No. 1 in Proteomics

Says who?

Dr. Norrie Russell, President and CEO, Lynx Therapeutics inc.

"In my previous employment, I was very pleased to have the opportunity to get early access to the 2-D DIGE fluorescent technology and proud to be Amersham Pharmacia Biotech's first collaborator in the programme. A first for both in Proteomics. I remain impressed by their pro-active approach."

says

Dr. Hanno Langen, head of the Proteomics group at Hoffmann-La Roche, genetics department

"Proteomics is all-encompassing and all-absorbing. It brings together various disciplines and technologies that have been around for quite a time now. It is this convergence that is the great enabling factor. With Amersham Pharmacia Biotech focusing on this area, I look forward to user-friendly, fully integrated systems which offer the convenience and reproducibility that make serious research in Proteomics possible and will allow us to focus on what we researchers in drug discovery like doing best, identifying proteins of interest."

Amersham Pharmacia Biotech UK Limited Amersham Place Little Chalfont Buckinghamshire England HP7 9NA
Amersham Pharmacia Biotech AB SE-751 84 Uppsala Sweden
Amersham Pharmacia Biotech Inc 800 Centennial Avenue PO Box 1327 Piscataway NJ 08855 USA
Amersham Pharmacia Biotech Europe GmbH Munzinger Strasse 9 D-79111 Freiburg Germany

Prof. Dr. Mathias Uhlén,
the Royal Institute of Technology, Stockholm
"Proteomics is the exciting and daunting challenge to explore protein function of all genes discovered through genome efforts using modern techniques, such as high-throughput chromatography, electrophoresis and mass spectrometry. The enabling tools for Proteomics research are today provided by Amersham Pharmacia Biotech. In the future, one can envision new technology platforms, such as protein 'chips' based on combinatorial libraries to allow massive parallel analysis of protein extracts using protein arrays. The future is function and thus the future is protein bioscience."

Prof. Dr. Angelika Görg,
Technical University, Munich
"The realization of the Immobiline™ concept for 2-D electrophoresis was our major concern. There is undeniably a great sense of achievement in seeing one's ideas develop and become widely accepted and used by the scientific community. With Amersham Pharmacia Biotech as a partner, scientists the world over can look forward to working at the forefront of Proteomics."

Hear what we have to say, as well.

You probably know us as at Amersham Pharmacia Biotech as the developers and technology leaders in electrophoresis and chromatography for the separation of biomolecules. It's a position we've held for the last half-century. You would also know us as the people behind novel, highly automated DNA sequencing systems and leading edge, high-throughput drug screening technologies.

Now, building on our heritage, and via the integration of a series of both new and proven technologies, we're constructing the technology platforms that will enable the unravelling of the proteome. These systems take over where the information gathered by the genomics work has to be converted into the understanding of the active biomolecules, the proteins.

Whether you are into protein profiling, purification and detection or characterisation, you'll find the answer with us, all with integrated bioinformatics solutions. And where a protein has been identified and needs to be manufactured on a large scale, you need look no further than our specialist industrial processing systems and expertise.

Essentially, we have been supplying Proteomics tools to the pharmaceutical industry for 50 years. We've been spearheading the 2-D revolution via enabling inventions like IPG technology. The enhanced resolution of our narrow pH range Immobiline DryStrips are now setting new standards in identification. To enhance our offering of integrated high-throughput solutions, we're introducing 2D-MS systems utilising MALDI-TOF and a range of LC-MS systems. And our technology access and transfer programmes will further speed the development of new technologies and applications. All this is just part of our on-going evolution of products and services.

They say it's going to take until the middle of the next millennium to identify all the human proteins. We are ready now to put the systems at your fingertips which will prove that prediction false. To find out more about what we're achieving today visit: **http://proteomics.apbiotech.com**

amersham pharmacia biotech

Gordon Research Conferences

2000 Meeting Schedule

VISIT THE *frontiers of science* GO TO A GORDON CONFERENCE

GORDON RESEARCH CENTER
UNIVERSITY OF RHODE ISLAND
PO BOX 984
WEST KINGSTON, RI 02892-0984

PHONE: 401-783-4011
FAX: 401-783-7644
E-MAIL: grc@grcmail.grc.uri.edu/
World Wide Web: http//www.grc.uri.com

Full Programs in *Science*: Winter - October 8, 1999 - February 18, 2000
Be sure to check the GRC web site for the exact start dates and times for each Conference.

2000 INTERNATIONAL — *HONG KONG/ITALY/U.K*

Conference Title	Chair	Location	Date
Bioelectrochemistry	Lluis Mir	Queen's College, Oