer (contains DMSO)
Lane 3: **Advantage-GC buffer and GC-Melt**
Lane M: 100-bp ladder



Amplification of a 69%-GC fragment of TGF-β1 genomic sequence using the Advantage-GC Genomic PCR Kit.

Lane 1: standard PCR buffer
Lane 2: Advantage-GC buffer (contains DMSO)
Lane 3: **Advantage-GC buffer and GC-Melt**
Lane M: 1-kb ladder

CLONTECH's new PCR amplification system, **Advantage-GC**, with the unique **GC-Melt™** reagent, amplifies stubborn GC-rich regions far better than conventional methods do. Two new kits, the Advantage-GC cDNA PCR Kit (#K1907-1) and the Advantage-GC Genomic PCR Kit (#K1908-1), combine the benefits of Advantage PCR—high efficiency and yield—with the ability to amplify nearly pure GC stretches. Melt your GC troubles away with Advantage-GC PCR Kits! For more information or to place an order, call **800-662-CLON (2566)**. For international orders, please contact your local distributor.

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of the heating steps that are required for PCR, water evaporates from the sample and condenses inside the top of the reaction tube. This may disrupt the homogeneity of the reaction mixture and cause it to be heated inadequately." But with the hot top, a researcher does not have to overlay wax or mineral oil on top of the reaction mixture to prevent moisture loss. The hot top simply holds the reaction tubes in place and prevents evaporation.

Researchers at Stratagene are also trying to find and isolate new thermostable polymerases. Several years ago, Stratagene scientists obtained a sample of sludge from an underwater volcano and isolated the enzyme *Pfu* — an acronym for a DNA polymerase from *Pyrococcus furiosus*, a bacterium that lives in deep-underwater volcanoes.

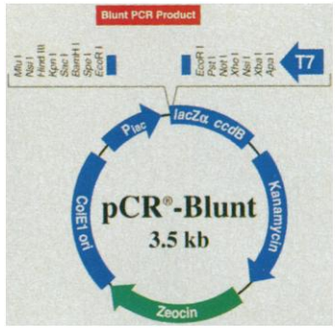
"*Pfu* has particular advantages over *Taq*," says Drake. "*Pfu* is more thermostable. Whereas *Taq* can lose 40–90 percent of its activity over an hour at 95° C, *Pfu* only loses 3–5 percent of its activity over the course of 2 hours at 95° C." Like *Taq*, *Pfu* has a 5′-to-3′ polymerase activity. But unlike *Taq*, *Pfu* also has a 3′-to-5′ exonuclease proofreading activity, which allows it to correct the misplacement of a nucleotide. "The error rate of *Pfu* is 12-fold less than *Taq*," says Drake.

As for the future of the RoboCycler®, Drake says that Stratagene is developing a machine that can run more samples — up to 384 wells. Also, Stratagene is trying to incorporate the RoboCycler® into a larger robotic assembly that can handle higher throughput.

Many companies make products and instruments that are necessary for the polymerase chain reaction itself. Others make products that researchers use after the PCR process is completed.

XXXXXX

"WE HAVE A NEW PCR CLONING PRODUCT CALLED THE ZERO BLUNT™ PCR CLONING KIT," SAYS GLENN DAVIES, director of sales and marketing at Invitrogen in San Diego. He recommends the new cloning system for customers who use alternative thermostable



Invitrogen's pCR®-Blunt cloning vector is the key component of the company's new Zero Blunt™ PCR Cloning Kit. The vector contains a lethal gene that allows only recombinants that contain the PCR product to grow.

DNA polymerases such as Vent® and *Pfu*, which result in DNA sequences that have blunt ends.

"If a customer has chosen to use an alternative, blunt-end polymerase for PCR, then we offer a simple, rapid, efficient way to clone the blunt-end DNA products that result," says Davies. "Our technology comes in after-the-fact — after a researcher has done the PCR and needs to clone the DNA product."

Invitrogen's Zero Blunt™ PCR Cloning Kit includes the pCR®-Blunt vector, ligation enzymes, and competent cells.
(The kit does not include the thermostable polymerases.) The pCR®-Blunt vector works by positive selection; it allows only the growth of recombinants that contain the PCR product.

"This product yields greater than 95 percent true recombinants," says Davies. "It's state of the art right now."

Today, most researchers use a form of the thermostable *Taq* DNA polymerase to amplify their PCR products. *Taq* has the disadvantage of producing some DNA fragments that are not the sequence of interest. *Taq* also yields DNA products that have an "A" overhang, rather than blunt ends. Researchers can then use Invitrogen's TA Cloning® methodology for cloning these PCR products, in which the cloning vector

has a "T" overhang that anneals easily to the "A" overhang of the amplified DNA product.

Invitrogen's Zero Blunt™ PCR Cloning Kit capitalizes on the best of the enzyme worlds. It allows researchers to use the blunt-end polymerases such as Vent® and *Pfu* to amplify their target DNA sequence. These alternative enzymes are advantageous because of their stability at temperatures greater than 90° C and because of their 3′ exonuclease proofreading ability. Consequently, the DNA products that result from Vent®- and *Pfu*-based PCR are of higher fidelity than those resulting from *Taq*. "The Zero Blunt™ PCR Cloning Kit allows researchers to clone blunt-end products as efficiently as they can the A-overhang DNAs," says Davies.

Invitrogen's new PCR cloning system is called 'zero blunt' because it is based on a method for obtaining zero background. The pCR®-Blunt cloning vector contains the lethal gene, *ccd*B (*c*ontrol of *c*ell *d*eath). When the gene is expressed, it produces a protein that inhibits cell growth. Inserting a PCR product into the *ccd*B gene, as is done in the Zero Blunt™ cloning method, disrupts *ccd*B expression and allows cell growth. As a result, only cells that contain such an insert will grow.

Invitrogen launched the Zero Blunt™ PCR Cloning Kit last fall after noticing that more of their customers were using high-fidelity enzymes and that the available methods for cloning DNA products with blunt ends often yielded high backgrounds. The lethal-gene technology of the vector was devised by a group of researchers in Belgium and licensed by Invitrogen several years ago.

Davies see the development of the Zero Blunt™ PCR Cloning Kit as compatible with Invitrogen's overall goals. "I think the impetus in this area is always to make tools that make the researcher's job easier — to do it more efficiently and get better results." It may seem that the advent of designer primers, higher fidelity enzymes, robotic thermal cyclers, and improved cloning technology satisfies any wish that a PCR user might have. Not so. Pick any stage of the process and the user still wants more, from better primers to

more sensitive and faster end-product analysis.

"There is a need to make the ideal primers more quickly," says Gibbs. If the design of the primers is not adequate, the amplification process does not yield sufficient amounts of the target DNA sequence. And if the amount of target DNA is very low to start — as it typically is for in situ PCR — the result will be unsatisfactory.

Nierman concurs and cites efforts to determine the locations of dinucleotide repeats in the genome as an example. Sometimes, he says, the genetic markers used to determine these locations are inadequate. "The reaction is not robust enough, so you get an inconsistent map location at the end of the process."

On Gibbs' wish list for better PCR-related technologies are an improved ability to do multiplex PCR and a robust method for detecting the amplification products on solid phase. He also wants greater capacity. "Right now, the precision and sensitivity of PCR are great," says Gibbs. "The only thing you can't do is enough of it." In addition to asking for increased throughput, he also wants better ways to interpret and manage large data sets.

What does the future hold for PCR? Nierman says it is not yet clear what will happen to long PCR technology. "We've had a continuous displacement of technologies, for example, RFLP [restriction fragment length polymorphisms] by PCR." And in forensic settings, older methods are still in use, largely because it is difficult to introduce new technologies into the courtroom. So forensic PCR needs to catch up with the rest of the field, says Nierman. He also predicts that as scientists sequence the genomes of more organisms, "there will be a shift toward the analysis of genes that have been identified." In fact, federal agencies, including the Department of Energy and NIH, are now issuing requests for applications that focus on the functional analysis of newly discovered genes.

Gibbs focuses on future applications that relate to human disease. "There will be instant genetic testing," he predicts. "We can expect assays that are quick and that have high throughput. We will also be able to interpret our screening results more quickly. Insurance companies are demanding lots of these tests. Just as the genome project provides the information, PCR will be the mechanism by which this becomes part of our daily lives."

It's a brave new world out there. ■

— J. St. George

J. St. George is a science writer who works in the Washington, DC, area.

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THE WORLD DEPENDS ON THE

It takes world-class employees to make a world-class company.

At Abbott Laboratories, our professionals are researching, developing and marketing the health care products that will make a significant impact on generations to come. The Pharmaceutical Products Division of Abbott Laboratories, a worldwide leader in the development of health care products, has immediate openings in the Structural Biology group.

PROTEIN BIOCHEMIST/ CRYSTALLOGRAPHER

The Structural Biology group is looking for a new member of its Protein Crystallography Laboratory to support Discovery Projects within the Pharmaceutical Products Division. The Protein Crystallography Laboratory is dedicated to providing valuable structural information for applications in the areas of Rational Drug Design and Protein Engineering. Close interaction with the molecular modeling group, NMR spectroscopists, protein biochemists, medicinal chemists, and molecular biologists provides the appropriate milieu for creative and challenging research. We are looking for a candidate who is self-driven, imaginative, dedicated, and enthusiastic. Such an individual can look forward to a gratifying career in the application of structural methodology to drug design.

Candidates with a PhD or Masters with a major in Chemistry, Biochemistry, Protein Biochemistry or closely related fields with extensive research experience in protein crystallization, crystal quality screening and handling are strongly encouraged to apply. Complementary experience in the area of protein expression, preparation and purification is desirable. Research experience in other techniques of protein crystallography (data collection, data reduction, structure solution and refinement) is not essential. The selected candidate will participate in the ongoing macromolecular crystallography projects by specifically aiding in protein crystallization, including crystal characterization, manipulation and screening. In addition, interaction and participation with the group(s) doing the protein expression, preparation and purification will be expected.

Our Protein Crystallography Laboratory is equipped with two Rigaku 12 Kw rotating anode x-ray generators, a Rigaku RAXIS IIC image plate and a MARRESEARCH area detector. Abbott is a participating member of the Industrial Macromolecular Crystallography Association (IMCA) which is actively pursuing the construction of two synchrotron beam lines for macromolecular crystallography in the Advanced Photon Source at Argonne National Laboratory. Commissioning of the beam lines for routine operation is planned for June 1997. Our computing and graphics facilities are state-of-the-art. **(Job #96-LAM-2808)**

POST-DOCTORAL FELLOW

The ideal candidate will have a PhD in Chemistry and previous post-doctoral experience in cloning and expression. You will work under the joint direction of the protein biochemistry group and biotransformation research and with associated biochemist and fermentation engineers to clone, express, purify and characterize recombinant forms of human drug metabolizing enzymes. **(Job #97-LAM-046Y)**

With 50,000 employees worldwide, and more than $11 billion in annual sales, we've established ourselves as a respected global business and innovative leader in the changing health care industry. For consideration, please send your c.v. to: **Abbott Laboratories, Job #(please select), D583, AP9A, 100 Abbott Park Rd., Abbott Park, IL 60064.** Abbott is an Affirmative Action Employer/ Smoke-Free Environment.

ABBOTT LABORATORIES
Quality Health Care Worldwide

WHERE POSSIBILITIES BECOME

ACHIEVEMENTS

By merging pharmaceutical science with information technology, Eli Lilly and Company is creating unprecedented opportunities to better meet the global population's health care needs. And achieving all this, is a dedicated team of professionals. Their talents and skills in a variety of arenas, keep our $6+ billion company on the cutting edge.

MS Biochemists/Biologists

The Infectious Diseases group is seeking individuals to join an interdisciplinary team in research directed towards the discovery of new anti-infective compounds. Qualified candidates will possess an MS degree, or equivalent experience, in ***Biochemistry, Molecular Biology, or Bacteriology/Virology.*** *Experience with viruses or bacteria and knowledge of enzymology or protein chemistry is desirable.*

For prompt consideration, please send resume and cover letter suitable for scanning to: ***Eli Lilly and Company, Corporate Recruitment, Attn: ADSCMBI02, Lilly Corporate Center, Indianapolis, IN 46285.***

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We are an equal opportunity employer dedicated to diversity and the strength it brings to the workplace.

For other job opportunities, please access our Job Bank at http://www.lilly.com or phone our Jobline 1-800-892-9121.

KNOWLEDGE IS POWERFUL MEDICINE

CARDIOVASCULAR SCIENTIST

Rhône-Poulenc Rorer, a global leader in the pharmaceutical industry, is seeking a Scientist for their suburban Philadelphia headquarters.

The candidate will be responsible for providing cellular, biochemical, and molecular expertise to research programs for novel drugs for the treatment of heart failure and ischemic heart disease. We seek an individual who can perform basic research to identify and validate new potential drug targets and the development of assays to screen for inhibitors or agonists of new drug targets.

To qualify, you should have a Ph.D. with at least 2 years of post-doctoral work. You should have previous experience in studying cardiac physiology/pharmacology using isolated myocytes. Knowledge or research experience of factors governing myocyte hypertrophy and/or apoptosis would be an advantage.

Rhône-Poulenc Rorer offers a competitive salary, excellent benefits, a highly challenging work environment, and opportunities for advancement. Qualified candidates should send their resume to: **Rhône-Poulenc Rorer Research & Development, Human Resources, Mailstop H37, Position JO-LMJ, P.O. Box 5096, Collegeville, PA 19426-0800.** Equal Opportunity Employer, M/F/D/V.

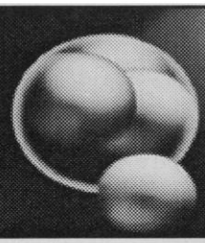
RHÔNE-POULENC RORER

U.S. GEOLOGICAL SURVEY
Deputy Chief Biologist for Science
Senior Executive Service (SES)

The U.S. Geological Survey (USGS) anticipates seeking candidates for the full-time position of Deputy Chief Biologist for Science, Biological Resources Division (BRD), Reston, Virginia. Applicants should have achieved national recognition for outstanding achievement in the biological and ecological sciences as well as possess significant managerial experience. This is a career civil service position, in the SES, with a salary range that begins at $103,897 per annum.

The Biological Resources Division provides scientific understanding and technologies needed to support the sound management and conservation of our Nation's biological resources; provides information needed by resource managers in the Department of the Interior in a form that allows them to assess, predict, and manage the biological consequences of various management policies and practices; and identifies and serves science needs of a wide range of partners, including State and Federal agencies, and the public. As Deputy Chief Biologist for Science, the incumbent is responsible for: (1) overall science direction of the BRD; (2) program planning, review and evaluation; and (3) national program management. Responsible for the development, documentation, and publication of BRD strategic planning and its interface with the Government Performance and Results Act (GPRA). Manages the processes, staff, and financial resources necessary to ensure that BRD's scientific goals and objectives are relevant to the needs of clients and stakeholders and are interrelated and appropriately linked to the Bureau Information Needs, USGS Strategic Plan, BRD Strategic Science Plan, GPRA, Annual Performance Plan, Annual Performance Report, Annual Work Plan, and budget requests. Manages various review and evaluation functions designed to ensure that the science conducted throughout BRD is relevant, meets and/or exceeds clients' needs, is of the highest quality, and is delivered on a timely basis. Provides leadership for and represents programs identified in the Strategic Science Plan. In this capacity, he/she functions as an advocate for these programs, thereby enhancing consistency and integration within programs, across scientific disciplines and geographic areas and serves as the spokesperson for each Strategic Science Plan program during budget development and other funding opportunities.

Individuals interested in this position should contact Lisa Snooks at (703) 648-7420 to receive application forms and a complete vacancy announcement which describes job requirements (including knowledges, abilities, skills, and other characteristics (KASOCs) required for the position; and application and evaluation procedures. Applications (Optional Application for Federal Employment OF-612, or resume) must be received at the following address: **U.S. Geological Survey, 12201 Sunrise Valley Drive, MS 601, Reston, Virginia 20192**, by April 9, 1997, and should reference announcement #SES-97-2. A Reference and Qualifications Analysis form and a narrative qualifications statement addressing the KASOCs should also be submitted by the above date and will be used in the evaluation of candidates.



Defining New Boundaries

At Amylin Pharmaceuticals, Inc., our pioneering research on the hormone, amylin, is redefining the boundaries of treatment for diabetes and related disorders. Our Research Division is currently 70 strong and has consistently invested in state-of-the-art equipment, including high-throughput screening robotics, microphysiometry, automated peptide and organic synthesis, electrospray, MALDI-TOF mass spectrometers, and NMR. We are currently expanding our drug discovery capabilities and have the following openings for Molecular Biologists and Chemists:

Scientific Investigator, Molecular Biology

Will lead a small group of scientists responsible for the design, construction and optimization of recombinant protein expression systems. A Ph.D. in Molecular Biology, Biochemistry or a related discipline with a minimum of 5 years of experience is required, as well as demonstrated ability to work constructively as a member of an interdisciplinary team. Industrial experience with recombinant protein production using a variety of expression systems is highly desirable. Ref #MW1

Staff Scientists, Molecular Biology

Requirements include a Ph.D. in Molecular Biology, Biochemistry or a related discipline, preferably with post-doctoral experience, or a B.S./M.S. with 8 years of relevant experience and expertise in current molecular biology methods. One position requires experience in recombinant protein expression (bacterial, yeast, insect and/or mammalian systems), including vector construction, strain selection, recombinant analysis and expression optimization. The second position requires experience with phage display technologies. Ref #MW2 and #MW3

Research Associate, Molecular Biology

Must have a B.S. in Molecular Biology or a related discipline plus at least 3 years of relevant experience or an M.S. plus at least 1 year of experience. Research projects involve identifying molecular targets in metabolic disorders and investigating their expression, gene regulation, and mechanisms of action. Requires working familiarity and competency with a variety of standard molecular biology techniques including, but not limited to: extraction and analysis of nucleic acids; DNA sequencing; PCR-based amplification; Southern, Northern and Western blotting; cDNA cloning; and expression of recombinant proteins in heterologous systems. Ref #MW4

Staff Scientist, Medicinal Chemistry

Requires a Ph.D., preferably with relevant post-doctoral experience. A background in organic synthesis and medicinal chemistry is essential. Experience in combinatorial chemistry, machine based solid-phase synthesis, computer graphics and database operation is preferred. Knowledge of biochemistry and bio-assays is a plus. Ref #MW5

Research Associates/ Senior Research Associates, Medicinal Chemistry

Must have a B.S./M.S. with up to 6 years of experience, preferably obtained within the pharmaceutical industry, or a recent Ph.D. may qualify. A background in organic synthesis is essential along with high quality experimental skills, including HPLC, NMR, and MS experience. Combinatorial chemistry, machine based solid-phase synthesis, medicinal chemistry and computer graphics experience is preferred. Ref #MW6 and #MW7

Research Associate/Senior Research Associate, Protein Chemistry

Must have a B.S./M.S. with up to 6 years of experience, preferably obtained within the pharmaceutical industry, or a recent Ph.D may qualify. A background in state-of-the-art protein purification and characterization is essential. Experience in bacterial or mammalian cell fermentation and/or molecular biology techniques is preferred. Ref #MW8

Amylin is located in La Jolla's Golden Triangle region of Southern California and offers an excellent salary and benefits package, including stock option participation. For immediate consideration, please send your resume to:
JP HR, Ref#____(see above),
Amylin Pharmaceuticals, Inc.,
9373 Towne Centre Drive,
San Diego, CA 92121.
Fax: (619) 552-2212;
E-mail: mworley@amylin.com
EOE.

Visit our Web site for more information:
www.amylin.com

AMYLIN
PHARMACEUTICALS

ASSISTANT/ASSOCIATE PROFESSOR

The Department of Cell Biology and Anatomy in the Faculty of Medicine and Oral Health Sciences at the University of Alberta invites applications for a tenure-track position as **ASSISTANT/ASSOCIATE PROFESSOR**. We are looking for an individual who will complement our existing strengths in 1) neurobiology, 2) cell signaling, 3) protein targeting and organelle biogenesis, and 4) cell-cell interactions. Salary range: $39,230–$69,664 per annum, plus comprehensive benefits. Applicant should have proven records of research achievement and be eligible for funding by the Alberta Heritage Foundation for Medical Research. The successful candidate will be expected to carry on an independent research program, but will also have the opportunity for collaborative interactions with several multidisciplinary research groups within the University. A contribution to the Department's teaching program will also be expected. Please send a curriculum vitae, a one-page statement of research interest, and arrange to have three to five letters of reference sent on your behalf to: **Dr. Richard Rachubinski, Professor and Chair, Cell Biology and Anatomy, University of Alberta, Edmonton, Alberta T6G 2H7 Canada**. Deadline for receipt of applications is August 15, 1997. *In accordance with Canadian immigration requirements, priority will be given to Canadian citizens and permanent residents of Canada. If suitable Canadian citizens and permanent residents cannot be found, other individuals will be considered. The University of Alberta is committed to the principle of equity in employment. As an employer we welcome diversity in the workplace and encourage applications from all qualified women and men, including aboriginal peoples, persons with disabilities, and members of visible minorities.*

RESEARCH ASSISTANT PROFESSORS

Molecular Physiology: Two positions are available for an interdisciplinary study of the molecular physiology of secretion in exocrine cells. For position one we seek a Ph.D. with experience patch clamping native cells, especially epithelial cells. The focus of the work is the modulation and regulation of the anion channels in parotid acinar cells and includes an electrophysiological study of the channels and the cloning, *in vitro* expression, and structure function studies of the channel proteins. For the second position we seek a Ph.D. with extensive molecular biological experience in cloning and expression of proteins, especially transport proteins. Experience with transgenic or knockout technologies desirable. The focus of the second project is the Na^+/H^+ exchangers in exocrine gland cells and includes cloning, *in vitro* expression, and structure function studies. Send curriculum vitae and names of three references to: **Dr. James E. Melvin, University of Rochester Medical Center, 601 Elmwood Avenue, Box 611, Rochester, NY 14642. FAX: 716-473-2679. Email: melvin@medinfo.rochester.edu.** *Equal Opportunity Employer.*

MOLECULAR/CELLULAR BIOLOGIST

The Biology Department of Gannon University is seeking a well-qualified candidate to fill a position at the **ASSISTANT PROFESSOR** level. Responsibilities: instruction of cell biochemistry, cell biology, plant science and first semester biology. Upper-level plant biology instruction in alternate years. Directing undergraduate research. Requires Ph.D. in biology/botany, a commitment to teaching and ability to work successfully with undergraduate students. This appointment is a 9-month, tenure-track position. Position available August 1997. To apply, send letter of application, curriculum vitae, and three letters of recommendation by April 10, 1997 to: **Director of Human Resources, Gannon University, University Square, Erie, PA 16541. FAX: 814-871-7514.** *Affirmative Action/Equal Opportunity Employer.*

Tenure-track **ASSOCIATE/FULL PROFESSOR** position in genetic toxicology is available in the Institute of Chemical Toxicology, Wayne State University. Individuals with actively funded research examining DNA damage by bioactivated chemical carcinogens with special emphasis on low level dose effects on DNA damage and the relationship between low dose exposure and mutational spectra of target genes in human cells are especially encouraged to apply. Applicants should send their curriculum vitae along with the names and addresses of four references to: **Dr. Raymond F. Novak, Director, Institute of Chemical Toxicology, Wayne State University, 2727 Second Avenue, Detroit, MI 48201.** *Wayne State University is an Equal Opportunity/Affirmative Action Employer. Women and minorities are especially encouraged to apply.*

POSITIONS OPEN

Wayne State University

The Department of Occupational and Environmental Health Sciences anticipates the availability of tenure-track positions at the rank of **ASSISTANT/ASSOCIATE PROFESSOR** to teach and conduct research in Toxicology, Industrial Hygiene or related disciplines. The applicant should have a Ph.D. and/or M.D. degree. The prime criteria for selection will be the outstanding record of accomplishments within the broad discipline of the Environmental Health Sciences. Qualified candidates should send curriculum vitae and a concise description of research interests to: **Deepak K. Bhalla, Ph.D. (Chair, search committee), Department of Occupational and Environmental Health Sciences, 628-Shapero Hall, Wayne State University, Detroit, MI 48202.**

Wayne State University is an Equal Opportunity/Affirmative Action Employer. Wayne State University—People working together to provide quality service. All buildings, structures, and vehicles at Wayne State University are smoke-free.

PHYSIOLOGIST/ENDOCRINOLOGIST

The newly formed Department of Biological Sciences, University of Maine, seeks applicants for a tenure-track, academic year teaching and research position at the **ASSISTANT PROFESSOR** level in endocrine physiology of vertebrates. The applicant is expected to establish a vigorous, externally-funded research program at the whole animal or cellular/molecular level, with the opportunity to collaborate with biologists in several departments conducting biomedical research. Ph.D. in an appropriate discipline is required, teaching and postdoctoral experiences are preferred, and a strong commitment to undergraduate and graduate education is expected. Teaching load will be approximately one course per semester, and will include an undergraduate course in anatomy and physiology for students in allied health programs, physical education, and social work, and advanced undergraduate and graduate courses in the candidate's specialty. Review of applications will begin March 21, 1997 and will continue until a suitable candidate is found. Applicants should submit curriculum vitae, statement of interests, representative published papers, and names, addresses, and telephone numbers or Email addresses of three references to: **Chairperson, Endocrinology Search, Department of Zoology, University of Maine, 5751 Murray Hall, Orono, ME 04469-5751.** *The University of Maine is an Equal Opportunity/Affirmative Action Employer.*

ASSISTANT PROFESSOR—Zoology, Department of Biological Sciences. Tenure-track position to begin August 1997. Qualifications: Ph.D. and postdoctoral experience in an appropriate biological area required. Expertise that complements our strengths in aquatic, molecular, evolutionary, and wildlife biology preferred. Responsibilities: Teaching courses in human anatomy, zoology, and upper-level courses in area of specialty; developing an externally-funded research program; directing graduate students. Application deadline: March 31, 1997. To apply: Send curriculum vitae, statements of teaching and research interests, undergraduate and graduate transcripts, and three current letters of recommendation to: **Dr. Tom Timmons, Department of Biological Sciences, Murray State University, P.O. Box 9, Murray, KY 42071-0009.** *Equal education and employment opportunity, Minorities/Females/Disabled, Affirmative Action Employer.*

ASSISTANT PROFESSOR ENVIRONMENTAL WEED ECOLOGIST

Full-time, 12 month tenure-accruing position, Agronomy Department, University of Florida. 70% research, 30% instruction. Research should stress interdisciplinary approaches to determine the ecology and control of invasive plants in managed and natural habitats. Teaching includes an undergraduate course on pest plants, and a graduate weed ecology course. Ph.D. required; postdoctoral experience preferred. To apply, provide letter of application, curriculum vitae, transcripts, statement of research and teaching goals, names, addresses, and telephone numbers of five references by April 1, 1997 to: **Dr. K. H. Quesenberry, P.O. Box 110500, University of Florida, Gainesville, FL 32611-0500. Email: clover@gnv.ifas.ufl.edu.**

POSITIONS OPEN

The Chemistry and Geochemistry Department at Montana Tech of the University of Montana is seeking two tenure-track **ASSISTANT PROFESSORS** 1) a geochemist/physical chemist starting in the fall of 1997 and 2) an environmental geochemist/chemist starting in January 1998. Minimum qualifications include a Ph.D. in geochemistry, physical chemistry, or environmental chemistry and the ability to teach undergraduate and graduate courses in general chemistry, physical chemistry, and geochemistry, as appropriate to the particular position. Individuals who excel in teaching and who can establish a vigorous research program at both the undergraduate and master's level in environmental geochemistry are encouraged to apply. Preference will be given to candidates who can contribute to our master's environmental geochemistry program. Review of applications will begin April 1, but the position will remain open until filled. The Department of Chemistry and Geochemistry offers an ACS accredited B.S. degree in chemistry and a Master's Degree in Geochemistry. Montana Tech is situated in the historic mining community of Butte in the heart of the Rocky Mountains. Applicants should submit a résumé, curriculum vitae, a statement of research interests, and the names of three references to: **Dr. Doug Coe, Head, Department of Chemistry and Geochemistry, Montana Tech of the University of Montana, 1300 West Park Street, Butte, MT 59701. Telephone: 406-496-4207.** *Montana Tech is an Equal Opportunity/Affirmative Action Employer.*

Industrial Hygiene: The University of Alabama at Birmingham (UAB) School of Public Health is seeking candidates for a full-time tenure-track **ASSISTANT PROFESSORSHIP** in the industrial hygiene program of its nationally recognized National Institute of Occupational Safety and Health-supported Deep South Educational Resource Center. Candidates should have a doctoral degree in industrial hygiene or related field with postdoctoral experience preferred. This individual will be expected to develop an independent extramurally-funded research program in occupational/environmental exposure assessment methods and/or modeling with abundant collaborative opportunities at UAB. Other responsibilities will include teaching, developing courses, advising students, and serving on doctoral and master's research committees. Candidates should forward their curriculum vitae, statement of teaching and research interests, and names and addresses of three references by May 15, 1997 to: **Dr. Kenneth Dillon, Chair, Search Committee, UAB Department of Environmental Health Sciences, Birmingham, AL 35294-0008. Email: dillonk@tidwell.soph.uab.edu.** *UAB is an Equal Employment Opportunity Employer. Women, minorities, and persons with disabilities are encouraged to apply.*

MOLECULAR NEUROBIOLOGIST TENURE-TRACK FACULTY POSITION

The Institute of Neurobiology of the University of Puerto Rico Medical Sciences Campus, an interdisciplinary research institute, seeks a molecular neurobiologist. The candidate must show strong potential for establishing an externally funded research program in molecular biology that interfaces with the diverse interests of the Institute. The appointment will be at the level of **ASSISTANT** or **ASSOCIATE PROFESSOR**. Limited teaching to graduate students and in a relevant medical school department in Spanish or English. Send curriculum vitae, recent reprints, statement of research plans, and the names of three references to: **Dr. Conchita Zuazaga, Institute of Neurobiology, 201 Boulevard del Valle, Old San Juan, PR 00901.** *Equal Opportunity/Affirmative Action Employer.*

ANALYTICAL CHEMISTRY INDIANA UNIVERSITY, BLOOMINGTON

The Department of Chemistry invites applications for a tenured position in analytical chemistry at the level of **ASSOCIATE PROFESSOR** or higher. Outstanding, established teacher-scholars are sought whose research interests will complement those of the current staff. The position will be occupied in the calendar year 1998. Applicants should submit a curriculum vitae and a list of publications to: **Professor Paul A. Grieco, Department of Chemistry, Indiana University, Bloomington, IN 47405.** The deadline for receipt of applications is April 15, 1997. *Indiana University is an Affirmative Action/Equal Opportunity Employer and especially encourages applications from women and members of minority groups.*

AUBURN UNIVERSITY

Director, Institute for Biological Detection Systems

Auburn University invites applications for the position of Director of its Institute for Biological Detection Systems (IBDS). The IBDS was established to conduct research in the fundamental technology areas of biologically based detection systems. It is nationally recognized for research on biological detection, particularly in the area of canine olfaction. Research scientists associated with the Institute are based in several of the colleges at Auburn University; the Director reports directly to the Auburn University Vice President for Research. The responsibilities of the Director include, but are not limited to:

- Providing leadership and vision for current and future IBDS research.
- Directing and administering all research activities of IBDS.
- Identifying and obtaining extramural funding for the Institute.

Candidates for the position of Director must have a bachelor's degree, preferably in biology, chemistry, engineering, or veterinary medicine or related fields. Advanced degree is preferable. Candidate should have demonstrated professional experience in biological detection systems, biomedical engineering, chemical agent, illicit drug, explosives and/or contraband. Candidates must show evidence of effective leadership and administrative skills, good interpersonal skills, and have successful grantsmanship experience. Familiarity with federal funding agencies is preferred.

Salary is commensurate with experience and background. A letter of application as well as a current resume with names, addresses, and telephone numbers of three references should be sent to:

Dr. Christine Curtis
Associate Vice President for Research
202 Samford Hall
Auburn University, AL 36849
telephone: 334-844-4784
FAX: 334-844-5971
e-mail: curticw@mail.auburn.edu

Review of applications will commence: March 1, 1997 and will continue until the position is filled.

Auburn University is an Affirmative Action/Equal Opportunity Employer. Additional information concerning Auburn University is available at the website: **http://www.auburn.edu/.**

Research & Development

ON THE JOURNEY OF *Discovery*

Glaxo Wellcome, *the world's largest pharmaceutical company, is an organization committed to fighting disease and bringing innovative medicines to patients throughout the world. To accomplish this feat, we are on a constant journey of discovery—a journey fueled by consummate professionals dedicated to significant medical advances which improve the quality of life. If you would like to share our journey while testing the limits of your own potential, join us at our* ***Corporate Headquarters located in Research Triangle Park, NC.***

We're Breaking New Ground in Research & Development

We are currently seeking the following highly motivated individuals for a newly-formed research team within our Biological Sciences Department.

RESEARCH INVESTIGATOR I/II

This individual will play a key role in identifying interactions between normal or diseased human gene products and therapeutically relevant proteins. Will communicate with therapeutic project teams, genomics and screening groups within the organization, in furtherance of the drug discovery process.

This position requires a BS/BA with 7 years; or a Master's degree with 5 years; or a Ph.D. with 2-3 years relevant postdoctoral experience in yeast physiology, genetics and molecular biology. Demonstrated experience in classical and molecular approaches to yeast strain construction and yeast two-hybrid screening is required. Experience in cDNA library construction, Northerns, Westerns, protein expression and in vitro methods of protein interaction analysis is desired. **Please refer to Job#ASC2793-1 on all resumes.**

ASSOCIATE SCIENTIST/ RESEARCH SCIENTIST

This individual will play a key role in identifying interactions between normal or diseased human gene products and therapeutically relevant proteins.

This position requires a BS/BA with a minimum of 2 years relevant experience, preferably in the areas of yeast physiology, genetics and molecular biology. Experience in yeast strain construction and yeast two-hybrid screening is highly desired. Background in protein expression and in vitro methods of protein interaction analysis is desired.**Please refer to Job #ARN2680-2 on all resumes.**

In exchange for your considerable skills, we offer an excellent salary/benefits package, opportunity for career growth, and the energy and excitement of working in Research Triangle Park, the world's largest planned research center. In addition, our beautiful North Carolina location offers a vast array of cultural, recreational, and entertainment opportunities, a mild four-season climate, affordable housing, and close-knit communities that are attractive and friendly. For confidential consideration, send your resume, which must include position title/job number and salary history, to: **Human Resources Department, Glaxo Wellcome, P.O. Box 13398, Research Triangle Park, NC 27709.** (No Phone Calls or Agency Referrals, Please) An Equal Opportunity Employer M/F/D/V

GlaxoWellcome

You'll Learn, You'll Create, You'll Discover

Make a Difference in the Quality of Life

Baxter Healthcare Corporation's Biotech Group, a global leader in the biopharmaceutical manufacturing industry, seeks a research professional at our Los Angeles Research & Development facility.

Virology Scientist

This position will participate in research activities related to viral risk reduction and the development of new technology in the area of virology; implement studies and research activities; review project specific objectives; and provide technical recommendations to management.

We require a BS in Virology, Microbiology, or related field with 6+ years experience (or MS with 3+ years experience, or Ph.D. without post-doctoral experience); strict interpretation and compliance with sterile technique and biohazard containment; understanding of GLP/GMP; computer literacy; and excellent written/oral communication skills.

Baxter employees enjoy a competitive salary/benefits package. For immediate consideration, mail/FAX resume to: **Baxter Biotech, Hyland Division, Human Resources Dept. ML-SRA, 1710 Flower Avenue, Duarte, CA 91010. FAX: (818) 305-5020**. Equal opportunity employer.

Biotech Group • Hyland Division

Baxter

Build on our Research Excellence

Database Informatics: Biologists

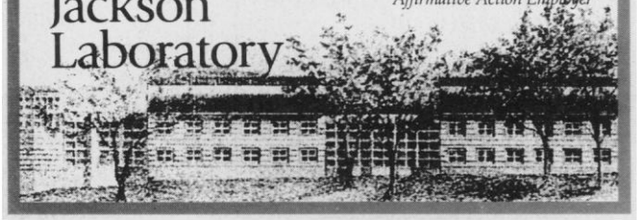
Professional positions are available in the Mouse Genome Informatics Program at The Jackson Laboratory initiating the development of a Gene Expression Resource and a Tumor Biology Database for the laboratory mouse. The successful applicants will be primarily responsible for data aquisition and database maintenance, including literature searching, evaluating and analyzing data to be incorporated into the databases and interacting with research laboratories to facilitate electronic data contributions. In addition, they will participate in database and interface design work, through input into database content and display concepts. Applicants should be versed in developmental, cellular or molecular biology. Knowledge of mammalian genetics a plus. Other desirable attributes include writing/communication skills and experience using computers. M. S. degree in Life Sciences or equivalent experience required.

The Jackson Laboratory is one of the world's foremost centers for mammalian genetics research. Located in Bar Harbor Maine, the lab is adjacent to Acadia National Park. Mountains, ocean, forests, lakes, and trails are all within walking distance. If you love high tech challenges but you're looking for a more natural environment, this could be the opportunity you've been searching for. Applications should be addressed to:

Human Resources, The Jackson Laboratory,
600 Main Street, Bar Harbor, Maine 04609.
Email: jobs@jax.org.

The Jackson Laboratory is an Equal Opportunity/Affirmative Action Employer

The Jackson Laboratory



St. Jude Children's Research Hospital

ALSAC • Danny Thomas, Founder

Postdoctoral Research Position

HIV Pathogenesis/ Human Gene Therapy

An immediate opening is available for a recently graduated postdoctoral fellow to conduct research in the areas of HIV pathogenesis (analysis of Nef function) and/or human gene therapy (development of lentivirus-based gene transfer systems). A strong background in molecular and cell biology substantiated by peer reviewed publications essential. Knowledge in cell signaling and/or retrovirology would be beneficial.

For consideration, please submit a current CV, a list of publications and the names and addresses of three references to: **Dr. J. Victor Garcia, Associate Member, Dept. of Virology and Molecular Biology, St. Jude Children's Research Hospital, 332 N. Lauderdale, Memphis, TN 38101.** Equal Opportunity/Affirmative Action Employer.

VFW Endowed Chair
Pharmacotherapy in the Elderly
Professor Tenured/Tenurable
College of Pharmacy-University of Minnesota

The College of Pharmacy is seeking an outstanding scientist, educator, and leader to serve as the first occupant of the newly established VFW Endowed Chair-Pharmacotherapy in the Elderly. The position also includes a twelve-month, full-time, tenured/tenurable appointment at the rank of professor. The Chair is expected to establish and direct a major program in geriatric pharmacotherapy/clinical pharmacology and serve as a catalyst for a substantial expansion of research, teaching, and clinical practice in geriatrics within the Academic Health Center. The position is supported by a three million dollar endowment and a substantial start-up package.

Qualifications

The ideal candidate will possess a distinguished record of academic and professional leadership and demonstrated excellence in research including studies in the elderly. Candidates must have an earned doctorate (M.D., Pharm.D., Ph.D. or foreign equivalent) in an area broadly related to the study of pharmacotherapy and/or clinical pharmacology and a minimum of seven years academic or research experience. Candidates should have experience in directing post-doctoral fellows, residents and/or graduate students; funding from government, private agencies and/or the pharmaceutical industry; and a strong publication record in peer-reviewed journals. Preference will be given to candidates with an established focus in geriatric pharmacotherapy and/or clinical pharmacology, seven or more years of academic or research experience, and familiarity with pharmacy. The ideal candidate must be an individual who is able to effectively interact and collaborate with other professionals involved with research in geriatrics/gerontology. Candidates must be eligible for appointment at the rank of professor at the time of employment.

A letter, curriculum vitae, and the names and addresses of three references should be sent by May 30, 1997 to:

James Cloyd, Pharm.D., F.C.C.P.
Chair, Search Committee
Weaver-Densford Hall
308 Harvard Street SE
Minneapolis, MN 55455-0343

"The University of Minnesota is an equal opportunity educator and employer."

NATIONAL INSTITUTES OF HEALTH
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Biochemistry and Biophysics of Signal Transduction
Burton J. Litman, Ph.D.

The mechanism whereby ethanol, general anesthetics, and membrane phospholipid composition affect membrane associated signal transduction is being studied by use of spectroscopic techniques, which probe membrane structure and protein conformation, and measurements of enzyme function. G protein-coupled receptor systems are emphasized and the visual transduction pathway is used as a model system. Training in membrane biochemistry/biophysics desired. Candidates must have less than five years of postdoctoral training and should provide three letters of reference, a curriculum vitae, bibliography, and statement of research interests. Send to **Burton Litman, Laboratory of Membrane Biochemistry and Biophysics, NIAAA, NIH, 12501 Washington Avenue, Rockville, MD 20852**. *The NIH is an Equal Opportunity Employer.*

NATIONAL CANCER INSTITUTE

DIVISION OF CANCER TREATMENT, DIAGNOSIS, AND CENTERS
CANCER DIAGNOSIS PROGRAM

Opening Date: 2/24/97 **Closing Date:** 3/24/97
Announcement #s: See Below

HEALTH SCIENTIST ADMINISTRATOR/MEDICAL OFFICER
SUPERVISORY BRANCH CHIEF(S)
GS-0601/0602-15

The Cancer Diagnosis Program (CDP), located in Rockville, MD, is a new unit that facilitates the application of new insights in biology to cancer diagnosis and prediction of prognosis and response to therapy. The program interacts extensively with biologists, technology developers, and clinical oncologists in academia and industry to assure that the most promising scientific opportunities are exploited in laboratory and clinical investigation. The Program identifies and supports novel technologies for the molecular analysis of tumor samples. It creates and supports tissue resources for use of the cancer research community. Program staff are actively involved with the regulatory and ethical issues related to clinical investigation involving human tissue samples. CDP consists of the Diagnostics Research Branch (RDB), the Resource Development Branch (RDB), and the Technology Development Branch (TDB). The CDP is seeking to fill the three Branch Chief positions.

#CA-97-2305 - *The Chief of the DRB* will be responsible for formulating program goals, directing and managing an extramural research program of national and international scope designed to develop and evaluate improved ability to make more accurate diagnoses; to stage tumors more precisely for prognostic and therapeutic decisions; to monitor more effectively changes during and following therapy; to detect cancer at earlier stages; and to identify individuals at high risk.

#CA-97-2306 - *The Chief of the RDB* will be responsible for assessing the need for resources that will facilitate cancer research and for managing the program to implement development of these resources. This includes formulating short and long term goals and working with the scientific community to assure that research needs are met.

#CA-97-2307 - *The Chief of the TDB* will be responsible for directing and managing a program designed to develop new technologies to identify molecular alterations in tumors that will improve diagnostic, prognostic, and predictive ability in order to aid in clinical decision-making.This will include identifying research opportunities, developing plans to exploit these opportunities, and implementing the necessary programs.

Salary-ranges from $75,935 - $98,714 per annum; physicians may be eligible for Physicians Comparability Allowance up to an additional $20,000 per year. Benefits-health and life insurance options, retirement, paid holidays, vacation & sick leave.

U.S. citizenship is required. Applicants must meet the basic experience and educational qualification requirements for Health Science Administrator. In order to validate your qualifications, it is mandatory that you describe your proficiency in the following knowledge, skills, and/or abilities (KSAs): **1)** Ability to plan, develop and implement a comprehensive scientific program including the formulation of program objectives, goals and initiatives; **2)** Ability to provide scientific leadership and to manage scientific programs and personnel, establishing program priorities and assessing program effectiveness; **3)** Ability to communicate clearly both in writing and orally about scientific issues and to establish and maintain effective collaborative relationships with other scientists; **4) RDB Branch Chief ONLY** - Ability to plan and develop resources for research, particularly specimen resources, with knowledge of human subjects protections issues as well as familiarity with a range of research areas that may require the use of human specimens; **5) DRB Branch Chief ONLY** - Knowledge of a broad range of research topics that can potentially be used in formulation of program goals in cancer diagnosis; **6) TDB Branch Chief ONLY** - Knowledge of a broad range of molecular biologic technologies that can potentially be used in formulation of program goals in technology development and cancer diagnosis.

For further qualification requirements, application procedures and other additional information, please contact Mr. Kuong Tran, Personnel Management Assistant, NCI at (301) 402-2812. Please submit an Application for Federal Employment or a resume to Mr. Tran at:

THE NATIONAL CANCER INSTITUTE
Personnel Management Branch
6120 Executive Boulevard, Executive Plaza South, Room 550
Rockville, Maryland 20852

A current curriculum vitae and bibliography must accompany all applications for this position.

NIH IS AN EQUAL OPPORTUNITY EMPLOYER

St. Jude Children's Research Hospital

ALSAC • Danny Thomas, Founder

Postdoctoral Position

Applications are invited for a NIH-funded postdoctoral position, available immediately. Studies will incorporate molecular, cellular, and biochemical approaches to study the biology of molecular chaperones that reside in the endoplasmic reticulum of mammalian cells.

Specific projects include:
1) elucidating the mechanisms that control and monitor folding, assembly and transport of nascent ER proteins and the role of cooperativity between ER chaperones in these processes

2) identifying components of the signal transduction pathways that detect ER stress, leading to transcriptional up-regulation of ER chaperones and growth arrest

Applicants should have a recent Ph.D. or M.D. with experience in protein biochemistry, cell biology, or molecular techniques. Please forward your curriculum vitae, a statement of research experience and interests and the names, addresses and phone numbers of three references to: **Linda M. Hendershot, Ph.D., Dept. of Tumor Cell Biology, St. Jude Children's Research Hospital, 332 N. Lauderdale, Memphis, TN 38105.** Women and minorities are encouraged to apply. SJCRH is an Equal Opportunity/Affirmative Action Employer.

ALLEGHENY UNIVERSITY

ASSISTANT OR ASSOCIATE PROFESSOR

The Department of Microbiology and Immunology at MCP•Hahnemann School of Medicine, Allegheny University is seeking applicants for two tenure-track faculty positions at the Assistant or Associate Professor level, depending on qualifications. As part of our effort to expand our program in molecular pathogenesis, we are soliciting applications from individuals who have demonstrated superior talent and productivity in the area of molecular mechanisms of viral pathogenesis. Successful applicants are expected to participate in the teaching of medical and graduate students. The emphasis of activities, however, will be research. Willingness to interact with other investigators in both the basic and clinical sciences is desired. Please send curriculum vitae, summary of research interests, and names of three references to: **Donna M. Murasko, Ph.D., Professor and Chair, Microbiology and Immunology, MCP• Hahnemann School of Medicine, Allegheny University of the Health Sciences, 2900 Queen Lane, Philadelphia, PA 19129.**

Ribozyme Pharmaceuticals, Inc., a leader in the development of ribozyme-based products for pharmaceutical and agricultural applications, currently is seeking an experienced Scientist to join the Cell Biology Group at our state-of-the-art facility in Boulder, Colorado.

SCIENTIST

A versatile scientist is sought to assist in our program of developing novel therapeutics for cancer, neurological and inflammatory diseases. Applicants must have a Ph.D. or M.D. and 3-5 years' post-graduate experience in the area of cell culture and/or organ culture assays. Expertise in molecular biology and high-throughput cellular assays is desirable. This position requires strong communication skills and an ability to interact with an interdisciplinary team. Please refer to Job #083.

We offer a competitive salary and benefits package, including a stock option plan. For consideration, please send a Curriculum Vitae and the names of three references to:

Ribozyme Pharmaceuticals, Inc., Job #083, 2950 Wilderness Place, Boulder, CO 80301. Fax: (303) 449-6995. E-mail: jobs@rpi.com.

Web site: http://www.rpi.com

No phone calls please. We are an equal opportunity employer.

RPI

SUNNYBROOK HEALTH SCIENCE CENTRE
University of Toronto

VICE PRESIDENT, RESEARCH

Applications are invited for the position of Vice President, Research, Sunnybrook Health Science Centre, Toronto, Canada. Sunnybrook is a fully affiliated teaching hospital of the University of Toronto offering programs in Heart and Circulation, Aging, Mental Health, Oncology, Trauma and Community Services. Research is focused on these clinical programs as well as the disciplines of biological sciences, clinical epidemiology and health services research, clinical physiology, and imaging and bioengineering.

Sunnybrook has superb research facilities and a national and international reputation for excellence. The Research Program conducts leading-edge, bench-to-bedside research in 210,000 square feet of space throughout the campus. External funding has grown at an incredible rate—from $3 million in 1991 to $20 million today.

The successful candidate will be responsible for leading the further development of research at Sunnybrook through promoting exceptional standards for research endeavours; recruitment of research staff to meet the Centre's academic goals; ensuring the continued growth in research through expansion of the Centre's funding base; and integrating basic research and clinical activities within the Centre.

Candidates should be eligible for academic appointment to the rank of Professor and have:

- a Ph.D. or M.D. with an international reputation of excellence in research
- highly respected leadership abilities with research achievement
- impeccable professional and research integrity
- the ability to promote communication and collaboration across a broad spectrum of research interests
- the ability to represent Sunnybrook locally, nationally, and internationally

Interested candidates may apply in writing, including their curriculum vitae, by April 15, 1997 to: **Mr. Tom R. Closson, President and CEO, Sunnybrook Health Science Centre, 2075 Bayview Avenue, Room C-104, North York, Ontario, M4N 3M5**

Oread BioSafety a comprehensive Toxicology & Pharmacology organization with operations in Lawrence, KS & Farmington, CT is actively looking for qualified candidates with the following expertise:

Study Directors & Scientists

- **ADME/PK Study Director (KS)**
- **Toxicology Study Director (CT)**
- **Pharmacology Study Director (CT)**
- **Experienced Toxicology & Pharmacology Scientists (CT)**

- **OTHER TECHNICAL POSITIONS AVAILABLE**

Oread offers a competitive salary & comprehensive benefits package. For consideration please mail, fax, or e-mail resume & salary requirements to:

OBS-1
Oread
1501 Wakarusa Dr.
Lawrence, KS 66047-1803

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E-mail: employment@oread.com
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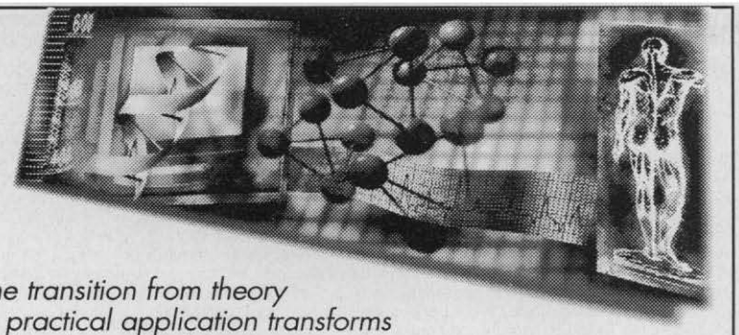
Assistant/Associate Professor Department of Biology

The Department of Biological Sciences invites applications for a new tenure track position at the Assistant/Associate level in Biology Education starting September 1, 1997. A Ph.D. in biology, with expertise in educational research, or a Ph.D. in science education is required. The candidate must possess at least a Master's degree (or equivalent) in the biological sciences, and preference will be given to individuals with teaching experience at the K-12 level. The successful candidate will be expected to: 1) develop a research program concerned with recent advances in theory and practice of biology education; 2) teach courses in science education; 3) oversee the academic advising and the student teaching supervision of biology/sciences education majors; 4) acquire and administer grants; 5) provide leadership in biology education research within the Department of Biological Sciences; 6) participate and provide leadership in an existing campus-wide community of science faculty and science educators committed to the enhancement of science education; 7) foster productive relationships between the University and the professional K-12 teaching community. Review of applications will begin as they are received and will continue until March 31,1997. Candidates should submit a curriculum vitae, three letters of recommendation, copies of representative reprints, and a statement of present and future research plans to: **Professor Steven D. Skopik, Chair, Biology Education Search Committee, Department of Biological Sciences, University of Delaware, Newark, DE 19716.**

The UNIVERSITY OF DELAWARE is an Equal Opportunity Employer which encourages applications from Minority Group Members and Women.

UNIVERSITY OF DELAWARE



The transition from theory to practical application transforms molecules to medicines

BIOTECHNOLOGY DEVELOPMENT AT SCHERING-PLOUGH

At Schering-Plough's Biotechnology Process Development Facilities, scientists skillfully perfect innovative and cost-effective methods to bring quality pharmaceutical products to market. In this technologically advanced environment, you will provide the vital link between research and manufacturing.

BIOCHEMICAL ENGINEER/SCIENTIST

To support discovery, clinical and manufacturing groups, you will be involved in the development and optimization of microbial fermentation and primary recovery processes such as production of antibiotics and recombinant proteins. This will include culture preservation, media optimization, developing fed-batch fermentation and lab-scale primary recovery processes, data analysis, writing reports and making presentations. To qualify, you will need a BS degree in Biochemical Engineering, Microbiology or Biochemistry and 2-6 years of related experience or an MS degree and 0-4 years of related experience. Background must include laboratory experience with microbial fermentation and relevant analytical and microbiological techniques. To be considered for this position, please respond to Dept. BD-9702-JW.

ASSISTANT/ASSOCIATE SCIENTISTS

We seek talented individuals to support the fermentation, purification and analytical steps associated with the development of biologically derived compounds. Positions are available in both laboratory and pilot plant operations and require self-starters with good communication skills and a demonstrated interest in Biotechnology Development. Other qualifications include a BS degree in Biology or a related science and 2-6 years of related experience or an MS degree and 0-4 years of related experience. Cell culture, immunoassay, modern analytical techniques and/or GMP/GLP experience a plus. To be considered for these positions, please respond to Dept. BD-97X-JW.

We offer an excellent compensation package including a competitive salary and comprehensive benefits. For prompt, confidential consideration, we invite you to forward a resume indicating the Dept. Code for your position of interest and salary requirements to: Human Resources-JW, Schering-Plough Research Institute, 2015 Galloping Hill Road, Kenilworth, NJ 07033-0539. You may also respond via e-mail to: spri@spcorp.com. Please include the Department Code for your position of interest in the Subject Line. We are an equal opportunity employer. *We regret we are unable to respond to each resume. Only those selected for an interview will be contacted.*

Schering-Plough Research Institute

Using Science for Human Advantage

POSITIONS OPEN

DEPARTMENT OF MICROBIOLOGY AND IMMUNOLOGY EAST CAROLINA UNIVERSITY SCHOOL OF MEDICINE

Faculty position available at the **ASSISTANT** or **ASSOCIATE PROFESSOR** level in the area of virology, emphasizing molecular biology approaches to viral pathogenesis related to human health and disease. Salary and rank will be commensurate with qualifications. Successful candidates will develop an extramurally-funded research program and will participate in team-taught courses in the medical and graduate schools. Appointment at the Associate Professor level requires a strong record of continuous research funding including current extramural support and evidence of leadership in teaching and service. The Department has 13 full-time tenure-track faculty positions and is fully equipped with advanced core facilities for research in virology, molecular biology, genetics, and immunology. Please provide curriculum vitae, a letter describing research and teaching goals, and names and addresses of three references to: **Virology Search Committee, Department of Microbiology and Immunology, School of Medicine, East Carolina University, Greenville, NC 27858-4354**. Applicants must comply with the Immigration Reform and Control Act.

East Carolina University is an Equal Opportunity/Affirmative Action University. Accommodates individuals with disabilities.

The Swiss Federal Institute of Technology Zurich (ETHZ) invites applications for the position of an

ASSISTANT PROFESSOR FOR MAN AND THE ENVIRONMENT

The successful candidate is expected to participate in the development of research and teaching activities at the interface between natural environmental sciences and humanities and/or social sciences. Research should focus on environmental problem solving from a humanities or social science point of view. Experience in scientific interactions with engineers or natural scientists is a precondition. Candidates should be experienced in teaching introductory courses either in humanities or social sciences. He/she should also supervise diploma theses and participate particularly in environmental case studies. The post of an **ASSISTANT PROFESSOR** has been established to promote the career of young scientists. It is available for three years in the first instance, with the possibility for a renewal for an additional three years. Applications with curriculum vitae and a list of publications should be submitted to: **President of ETH Zurich, Prof. Dr. J. Nüesch, ETH Zentrum, CH-8092 Zurich**, no later than March 31, 1997. *The ETHZ specifically encourages female candidates to apply with a view towards increasing the proportion of female professors.*

ASSISTANT PROFESSOR OF BIOLOGY

TENURE-TRACK opening is anticipated for fall 1997. Ph.D. in Molecular Biology with good communication skills and a demonstrated ability to teach biology at the undergraduate level. Teach first-year biology and upper-level courses in biotechnology and molecular biology; advise science majors and conduct appropriate research projects with students. University of Houston-Downtown is located in the dynamic central business district of Houston. The 8,000 undergraduate student body has an ethnic mix which matches that of the city. Application deadline: April 7, 1997. Send letter of application, curriculum vitae, and names of three references to: **Chair, Biology Search Committee, Department of Natural Sciences, University of Houston-Downtown, Houston, TX 77002.** *The University of Houston-Downtown is an Affirmative Action/Equal Opportunity Employer.*

MOLECULAR BIOLOGIST

ASSISTANT PROFESSOR, part-time, beginning fall 1997 to teach immunology, microbiology or virology, and a non-majors course. Four course load; one-year contract with expectation of renewal. Required: Ph.D., strong commitment to teaching at undergraduate level, recent research experience. Send curriculum vitae, statement on teaching, and names and telephone numbers of three references by April 1, to: **Dr. Karen Swearingen, Biology Department, Mills College, Oakland, CA 94613**. Located in the San Francisco Bay Area, Mills is a selective liberal arts college for women, with coeducational graduate programs. *Persons of color and those committed to working in a multicultural environment are encouraged to apply. Affirmative Action/Equal Opportunity Employer.*

FACULTY POSITION KANSAS STATE UNIVERSITY

The Department of Anatomy and Physiology invites applications for a tenure-track faculty position at the **ASSISTANT/ASSOCIATE PROFESSOR** level (80% research, 20% teaching). Preference will be given to candidates whose research interest complements departmental programs in cardiovascular physiology, immunophysiology, or neurobiology. (Candidates with expertise in cell signaling are especially encouraged to apply.) The appointee will be expected to develop a graduate-level course related to their research interests and contribute to one of our team-taught courses for veterinary students. Applicants should have postdoctoral experience, a strong publication record and an extramurally-funded research program; D.V.M. and/or Ph.D. required. Position available October 1, 1997.

Applications should include a curriculum vitae, a statement of research and teaching interests, addresses of three references, and reprints of three representative publications. Applications will be received until April 15, 1997 or until the position is filled. Send application to: **Dr. Jon D. Dunn, Professor and Department Head, Department of Anatomy and Physiology, College of Veterinary Medicine, VMS 228, Kansas State University, 1600 Denison Avenue, Manhattan, KS 66506-5602.** *Kansas State University is an Equal Opportunity Employer/Affirmative Action Employer.*

SENIOR GRANTS ADMINISTRATORS

A&PC is a rapidly expanding biotech company seeking motivated individuals for the following positions:

Three **SENIOR GRANTS ADMINISTRATORS** having five years minimum experience.

Job requires self-starting individuals who are detail-oriented and have extensive experience in the administration of research grants and contracts from federal and non-federal sources.

A competitive fringe benefits package and pension plan is available. Salary will be commensurate with experience. Applicants should send a letter of interest and résumé by March 7 to:

A&PC
Attn. Human Resources
P.O. Box 130517
St. Paul, MN 55113

Equal Opportunity Employer.

PROGRAM MANAGER

The St. Louis Science Center has a full-time position in Program Development. You will be responsible for conceptual development, planning, implementation, and revision of new programs which may include the development of permanent, temporary, or traveling exhibits, curriculum, and core facility programs. You will be responsible for the creative conceptualization and development of new and innovative programs and for adapting and improving existing programs in a manner that serves the institution's mission as a "center of science."

Qualifications: a Bachelor's degree in science (physics preferred), science education, curriculum development or related fields; experience in design, development and delivery of informal science education programs and exhibits; supervisory, management or project management experience; excellent oral and written communication and presentation skills; creativity and flexibility.

We offer a 35 hour work week, medical/dental/life insurance and a 457(b) savings plan after 30 days, a pension plan, and three weeks paid vacation after one year. Please send résumé along with salary requirements/history by February 5, 1997 to:

St. Louis Science Center
Attn: HR/PROGMGR
5050 Oakland
St. Louis, MO 63110
Email: dwashing@slsc.org

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NERAC Inc. helps America's leading high-tech and manufacturing companies explore state-of-the-art solutions for today's and tomorrow's innovations. Join our dynamic, progressive team in Connecticut. Qualified candidates possess: superb communications skills, customer-orientation, science or engineering degree, and experience. Comprehensive benefits package and competitive salary. *Affirmative Action/Equal Opportunity Employer.* Visit our Web page for details: **http://www.nerac.com**.

RESEARCH ASSISTANT PROFESSOR POSITION MOLECULAR VIRAL PATHOGENESIS

A **RESEARCH POSITION** is immediately available for candidates interested in viral pathogenesis. The research will focus on molecular mechanisms of viral persistence and virus-receptor interactions of Theiler's virus infection of mice. Ideally, candidates should have a strong research background in molecular virology, molecular biology or biochemistry. Those interested should send a curriculum vitae, description of research experience and names, addresses, FAX and telephone numbers of three references to: **Howard Lipton, M.D., Professor (Departments of Biochemistry, Molecular Biology & Cell Biology and Microbiology-Immunology, Northwestern University), Division of Neurology, Evanston Hospital, 2650 Ridge Avenue, Evanston, IL 60201-1750.** *An Equal Opportunity Employer.*

The UNIVERSITY OF MONTANA VISITING ASSISTANT PROFESSOR

Plant Systematics two-year temporary position to begin fall 1997. Teaching introductory biology, Rocky Mountain flora, genetics and evolution, plant systematics, and advanced undergraduate/graduate course or seminar in area of specialization. Earned Ph.D. required. Training or expertise in modern plant systematics or related field. Interest in ecology and evolution and ability to interact with faculty and students in conservation biology. Send curriculum vitae, statement of teaching and research interests, and three letters of recommendation to: **Plant Systematics Search Committee, Division of Biological Sciences, The University of Montana, Missoula, MT 59812** by 15 April 1997. **Telephone: 406-243-5122; FAX: 406-243-4184.** *Affirmative Action/Equal Opportunity Employer. Women and minorities will be actively recruited and are strongly urged to apply.*

ASSISTANT PROFESSOR: DEPARTMENT OF RADIOTHERAPY LOYOLA UNIVERSITY MEDICAL CENTER

A **TENURE-TRACK** position is available in the Department of Radiotherapy for work in the area of tumor radioresistance. The area of interest to potential applicants should complement existing work within the department addressing the genetic modulation of radioresistance, including apoptotic effector pathways induced by radiation. Clinical collaboration is strongly encouraged and the successful candidate will have access to excellent laboratory facilities and equipment. Individuals who have either secured their own research funding or who can demonstrate such potential should first contact: **Andrew T. M. Vaughan, Ph.D., Loyola University Medical Center, Cardinal Bernadin Cancer Center, 2160 South First Avenue, Maywood, IL 60153. Telephone: 708-327-8191; Email: avaugha@wpo.it.luc.edu.** *Loyola University is an Equal Opportunity/Affirmative Action Employer and Educator.*

TECHNICAL SERVICE (TELEPHONE)

Calbiochem-Novabiochem Corporation, a growing world-wide supplier of fine chemicals to the biotech researcher, seeks a **TECHNICAL SERVICES SPECIALIST**. Great opportunity to apply your scientific expertise in a business environment. You will resolve biochemical and immunochemical applications inquiries by fax and telephone. Requirements: M.S./Ph.D. in Biochemistry, Immunology or related field and two or more years of laboratory experience or equivalent. Excellent communication skills are required. Send résumé with salary requirements to: **Director HR, 10394 Pacific Center Court, San Diego, CA 92121**. See us on the web at **calbiochem.com**. *Affirmative Action/Equal Opportunity Employer.*

CALBIOCHEM-NOVABIOCHEM

MEDICAL WRITERS

Leading New York City medical education/communications company has an immediate opening for **MEDICAL WRITERS**. Familiarity with development of biological/biomedical sciences manuscripts essential. Ph.D. or advanced degree in the biological sciences preferred. The ability to write clearly and concisely is essential. The candidate will be expected to work on his/her own initiative, interface with physicians, clients, and project directors. Some travel may be required. Please send résumé to: **Human Resource Department, 12th Floor, 16 West 22nd Street, New York, NY 10010**.

Astra is a pharmaceutical company in a phase of rapid growth. Operations, which are highly international, encompass research, production and marketing of pharmaceuticals through subsidiaries, agents and licensees around the world. The Group has approximately 17,000 employees, of whom 6000 are in Sweden. Sales in 1995 totalled 7 billion Canadian dollars.

Astra Pain Control in Sweden is a research company within the Astra Group with about 270 employees. Its products dominate the world market for local anaesthetics. The company has recently established a research and development centre in Montreal, a division of Astra Pharma Inc. Canada, and is actively recruiting for the following position:

Postdoctoral Research Associate

In this role, you will study the biochemical pharmacology of receptors involved in analgesia, including, but not limited to, coupling of opioid receptors to G-proteins and intracellular second messengers. You should have a Ph.D. in a relevant field (pharmacology, neuroscience, biochemistry, or molecular biology) and original publications in signal transduction research. Candidates whose experience combines pharmacology, molecular biology and knowledge of pain modulation are particularly encouraged to apply. Please send a résumé, a two-page research proposal and the names and phone numbers of three references **by March 31, 1997** to: **K. Payza, Ph.D., Department of Pharmacology, ASTRA Research Centre Montreal, 7171 Frederick-Banting (Edifice), St-Laurent, (Québec) Canada H4S 1Z9.**

We thank all applicants for their interest, however, only those being considered will be contacted. No telephone enquiries or agencies, please.
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ASTRA
ASTRA CANADA

PROFESSOR OF MICROBIOLOGY AND MOLECULAR GENETICS
HARVARD MEDICAL SCHOOL

The Department of Microbiology and Molecular Genetics, Harvard Medical School invites applications for a tenure-level faculty position of **PROFESSOR** with research emphasis in **mammalian virology.** Research interests of candidates can include topics in molecular virology, viral immunology, viral structural or cellular biology. The successful candidate must have an outstanding international reputation and a robust research program in virology. The appointed candidate will also be expected to make a commitment toward the teaching of both medical students and graduate students. Applicants must have a Ph.D. and/or an M.D. degree and a minimum of 10 years of teaching and/or research experience. Women and minority candidates are encouraged to apply.

Candidates should provide a curriculum vitae including a full list of publications, six selected reprints, and a brief statement of research and teaching interests. These materials should be forwarded by March 17, 1997 to:

John Mekalanos, Ph.D., Chairman
Department of Microbiology and Molecular Genetics
Harvard Medical School
200 Longwood Avenue
Boston, MA 02115.

Harvard University is an Equal Opportunity/Affirmative Action Employer.

HARVARD MEDICAL SCHOOL

POSITIONS OPEN

MOLECULAR EPIDEMIOLOGY

The National Institutes of Health, National Institute of Neurological Disorders and Stroke, Laboratory of Experimental Neuropathology is seeking an Intramural Research & Training Award (IRTA) **FELLOW** (U.S. citizen or permanent resident) who has a recent Ph.D. (less than five years) or M.D. or equivalent degree with experience in molecular biology, virology, molecular genetics, or epidemiology. The appointee will work at the interface between molecular virology and epidemiology in a small group focusing on JC Virus genotypes and PML pathogenesis. The appointment will be for two years with a salary range between $25,000 and $38,000. Please submit a curriculum vitae and the names and addresses of three references by March 15, 1997 to:

Gerald L. Stoner, Ph.D.
LENP, NINDS
Building 36, Room 4A-29
Bethesda, MD 20892
Telephone: 301-496-6144
FAX: 301-402-1030
Email: stoner@helix.nih.gov

NIH is an Equal Opportunity Employer.

RESEARCH PLANT GENETICIST

USDA/ARS is seeking applications for a GS-11/12/13/14 **RESEARCH PLANT GENETICIST** position in the Horticulture and Breeding Research Unit, U.S. Horticultural Research Laboratory, Orlando, Florida. Incumbent conducts both basic and applied research as part of the Laboratory's citrus improvement program which is designed to provide fundamental knowledge on the genetic, morphological, and biological inherent traits necessary to produce horticulturally superior citrus trees. Primary focus is on identifying and utilizing horticulturally important genes via traditional and molecular techniques to develop citrus germplasm with improved tree growth, fruit quality and yield, resistance to biotic and abiotic stresses, etc. Request a copy of the vacancy announcement for qualification information. Salary range is 37K–82K. Must be a U.S. citizen. For application forms and procedures, contact: **C. Wayne Moore, Telephone: 407-897-7312.** Applications in response to this advertisement should be marked **D7S-044**, postmarked by March 24, 1997, and submitted to: **Vicki Taber, USDA, ARS, Southern Operations Branch, 6305 Ivy Lane, Room 370, Greenbelt, MD 20770-1435.** *ARS is an Equal Opportunity Employer.*

RESEARCH CHEMIST, ZP-1320-III/IV. The Biotechnology Division of the National Institute of Standards and Technology (NIST) is seeking a **RESEARCH CHEMIST** for a three-year term appointment with possible extensions. Applicants should have a background in biochemistry, genetics or clinical diagnostics to work on standards and/or measurements for DNA diagnostics. Experience should include work in an industrial setting with modern molecular genetic methods including nucleic acid isolation (DNA and RNA), library construction, amplification techniques, probe development and familiarity with a variety of analytical systems for nucleic acids. Additional work in chemistry, biochemistry, molecular biology or genetics/genomics is preferred.

The salary range is $38,330–$83,922 depending on qualifications and experience. Moving expenses will be paid, realty relocation will not. Applicants MUST request Vacancy Announcement (NIST/97-0148/XAH) via the Vacancy Hotline: **Telephone: 301-926-4851** for specific details. Technical contact: **Dr. Gary Gilliland, Telephone: 301-975-2629.**

U.S. citizenship is required. Closing date: April 4, 1997. *The Department of Commerce/NIST is an Equal Employment/Affirmative Action Employer.*

POSTDOCTORAL POSITIONS to study the functions and site-specific localization of $\alpha 7\beta 1$ integrin isoforms during development and in normal, dystrophic, and recombinant skeletal muscle. Recent Ph.D. candidates with experience in molecular or cell biology are preferred. To start July 1997 or reasonably thereafter. Send curriculum vitae, brief summary of research experience, and names of three references to: **Stephen J. Kaufman, Ph.D., University of Illinois, Department of Cell & Structural Biology, B107 CLSL, 601 South Goodwin, Urbana, IL 61801. FAX: 217-244-1648; Email: stephenk@uiuc.edu.** *The University of Illinois is an Equal Opportunity/Affirmative Action Employer.*

POSITIONS OPEN

OSU

ES CELL TECHNOLOGIST

The Keck Transgenic Animal Facility in The Neurobiotechnology Center under The Ohio State University's (OSU) Medical Biotechnology Program seeks a person with experience in ES cell technology for gene knock-out and other gene manipulations in mice. Responsibilities will include providing advice and technical assistance to the different research programs in OSU's biomedical community. There will be opportunities for collaborative research participation. Qualifications include degree in an appropriate field and hands on experience in ES cell technology. Applications should be addressed to: **P. E. Kolattukudy, Director, Neurobiotechnology Center and Medical Biotechnology, 206 Rightmire Hall, 1060 Carmack Road, Columbus, OH 43210. Telephone: 614-292-5670; FAX: 614-292-5379; Email: kolattukudy.2@osu.edu.**

The Ohio State University is an Affirmative Action/Equal Opportunity Employer.

Neurobiology **RESEARCH-TRACK POSITIONS** for integrative and/or cellular neurophysiologists to join a multidisciplinary research group studying transmitter actions, synaptic processing and plasticity in the mammalian olfactory bulb and primary olfactory cortex (piriform cortex). Applicants should possess a Ph.D. and/or M.D. and demonstrated experience and publications in one or more of the following techniques: 1) *in vivo* or *in vitro* extracellular/intracellular recording, and 2) patch clamping. Excellent oral and written communication skills are desirable. Send curriculum vitae and names, addresses and telephone numbers of three references to: **Dr. M. Ennis, Department of Anatomy and Neurobiology, University of Maryland School of Medicine, 685 West Baltimore Street, Baltimore, MD 21201. Email: mennis@umabnet.ab.umd.edu.** *The University of Maryland is an Affirmative Action/Equal Employment Opportunity/ADA Employer. Minorities and women are encouraged to apply.*

SCIENTIST

A new company destined to be the leading provider of the next generation of protein analysis tools is seeking exceptional candidates to provide technical support and work in customer laboratories on joint research and development programs. This technology will enable "functional genomics at the protein level." The ideal candidate will have a recent Ph.D. in biochemistry or molecular biology, excellent interpersonal skills, good research skills, willingness to travel, and the desire to be an integral part of an exciting, fast-growing organization. West coast positions in Seattle, San Diego, and San Francisco are available with competitive salary and stock options. Send résumé to: **Maggie Thach, 490 San Antonio Road, 2nd Floor, Suite 201, Palo Alto, CA 94306.**

RESEARCH ASSOCIATE

A position is available immediately to work with the Chairman of the Department of OB/GYN, Brigham and Women's Hospital in Reproductive Medicine Laboratory. Seeking M.D./Ph.D. to conduct a variety of routine and non-routine experiments using molecular techniques to study the role of peptide growth factors and biological receptors in the regulation of normal and abnormal female reproductive development. Please forward curriculum vitae and two names of reference to: **Dr. R. Barbieri, OB/GYN, Brigham and Women's Hospital, 75 Francis Street, Boston, MA 02115. Attention: B. Simpkins. Email: esimpkins1@bics.harvard.edu.**

POSTDOCTORAL ASSOCIATE

POSTDOCTORAL POSITION is immediately available for an individual interested in the role of virus-cellular receptor interaction in the pathogenesis of murine retroviruses. Ph.D. with experience in molecular or cellular biology preferred. Send curriculum vitae and three letters of reference to: **Dr. Kent Hunter, c/o Human Resources Department, Fox Chase Cancer Center, 7701 Burholme Avenue, Philadelphia, PA 19111. Email: kw_hunter@fccc.edu.** *Equal Opportunity Employer.*

POSITIONS OPEN

POSTDOCTORAL POSITION
HARVARD MEDICAL SCHOOL

Position available to study HIV-1 molecular biology and pathogenesis. Projects include 1) role of chemokine receptors in CNS infection; 2) mechanisms of neuronal cell death in AIDS; 3) molecular biology of HIV-1 regulatory proteins. Recent Ph.D. and experience in molecular biology or biochemistry is required. Send curriculum vitae, brief description of research experience, and names of three references to: **Dr. Dana Gabuzda, Dana Farber Cancer Institute, JF 712, 44 Binney Street, Boston, MA 02115. FAX: 617-632-3113.** *An Equal Opportunity Employer.*

POSTDOCTORAL FELLOW, Yale University School of Medicine. Postdoctoral position available to examine B and T lymphocyte interactions in murine models of autoimmunity (SLE and multiple sclerosis). Experience in T cell immunology and molecular biology helpful. The position is supported in part by an NIH training grant which requires the candidate be a U.S. citizen or permanent resident. Please send statement of research interest, curriculum vitae, and reference letters to: **Mark Mamula, Ph.D., Yale University School of Medicine, 333 Cedar Street, LCI 610, P.O. Box 208031, New Haven, CT 06520-8031.** *Yale University is an Equal Opportunity/Affirmative Action Employer.*

POSTDOCTORAL POSITION
SIGNAL TRANSDUCTION

Research in this exciting and important area will focus on cytokine and growth hormone mediated signal transduction mechanisms in hepatocytes and established cell lines. Emphasis will be on regulation of MAP kinase pathways, particularly JAK/STAT and JNK. Demonstrated experience in molecular biology preferred. Send curriculum vitae, statement of research interests, and names of three references to: **Dr. John R. Williamson, Department of Biochemistry and Biophysics, University of Pennsylvania, Philadelphia, PA 19104. FAX: 215-898-9918.** *Equal Opportunity Employer.*

POSTDOCTORAL FELLOW—DNA REPAIR

Position available immediately to study molecular mechanisms of transcription-coupled repair and mismatch repair (*Science,* **272**:557, 1996; *PNAS,* **93**:1292, 1996). Multidisciplinary program is focused on relationships between DNA repair mechanisms and genetic instability, mutagenesis and cancer. Expertise in molecular biology and genetics is required. Send a brief description of research interests, curriculum vitae, and the names and telephone numbers of three references to: **Dr. Isabel Mellon, Department of Pathology, University of Kentucky, Lexington, KY 40536. FAX: 606-257-7648; Email: mellon@pop.uky.edu.**

POSTDOCTORAL POSITIONS

The Fox Chase Cancer Center, one of only four independent Comprehensive Cancer Centers designated by the National Cancer Institute, has two **POSTDOCTORAL POSITIONS** available to study 1) signal transduction by tyrosine kinases, and 2) the molecular basis of cytotoxic drug resistance. Please submit curriculum vitae with two letters of reference to: **Dr. Gary D. Kruh, M.D., Ph.D., c/o Human Resources Department, Fox Chase Cancer Center, 7701 Burholme Avenue, Philadelphia, PA 19111.** *Equal Opportunity Employer.*

POSTDOCTORAL POSITION available for the study of the function and regulation of the mammalian stress-inducible protein genes (e.g., *PNAS,* **93**:7690, 1996; *Mol. Cell. Bio.,* **17**:54, 1997). Experience in tissue culture, molecular cloning, protein expression and purification, and mouse development will be useful. Please send résumé and names of three references to: **Dr. Amy S. Lee, Norris Cancer Center, University of Southern California School of Medicine, 1441 Eastlake Avenue, Los Angeles, CA 90033. Email: amylee@zygote.hsc.usc.edu.**

POSTDOCTORAL POSITION available to study regulation of cytoskeletal and extracellular matrix protein expression in renal glomerular mesangial cells. Training or experience in cellular and molecular biological methods is required. Interested applicants can send curriculum vitae and names of references to: **William F. Glass II, M.D./Ph.D., Department of Pathology, Eastern Virginia Medical School, P.O. Box 1980, 700 Olney Road, Norfolk, VA 23501-1980. Email: lbh@borg.evms.edu.**

POSITIONS OPEN

SENIOR POSTDOCTORAL POSITION AVAILABLE AT SLOAN-KETTERING INSTITUTE

Applicants with several years of postdoctoral experience who wish to assume a supervisory role, assisting in the design and successful completion of research projects conducted by postdoctoral fellows and technicians, are encouraged to apply. Applicants should have considerable expertise in screening phage libraries, expression cloning, or experience studying DNA-protein and protein-protein interactions, signal transduction pathways, or differential molecular cloning techniques. The laboratory focuses on defining the molecular events underlying normal and malignant hematopoiesis. Send a description of your research interests, curriculum vitae, and the names and telephone numbers of three references to: **Dr. Stephen D. Nimer, Memorial Sloan-Kettering Cancer Center, 1275 York Avenue, Box 575, New York, NY 10021.**

POSTDOCTORAL POSITION in experimental nonlinear chemical dynamics to study pattern formation in reaction-diffusion systems. Topics include: chemical wave propagation in nonuniform media, resonance phenomena in reaction-diffusion systems, mechanisms of pattern formation. Experience in computer controlled chemical kinetics experiments or equivalent. Send curriculum vitae and three references to: **I. R. Epstein** or **A. M. Zhabotinsky, Department of Chemistry, Brandeis University, Waltham, MA 02254-9110. FAX: 617-736-2516; Email: epstein2@binah.cc.brandeis.edu.** *Equal Opportunity/Affirmative Action Employer.*

POSTDOCTORAL POSITION MOLECULAR BIOLOGY MCGILL UNIVERSITY

A **POSTDOCTORAL POSITION** is available to study differential gene expression among visual pathways in the monkey. Candidates should have experience with gene cloning, library screening, and preferably, *in situ* hybridization. Please send curriculum vitae and names of at least two referees to: **Avi Chaudhuri, Ph.D., Department of Psychology, McGill University, 1205 Dr. Penfield Avenue, Montreal, QC H3A 1B1, Canada. Email: avi@hebb.psych.mcgill.ca.**

The Graduate Program in EEB is seeking a **POSTDOCTORAL RESEARCH ASSOCIATE** to assist in teaching a one-semester cadaver-based morphology course to medical students. Applicants must have experience. The second semester is available for research. Option for a one-year renewal exists. Submit teaching experience, research interest, and the names of three individuals to be contacted for reference. Applications to: **Dr. G. E. Goslow, Jr., Box G-B210, Brown University, Providence, RI 02912.** Applications received by April 1, 1997 will receive full consideration. *Brown University is an Affirmative Action/Equal Opportunity Employer.*

POSTDOCTORAL FELLOWSHIP available to study the mechanisms utilized by the distinct constitutive and kinase-inducible transactivation domains in CREB to regulate gene transcription. **Patrick G. Quinn, Ph.D., Department of Physiology, Penn State University College of Medicine, Hershey, PA 17033. Email: pquinn@cmp.hmc.psu.edu.** For your health, Hershey Medical Center is a smoke-free campus. *We are an Equal Opportunity/Affirmative Action Employer and encourage minority and female applicants to apply.*

POSTDOCTORAL POSITION available now to study genomic organization in maize. Research will focus on use of the transposon Ac as a search engine to identify genes in a small region of the genome and as an insertional mutagen to define their function. Experience in molecular biology essential; prior experience with handling, cloning and analysis of large DNA highly desirable. Please send curriculum vitae and contact information for three references to: **Dr. Hugo K. Dooner, Waksman Institute, Rutgers University, Piscataway, NJ 08855.**

POSTDOCTORAL POSITIONS

POSTDOCTORAL POSITIONS are available immediately in molecular biology, carcinogenesis, cancer treatment/chemoprevention or related fields. Experience in cell culture, molecular biology, and biochemistry techniques are required. Must be a U.S. citizen or permanent resident. Contact: **Dr. Ann R. Kennedy, Department of Radiation Oncology, 195 John Morgan Building, University of Pennsylvania, Philadelphia, PA 19104. Telephone: 215-898-0079.**

POSITIONS OPEN

CSIRO AUSTRALIA

Csiro Plant Industry, Canberra and Csiro Horticulture, Adelaide have two positions of **POSTDOCTORAL FELLOWS** in molecular biology of apomixis.

Please refer to advertisement on the internet at **http://www.employment.com.au.** Applications close 10 March 1997.

POSTDOCTORAL POSITION WAYNE STATE UNIVERSITY SCHOOL OF MEDICINE

POSTDOCTORAL POSITION available immediately to study insulin-regulated effects on glucose metabolism. Experience in biochemistry, molecular and cell biology is required. Send curriculum vitae, description of research interests, and three letters of recommendation to: **Dr. Assia Shisheva, Department of Physiology, 540 E. Canfield, Wayne State University School of Medicine, Detroit, MI 48201. FAX: 313-577-5494; Telephone: 313-577-5674; Email: ashishev@moose.med.wayne.edu.** *Wayne State University is an Equal Opportunity/Affirmative Action Employer. All buildings, vehicles and structures at Wayne State University are smoke-free. Wayne State University—People working together to provide quality service.*

POSTDOCTORAL POSITION available immediately to study the role of the inositol phosphate cascade in phototransduction. Experience with single cell electrophysiological techniques such as intracellular recording, intracellular pressure injection and voltage clamping is preferred as is the ability to work independently. Send curriculum vitae, a statement of research interests, and the names of three references to: **Dr. Alan Fein, Department of Physiology, University of Connecticut Health Center, 263 Farmington Avenue, Farmington, CT 06030-3505. Email: afein@neuron.uchc.edu.** *An Affirmative Action/Equal Opportunity Employer. Minorities/Females/Persons with Disabilities/Veterans.*

POSTDOCTORAL POSITION available to study the molecular mechanisms of transcriptional regulation in eukaryotes. Transcription factor activity *in vivo* and *in vitro* will be investigated using cell culture assays, DNA binding studies, *in vitro* transcription and identification of associated proteins. Recent Ph.D. with a strong background in molecular biology or biochemical purification is preferred. Send curriculum vitae, a statement of research interests, and the names of three references to: **Grace Gill, Ph.D., Department of Pathology, Harvard Medical School, 200 Longwood Avenue, Boston, MA 02115.** *Harvard Medical School is an Equal Opportunity/Affirmative Action Employer.*

POSTDOCTORAL POSITION available immediately to study i) brain GABA and glutamate metabolism in animals with a focus on epilepsy and ii) regulation of metabolism in the developing rat brain during normoxia and hypoxia using *in vivo* NMR spectroscopy. NMR studies of brain slices and isolated mitochondria are also ongoing. Applicants should have hands-on experience using multinuclear *in vivo* NMR spectroscopy. Send curriculum vitae with cover letter to: **Dr. Kevin L. Behar, C128-A SHM, c/o Department MBB, P.O. Box 208024, 333 Cedar Street, New Haven, CT 06520-8024.** *Yale University is an Equal Opportunity Employer.*

POSTDOCTORAL RESEARCH PROJECT at EPA's National Risk Management Research Laboratory in Cincinnati. Research relates to investigating adsorbents for recovery and reuse of metals from industrial process streams. A doctoral degree in chemistry, chemical or environmental engineering, or a related field within last three years preferred. Contact: **Postgraduate Research Program/NRMRL, ETD/ORISE, P.O. Box 117, Oak Ridge, TN 73831-0117. Telephone: 423-576-5654; Reference NRMRL 96-02.**

POSTDOCTORAL FELLOW position is available immediately to participate in neuroimmunology research. Requires M.D. or Ph.D. degree, with prior experience in tissue culture, experimental autoimmune disease models and T cell immunology. Send curriculum vitae, summary of research experience, and three letters of reference to: **Dr. Jingwu Zhang, Department of Neurology-NB302, Baylor College of Medicine, 6501 Fannin Street, Houston, TX 77030. FAX: 713-798-5665; Email: jzang@bcm.tmc.edu.**

POSITIONS OPEN

POSTDOCTORAL POSITION

Position is available to work on the formation of protein synthesis-dependent long-term memory in mice. Research focuses on the signaling pathways activated during learning, and how they affect CREB-dependent transcription, other transcription, and post-transcriptional events in the nucleus. Efforts are currently underway to identify the neurons which participate in memory formation, as well as develop inducible transgenic technology. Candidate should have strong mouse behavioral background, transgenic expertise, and/or molecular and biochemical experience. Send curriculum vitae, a statement of research interests and experience, and names of three references to: **Jerry Yin, Cold Spring Harbor Laboratory, Cold Spring Harbor, NY 11724. Email: yin@cshl.org; FAX: 516-367-8880.**

PHOSPHOINOSITIDE SIGNAL TRANSDUCTION PATHWAY IN PLANTS

A **POSTDOCTORAL POSITION** is currently available to study the function(s) of phosphoinositide-specific phospholipase C in plants. The position is initially for two years. Experience in yeast two-hybrid system and soybean transformation is desirable but not essential. Interested candidates with experience in molecular biology and a publication record are encouraged to apply. Application by mail and fax should be addressed to: **Dr. Madan K. Bhattacharyya, Division Plant Biology, Noble Foundation, P.O. Box 2180, Ardmore, OK 73402. FAX: 405-221-7380.** *The Noble Foundation is an Equal Opportunity Employer.*

POSTDOCTORAL FELLOWSHIP PHARMACOLOGY/CLINICAL PHARMACOLOGY

A position is immediately available to study the regulation of the expression of human thromboxane A_2 receptors by sex steroids. The studies include molecular and cell biology techniques and clinical investigation. Applicants must have either an M.D. or M.D./Ph.D. Send curriculum vitae to: **Perry V. Halushka, Ph.D., M.D., Department of Cell and Molecular Pharmacology and Experimental Therapeutics, Medical University of South Carolina, 171 Ashley Avenue, Charleston, SC 29425.** *An Equal Opportunity Employer.*

SCHOOL OF PHARMACY

POSTDOCTORAL POSITION available to investigate cell-specific metabolism of drugs and environmental toxins in bone marrow. Applicants should have a strong background in drug metabolism. Experience in standard molecular techniques, apoptosis, and flow cytometry is also preferred. Salary commensurate with experience. Send letter of interest, curriculum vitae, and contact information for three references to: **Dr. David Ross, School of Pharmacy, C238, University of Colorado Health Sciences Center (UCHSC), 4200 East 9th Avenue, Denver, CO 80262.** *The University of Colorado Health Sciences Center is committed to Equal Opportunity and Affirmative Action.*

POSTDOCTORAL POSITION DROSOPHILA NEUROBIOLOGY

Use genetics and molecular biology to 1) develop and study models of human neurodegenerative disease in the fruit fly *Drosophila melanogaster*; or 2) study the signal transduction mechanisms used in a growth cone during axon guidance (e.g., *Neuron*, **14**:43–56, 1995). Candidates should send curriculum vitae and three letters of reference to: **Dr. Mark VanBerkum, Ph.D., Department of Biological Sciences, Wayne State University, 5047 Gullen Mall, Detroit, MI 48202. Email: mvanberk@biology.biosci.wayne.edu.** *Wayne State University is an Equal Opportunity/Affirmative Action Employer.*

POSTDOCTORAL POSITIONS to study the interrelationships between nucleoside diphosphate kinase (Ndk) GTP synthesis, G proteins and suppression of cancer metastasis, using the bacterial Ndk as a model, as well as molecular basis of bacterial degradation of Xenobiotic compounds. Must have experience in molecular biology and protein engineering. Send curriculum vitae with a list of references to: **A. M. Chakrabarty, University of Illinois at Chicago, Department of Micro/Immuno, 835 South Wolcott (M/C 790), Chicago, IL 60612-7344.** *University of Illinois at Chicago is an Affirmative Action/Equal Employment Opportunity Employer. Women and minorities are encouraged to apply.*

PRESIDENT & CEO
FORSYTH DENTAL CENTER
Boston, Massachusetts

Forsyth Dental Center in Boston, Massachusetts, one of the world's leading independent, not-for-profit institutions for research and care in oral diseases, seeks a President & CEO.

This is a challenging opportunity for a leader with creativity and scientific acumen to guide and energize a strong team in the management and growth of a $12 million scientific enterprise. The President will be expected to offer a compelling vision for Forsyth's future and lead the institution in the fulfillment of that vision. Upholding and even strengthening the quality and impact of Forsyth's work, raising its public profile, recruiting new talent, and securing the revenue needed to support the institution over the long-term are the core challenges.

The activities of the Center are organized into three divisions: the Research Institute, the Forsyth School for Dental Hygienists, and the Infirmary (Clinical) Division. Since 1993, Forsyth has been formally affiliated with the Harvard School of Dental Medicine, and its School for Dental Hygienists is affiliated with Northeastern University. With eighty-five percent of the institution's current budget devoted to its research activities, Forsyth conducts a broad spectrum of basic and applied biomedical research programs. It consistently ranks as one of the top dental institutions in funds received from the National Institute of Dental Research.

Forsyth seeks a President with a history of decisive and innovative leadership, strong scientific credentials, keen humanitarian interest, and a sense of where biomedical science is headed and from where its support will come.

All inquiries, nominations, and applications should be directed in strict confidence to the search firm: David Bellshaw, Isaacson Miller, 334 Boylston Street, Boston, MA 02116. Fax: (617) 262-6509. A full position profile is available upon request.

Forsyth Dental Center is an equal opportunity employer that encourages applications from women and people of color.

FORSYTH DENTAL CENTER · FOUNDED 1910 · BOSTON, MASS.

MASSACHUSETTS GENERAL HOSPITAL
HARVARD MEDICAL SCHOOL
CHIEF OF CARDIOLOGY

Massachusetts General Hospital and Harvard Medical School are seeking a Professor of Medicine to serve as Chief of the Cardiac Unit at Massachusetts General Hospital. The successful candidate must be a distinguished leader in cardiology with recognized achievements in research, teaching, clinical care, and administration. The Chief must be capable of developing and maintaining a broad basic and clinical research effort consistent with the expectations and academic needs of the MGH and Harvard Medical School. The Chief must also play an important role in the education of residents, medical students, and other health professionals. The Unit has well established training programs in general cardiology, diagnostic catheterization and therapeutic interventional procedures, echocardiography, heart failure and transplantation, nuclear cardiology, cardiac pacing, and electrophysiology. The Chief of Cardiology will be responsible for a broad academically oriented clinical program and must be committed to developing innovative ways to enhance this program.

Interested candidates should send a letter of inquiry and an updated curriculum vitae with a statement of research interests to:

Dr. Dennis Ausiello, Chair of the Search Committee and Chief of Medical Services,
Massachusetts General Hospital, 32 Fruit Street, GRB-740, Boston, MA 02114.

Massachusetts General Hospital and Harvard Medical School are Affirmative Action/Equal Opportunity Employers.

HARVARD MEDICAL SCHOOL

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POSITIONS OPEN

NEUROBIOLOGY POSITIONS

The Department of Neurobiology of The Mount Sinai Medical Center, a leader in patient care, research, and medical education, has challenging positions available.

POSTDOCTORAL POSITION—Investigate anatomical and neurophysiological mechanisms underlying plasticity and reorganization of developing and adult motor cortex (MI). Current projects include the role of sensory input in specifying functional and anatomical organization of MI during development; the connectivity and glutamate/GABA receptor mechanisms contributing to peripheral nerve lesion-induced plasticity of adult MI; and the compensatory functional reorganization of MI following spinal cord lesions. Neurophysiological/EMG recording and/or immunoelectronmicroscopy experience required.

RESEARCH ASSISTANT—Non-doctoral faculty opportunity is available to study compensatory reorganization of motor cortex function following spinal cord/peripheral nerve injury in adult rats. Responsible for conducting *in vivo* neurophysiological experiments (single/multi-unit recording, intracortical microstimulation, EMG recording) using sterile surgical technique on rats.

Send curriculum vitae, research experience, and the names and telephone numbers of two references to: **Dr. George W. Huntley, Box 1065, Fishberg Research Center for Neurobiology, The Mount Sinai School of Medicine, One Gustave L. Levy Place, New York, NY 10029-6574. FAX: 212-996-9785; Email: huntley@cortex.neuro.mssm.edu.**

An Equal Opportunity Employer. We foster diversity in the workplace.

POSTDOCTORAL POSITION UNIVERSITY OF PITTSBURGH

Position available for an individual interested in the regulation of pre-mRNA splicing. The relationship between cell-specific and developmental regulatory mechanisms is being studied in neurons of rat brain using *in vitro* assays, cell culture models, and single cell approaches. Qualified candidates should possess a Ph.D. in molecular biology or related field.

Please send a curriculum vitae, summary of research interests, and the names of three references to:

Paula J. Grabowski
Department of Biological Sciences
University of Pittsburgh
Fifth Avenue and Ruskin Street
Pittsburgh, PA 15260

Equal Opportunity Employer.

POSTDOCTORAL POSITION ENVIRONMENTAL TOXICOLOGY

Immediate position in trace metal/toxicology laboratory investigating (i) Pb metabolism and toxicity (renal, skeletal, neuro) utilizing stable isotope tracer methods, and (ii) the molecular targets of toxic metal-binding. Research experience in metal metabolism and toxicology, a strong analytical background, and/or experience in protein and molecular techniques are desired. Send curriculum vitae and names of three references to: **Dr. Donald Smith, Environmental Toxicology/Biology, University of California, Santa Cruz, CA 95064. Email: dsmith@biology.ucsc.edu.**

A **POSTDOCTORAL POSITION** is available immediately to study method development of protein structural analysis. Highly motivated individuals with a strong background in analytical chemistry, protein chemistry, and biochemistry are invited. Experiences in organic synthesis, HPLC, and mass spectrometry are desirable.

Please send curriculum vitae, summary of research interest, and three letters of recommendation to: **Dr. Ryuji Kobayashi, Cold Spring Harbor Laboratory, 1 Bungtown Road, Cold Spring Harbor, NY 11724. Email: kobayash@cshl.org; FAX: 516-367-8873.** *Equal Opportunity Employer.*

Research Associate in Insulin Signaling—**POSTDOCTORAL POSITION** for NIH-funded position in the Markey Center for Cell Signaling now available to study the regulation of kinase cascades (MAP kinase, p70 S6 kinase) by insulin and their cross-regulation and function. Both molecular biologic and biochemical projects open. Send résumé and references to: **Dr. T. W. Sturgill, HHMI Research Laboratory, University of Virginia, Box 577, Charlottesville, VA 22908 USA. FAX: 804-924-9659.** *The University of Virginia is an Equal Opportunity/Affirmative Action Employer.*

POSITIONS OPEN

POSTDOCTORAL POSITION available immediately. Projects include studies on neutrophils and blood substitutes. Strong molecular biology skills required. Competitive salary and benefits. Send curriculum vitae and names of three references to: **Paul Sollitti, Ph.D., Blood Research Institute of New Jersey, West 970 Linwood Avenue, Paramus, NJ 07652. FAX: 201-670-6174.**

POSTDOCTORAL POSITIONS WASHINGTON UNIVERSITY SCHOOL OF MEDICINE NIH TRAINING PROGRAM IN DIABETES RESEARCH

Applications are being accepted for **POSTDOCTORAL POSITIONS** in a multi-investigator program to study diabetes and related endocrine diseases. Trainees will be offered opportunities in the following areas: cellular mechanisms in insulin secretion, insulin action, autoimmunity, the role of nitric oxide and cytokines, vascular and neurological complications, glucose transporters, biology of aldose reductase, and regulation of gene expression. U.S. citizenship or permanent resident status is required. Salary on NIH scale. Curriculum vitae and three letters of recommendation are required. For information, please contact: **Dr. Michael L. McDaniel, Box 8118, Washington University School of Medicine, Department of Pathology, St. Louis, MO 63110. Telephone: 314-362-7435; FAX: 314-362-4096; Email: mcdaniel@pathology.wustl.edu.** *Affirmative Action/Equal Opportunity Employer.*

Two **POSTDOCTORAL POSITIONS** are available immediately to study molecular, cellular, and tissue aspects of skin disease. The NIH-funded Postdoctoral Training Program in Dermatology in conjunction with the Vanderbilt University Skin Diseases Research Center offers preceptors engaged in active research on connective tissue metabolism, wound healing, hyperproliferative disorders of skin, cytokines and growth factors of special relevance to skin disease. Must have M.D., Ph.D., or M.D./Ph.D. degree and be a U.S. citizen. Research training may be coordinated with a clinical residency in dermatology. Send curriculum vitae, summary of research interest and experience, and names and telephone numbers of three references to: **George P. Stricklin, M.D., Ph.D., Skin Diseases Research Center, Division of Dermatology, Vanderbilt University School of Medicine, B3219 MCN, Nashville, TN 37232-2600. FAX: 615-343-4365; Email: sdrc@mcmail.vanderbilt.edu.**

Vanderbilt University is an Equal Opportunity/Affirmative Action Employer.

POSTDOCTORAL FELLOWSHIPS UNIVERSITY OF PITTSBURGH MEDICAL CENTER DENDRITIC CELL IMMUNOBIOLOGY

POSTDOCTORAL FELLOWSHIPS available for recent Ph.D./M.D.s to study molecular regulation of dendritic cell function in organ transplantation. Current NIH-funded projects are focused on cytokines, costimulatory molecules, apoptosis, and genetic engineering. Experience in molecular biology, gene transfer technology or cellular immunology is required. Please send curriculum vitae, a two-page statement of research interests, and arrange to have three letters of recommendation sent to: **Dr. Angus W. Thomson, Thomas E. Starzl Transplantation Institute, W1544 Biomedical Science Tower, University of Pittsburgh Medical Center, 200 Lothrop Street, Pittsburgh, PA 15213.**

POSTDOCTORAL POSITION is available immediately to work in an NIH-supported developmental biology project, investigating the mechanisms whereby homocysteine induces congenital malformations. The approach to this problem will utilize experimental embryology using avian embryos, as well as techniques of cell culture and molecular biology. Previous experience with one or more of these techniques is highly desirable. Please send a curriculum vitae and the names of three references to: **Thomas H. Rosenquist, Ph.D., Professor and Chairman, Department of Cell Biology & Anatomy, University of Nebraska Medical Center, 600 South 42nd Street, Omaha, NE 68198-6395.** *The University of Nebraska is an Equal Opportunity Employer. Applications from women, members of underrepresented minorities, disabled persons, and veterans are encouraged.*

POSITIONS OPEN

MOLECULAR TOXICOLOGY UNIVERSITY OF WISCONSIN-MADISON

POSTDOCTORAL POSITIONS in Molecular, Cellular and Biochemical Toxicology funded by an NIEHS training grant.

Topic areas include: Regulation of gene expression (toxicant metabolizing enzymes, oncogenes, DNA repair enzymes); cellular effects mediated by the Ah-receptor; toxicant activation; toxicity in developing organisms; mechanisms of carcinogenesis; action of toxicants on liver, kidney, gonadal, nerve, and immune cells.

Time will be allocated for training in toxicology, and molecular and cellular biology as appropriate. Collaborative projects involving more than one laboratory are encouraged.

Applicants must be U.S. citizens or permanent residents and should send a curriculum vitae, three references (address/telephone), and a letter stating research interests to: **Dr. Colin R. Jefcoate, Director, Environmental Toxicology Center, B157 Steenbock Library, 550 Babcock Drive, Madison, WI 53706. Telephone: 608-263-4580.** *An Equal Opportunity Employer.*

STANFORD UNIVERSITY POSTDOCTORAL FELLOWSHIPS

POSTDOCTORAL FELLOWSHIPS are available for research on molecular and cellular aspects of gastrointestinal disease. Faculty's current interests include:

Chris Cartwright: Tyrosine kinases and the control of cell growth; colon cancer.
Anson Lowe: Cell biology of the exocrine pancreas, pancreatitis, and pancreatic cancer.
Suzanne Matsui: Molecular biology and pathogenesis of gastroenteritis viruses; mechanisms of viral replication.
Bishr Omary: Role of intermediate filament proteins in signalling and disease.

Stipends will be funded by an NIH training grant. Requirements are Ph.D. or M.D. and U.S. citizenship or permanent residency. Send curriculum vitae, date of availability, and three references to: **Ms. Peggy George, Division of Gastroenterology, MSLS P304, Stanford University, Stanford, CA 94305-5487.**

Stanford University is an Equal Opportunity/Affirmative Action Employer.

POSTDOCTORAL RESEARCH ASSOCIATE

Positions available immediately for recent Ph.D.s with skills in cellular and molecular immunology and/or virology. Our laboratory at Maimonides Medical Center/SUNY Health Center is committed to both basic and clinical research in autoimmune diseases, especially multiple sclerosis and its animal models. Experience in T (and B) cell cloning and epitope mapping is a plus. We offer competitive salaries and excellent benefits. Send résumé, research interests, and names of three references to: **Maimonides Research and Development Foundation, Attn. Dr. F. Mokhtarian, 4802 Tenth Avenue, Brooklyn, NY 11219.** *Equal Opportunity/Affirmative Action Employer.*

Two **POSTDOCTORAL POSITIONS** in DNA repair and apoptosis/necrosis, funded by MRC and NCI of Canada, will focus on the function of poly (ADP-ribose) polymerase (*Nature*, **371**:346–7, 1994; *BBRC*, **229**:838–44, 1996). Salary $28,000 Canadian. Persons with training in cell and molecular biology should send their curriculum vitae to: **Dr. Guy Poirier, Health & Environment, CHUL Research Center, 2705 boulevard Laurier, Quebec, Canada, G1V 4G2. FAX: 418-654-2159; Email: guy.poirier@crchul.ulaval.ca.**

ANNOUNCEMENT

PRODUCT DEVELOPMENT

Submission of innovative ideas, proposals and novel concepts relating to anesthetics, analgesics, and cancer treatment are being invited for clinical use. Accepted applications will be pursued further for patents and clinical trials by our well established group. Applications should ideally have a brief description of the proposed drug/instrument or technique for development and the names of the original inventors. Patented products which need further support will also be considered for clinical trials. All submitted information will be held confidential and a reply will be given within 20 days of receipt. Contact: **C. E. Romero, VP Product Development, Broadview Consultants Inc., 70 Fifth Avenue, New Rochelle, NY 10801.**

Research Corporation Technologies, an independent technology management company, invites applicants for the positions of

- **VENTURE DEVELOPMENT ASSOCIATE**
- **VENTURE DEVELOPMENT ANALYST**

Applicants should have academic backgrounds that include **both an advanced degree in the life sciences AND a bachelor's or master's degree in business or economics**. Both positions require entrepreneurial spirit, strong business analytical skills and knowledge of technology development strategies, policies and issues. Frequent travel from the Tucson corporate office and strong written, oral and interpersonal communication skills are required. We welcome applicants with varying levels of experience; at least three years work experience is required for the Associate position.

The successful candidates will:

- work closely with the company's Life Sciences Group, which commercializes life sciences and medical technologies,
- coordinate the appraisal and business analysis of early-stage life and medical sciences technologies showing significant potential value,
- create and implement development plans to add value to these technologies through active investment and management,
- identify appropriate partners for specific development activities,
- be aware of and willing to learn about patent law and issues,
- negotiate licenses and other technology development agreements.

Research Corporation Technologies offers a competitive salary, generous benefits and short- and long-term incentive compensation plans. Send résumé to:

Jeffrey E. Jacob, Director
Venture Development Group
Research Corporation Technologies
101 N. Wilmot Road, Suite 600
Tucson, AZ 85711-3335
FAX: (520) 748-0025

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INTRAMURAL RESEARCH PROGRAM
NATIONAL INSTITUTE OF MENTAL HEALTH
NATIONAL INSTITUTES OF HEALTH
SEYMOUR S. KETY RESEARCH FELLOWSHIPS

The National Institute of Mental Health Intramural Training Program is pleased to announce the establishment of Intramural Research Training Awards in honor or Seymour S. Kety, M.D., first Scientific Director of the NIMH Division of Intramural Research (1951-1956). Applications are invited from U.S. citizens or permanent residents with an M.D. and/or Ph.D. degree with less than five years of postdoctoral experience. Awards will be made for up to three years and will provide the opportunity to work in any of the Intramural Research Program's 22 Clinical Branches and Basic Research Laboratories located on the 306-acre NIH Campus in Bethesda, MD, the St. Elizabeth's Hospital in Washington, DC, or the NIH Animal Facility in Poolesville, MD. The Program conducts a broad array of research activities that range from clinical investigation into the diagnosis, treatment and prevention of mental illness to basic neuroscience investigation at the systems, cellular and molecular levels. Stipends are highly competitive. Deadline for applications is April 15th. To apply, submit a cover letter expressing research interests, a curriculum vitae, and two letters of recommendation to:

Barry B. Kaplan, Ph.D.
Director of Fellowship Training
National Institute of Mental Health
NIH Clinical Center, Room 4N-222
10 Center Drive
Bethesda, MD 20892-1381
Phone: (301) 496-4183; Email: kaplanb@irp.nimh.nih.gov

The NIH is an Equal Opportunity/Affirmative Action Employer

Postdoctoral Research at The Wistar Institute

The Wistar Institute, an independent research organization located on the campus of the University of Pennsylvania, currently seeks postdoctoral applicants.

Postdoctoral Researcher 1 — Two positions are available: 1) Individual with strong background in molecular biology and some knowledge in immunology to characterize vaccinated cancer patients' humoral immune responses using antibody phage display; 2) Individual with expertise in cellular immunology to characterize vaccinated cancer patients' T cell responses.
Reply to Dr. Dorothee Herlyn.

Postdoctoral Researcher 2 — Two positions are available: 1) Mechanisms of eukaryotic transcriptional activation primarily focusing on the role of the TAFs and TFIIA in mediating the stimulatory effect of activation domains; 2) Mechanism of Epstein-Barr virus plasmid replication mediated by EBNA1. Identification of cellular factors mediating the cell cycle dependent DNA replication of the viral genome. Candidates with less than 2 years of postdoctoral experience and background in molecular biology, biochemistry or yeast genetics are preferred.
Reply to Dr. Paul Lieberman.

Postdoctoral Researcher 3 — Analysis of growth factors and signal transduction mechanisms that regulate growth, differentiation and function of myelin-producing cells in the central nervous system. A background in neuroscience and experience in tissue culture and molecular biology are preferred.
Reply to Dr. F. Arthur McMorris.

Postdoctoral Researcher 4 — Projects include characterization of a novel co-repressor for the KRAB domain; engineering repressors which revert the neoplastic phenotype; characterization of BRCA-1 interacting proteins. Highly motivated individuals with molecular biology/biochemistry background are preferred. **Reply to Dr. Frank J. Rauscher, III.**

Postdoctoral Researcher 5 — Analysis of genome function in human melanoma progression.
Reply to Dr. Harold Riethman.

Postdoctoral Researcher 6 — Study T cell development in mice. The position requires a Ph.D. and experience in molecular and/or cellular biology.
Reply to Dr. Lisa M. Spain.

Postdoctoral Researcher 7 — Study structure and function of cell-cell adhesion proteins associated with development of human melanoma and colon carcinoma using molecular biology and cell biology approaches. **Reply to Dr. David Speicher.**

Interested applicants are requested to send a C.V. and three references to the attention of the appropriate faculty member, **c/o THE WISTAR INSTITUTE, 3601 Spruce Street, Philadelphia, PA 19104.** Equal Opportunity Employer. Minority candidates are strongly encouraged to apply.

THE WISTAR INSTITUTE 1892

ProScript is a biopharmaceutical company focused on the discovery and commercialization of small molecule drugs for regulation of gene transcription factors and other mediators that are relevant to cancer, inflammatory disease, and metabolic disorders.

Vice President, Discovery Biology

Candidates must have a PhD or MD/PhD with 10+ years of relevant experience in molecular oncology, cell and molecular biology. A strong record of scientific achievement and publication is required. Experience in tumor biology and animal models in cancer is paramount. Candidates should have proven management skills and will be responsible for two expanding groups in molecular biology and pharmacology (currently 15 people).

Enzymologist

Candidates must have a PhD in Biochemistry or Chemistry and two or more years relevant post-doctoral experience. Candidates must possess strong analytical skills, an in-depth understanding of enzyme kinetics and mechanism, and a demonstrated ability to solve enzyme mechanistic problems using a broad range of experimental approaches.

Combinatorial Chemist

Candidates must be creative, PhD, synthetic chemists with broad technical and intellectual capabilities, including high-speed parallel synthesis and combinatorial chemistry. Knowledge of solid phase and solution techniques using a broad-based understanding of organic reactions will be employed for rapid SAR elucidation in our medicinal chemistry programs. Candidates should have 3-5 years relevant post-doctoral and industry experience. Good verbal and writing skills and a strong record of achievement will be required to spearhead new initiatives in combinatorial chemistry and high throughput synthesis.

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Please state the position of interest and send a detailed Curriculum Vitae along with the names of three references to: Human Resources, ProScript, 38 Sidney St., Cambridge, MA 02139.

ProScript

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Global Career Opportunities

Director, Max-Planck-Institut für Astronomie

The Max-Planck-Institut für Astronomie at Heidelberg invites applications for the position of one of the two Directors at the institute to be appointed following the retirement of Prof. Hans Elsässer in April, 1997. The MPIA has approximately 180 staff, student, and visiting positions. The MPIA runs the Calar Alto observatory in southern Spain with 3.5, 2.2, 1.2m and Schmidt telescopes and uses a substantial fraction of the observing time. It has a major role in the VLT project at ESO including VLTI, it runs a data center for ISO, and it expects to become a partner in the LBT project early in 1997. Candidates must have an outstanding international record of research in astronomy and demonstrated leadership ability. Astronomers or physicists with a strong interest in extragalactic research are preferred, although all fields of astronomical research will be considered. Applications should include a curriculum vitae, list of publications, and a cover letter outlining the current research goals of the candidate as they would be carried out with the resources of the institute. Applications should be sent by April 1, 1997 to the:

Chairman of the Search Committee
Prof. Gerd Buschhorn
Max-Planck-Institut für Physik
Föhringer Ring 6
80805 Munich
GERMANY

Further information may be found at the website: **http://www.mpia-hd.mpg.de**

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Bioinformatics

Our Bioinformatics group is responsible for generating, analyzing, and annotating ESTs that result from high density gene expression analysis and other research projects. We currently seek an enthusiastic, team-oriented individual to help us achieve our goals in performing cDNA sequence analysis, sequence annotation, database development, and software tools development. A PhD or MS/BS with 2-5 years' of biocomputing experience is required. We are particularly interested in candidates with demonstrated experience in DNA/protein sequence analysis and the design, implementation, and maintenance of annotated sequence databases. Knowledge of Mac/NT/UNIX OS and skills in UNIX shell scripting, Perl programming, CGI programming, and HTML are a definite plus.

Enjoy the benefits of Scios' competitive salaries and excellent benefits package. Please respond to: Scios Inc., Human Resources, Ref: 96-022, 2450 Bayshore Parkway, Mountain View, CA 94043. Or FAX to 415/962-5966. EOE.

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Announcement

The Boehringer Ingelheim Fonds

invites applications for the

1997 Research Award for Postdoctoral Fellows

to be submitted by May 1, 1997. The Foundation supports activities concerned with basic research in biomedicine and aimed at acquiring new scientific knowledge.

The award is intended for postdoctoral researchers, who, having spent two to three years working overseas, plan to move to Europe with the intention of establishing his/her own research group. The scientific achievements of applicants must be of outstanding quality having resulted in papers published in or accepted by leading international journals. Applicants should not be older than 31 years. Nationality is irrelevant.

The award consists of a three-year fellowship. After a period of two and a half years, the results attained by the Fellow and his/her further intentions will be evaluated in order to decide whether the fellowship is to be extended for a further three-year term. The first year of the scholarship may be availed of in order to bring projects in progress at the overseas laboratory to a conclusion. Once the Fellow takes up his work in Europe he/she will receive a one-off project-related grant of DM 100.000,00.

Detailed instructions are available on request from: **Boehringer Ingelheim Fonds, Foundation for Basic Research in Biomedicine, Stafflenbergstraße 32, D-70184 Stuttgart, Germany; tel.: 49/711/247397; fax: 49/711/248140; email: monika@bifonds.de**

Max-Planck-Institut für Metallforschung Stuttgart, Germany
Scientific member and Director at the Institute

Applications are invited for the position of a Scientific Member and Director at the Max-Planck-Institut für Metallforschung. We seek applicants with expertise in the field of

Theory of Mesoscopic Phenomena in Materials.

The candidate must have a distinguished academic record and an active interest in interdisciplinary research. He/she will head a research division which should focus on the theoretical aspects of macroscopic properties of complex materials systems in relation to their microstructure. Depending on the background of the candidate, structural (mechanical) properties and/or functional (electric, ferroelectric, magnetic) properties should be emphasized.

Interested applicants should submit a resume complete with curriculum vitae, research areas, list of publications and reprints of their five major publications to the Executive Director of the Institute, **Prof. Dr. Manfred Rühle, Max-Planck-Institut für Metallforschung, Seestraße 92, D-70174 Stuttgart, Germany,** at their earliest convenience but no later than March 31, 1997.

Lectureship in Virology

Applications are invited for the above post located in the Virology Research Group in the Department of Biological Sciences, available from October 1997. The successful candidate will be expected to establish an independent research programme which complements the Group's existing interests and to contribute to the Group's undergraduate and postgraduate teaching; people with research interest in any area of virology are therefore encouraged to apply. Ability to teach in the area of Viral Pathogenesis/ Immunology would be an advantage.

The Department received a grade 5 rating in the 1996 RAE exercise and has built a strong research base in virology, microbiology, molecular biology of animal development, cell biology and ecosystems analysis, and has recently set up Research Groups in protein structure and in molecular medicine.

The salary is on the Lecturer Grade A scale: £15,154 - £19,848 pa. Informal enquiries to Professor M A McCrae (tel:01203 523524; fax: 01203 524203; email: malcolm@dna.bio.warwick.ac.uk).

Application forms and further particulars can be obtained from the Personnel office, University of Warwick, Coventry CV4 7AL. Tel: 01203 523627; fax: 01203 524583; email: B.G.Ward@admin.warwick.ac.uk; Internet: http://www/warwick.ac.uk/services/publicity/Jobs, quoting reference 29/9A/96. Closing date for applications 11 March 1997.

UNIVERSITY OF WARWICK

Novo Nordisk Biotechnology Research Center Beijing, Peoples Republic of China.
Director of research
Research scientist.

Novo Nordisk has built a $10 million USD, 4000 sq. meter headquarters and research center close to Tsinghua and Beida Universities in Beijing's Haidian District. The building has been constructed according to the best North European standards, and the laboratory will be equipped with the necessary state-of-the-art equipment.

Research in the center will be focused on: Industrial Enzymes, Diabetes care and Biopharmaceuticals.

Publication of research results in Chinese and international Journals will be encouraged. Extensive collaborations with Chinese and overseas scientists is expected.

The local staff will be comprised of approximately 10 local scientists working on a temporary contract basis. In addition, there will be short term visiting scientists from Europe or the USA, plus the necessary technical assistance.

We seek applicants for the positions of Research Director and Research Scientist.

The Research Director:

Will have the responsibility for administrative and scientific activities of the center and will report to the president of Novo Nordisk China.

Necessary qualifications:

An experienced and broadly oriented scientist (Ph.D. plus over 7 years additional research experience) with a proven record of innovative research as demonstrated by publication in peer reviewed journals. Demonstrated leadership skills, as evidenced by prior supervisory experience and some research experience in an industrial setting. An inspiring and creative personality with a deep understanding of Chinese culture, as well as written and spoken Mandarin. Knowledge of enzyme technology or diabetes related research is an advantage.

The Research Scientist:

Will report to the Research Director and will be responsible for individual research projects.

Necessary qualifications:

A scientist (Ph.D. plus 0-3 years additional research experience) with an good publication record. Must be fluent in written and spoken Mandarin and have a good understanding of Chinese culture. Knowledge of enzyme technology, protein chemistry and industrial research is an advantage.

The successful applicants will be offered a 3 to 5 year contract with a competitive salary, plus housing and other benefits.

Please send your resume marked R&D to:

Novo Nordisk China
Rui Hong Building
Fourth Street no 9
Shangdi Zone, Haidian District
100085 Beijing
Fax Number +8610 62981283
E-mail ka@novo.dk

Novo Nordisk is one of the world's largest biotechnology companies. The main products are insulin for the treatment of diabetes and enzymes for use in industry. Novo Nordisk has offices in more than 140 countries and has an annual turnover of more than $2 billion USD. The number of employees world wide is more than 13000. In China, Novo Nordisk is investing more than $240 million USD in a new production plant in Tianjin. Other production facilities are in Shenyang and Suzhou. Novo Nordisk has sales offices in Shanghai, Guangzhou, Tianjin, Shenyang and Wuhan. In Beijing the company has its headquarters and research center.

Novo Nordisk

POSITIONS OPEN

POSTDOCTORAL POSITION available to study metalloenzyme engineering. Candidates should have a strong background in either structural biology, molecular biology, or spectroscopic methods used in metalloenzyme research. Send curriculum vitae and names of three references to: **Dr. David B. Goodin, Department of Molecular Biology—MB8, The Scripps Research Institute, 10550 North Torrey Pines Road, La Jolla, CA 92037. Email: dbg@scripps.edu; http://www.scripps.edu/dbg/index.html.**

POSTDOCTORAL POSITION available to study developmental control of V(D)J recombination and the basis for differential susceptibility of B and T lineage cells to malignant transformation in immune deficient scid mice. Send curriculum vitae and names of three references to: **Melvin J. Bosma, Fox Chase Cancer Center, 7701 Burholme Avenue, Philadelphia, PA 19111. Email: mj_bosma@fccc.edu.** *Equal Opportunity Employer.*

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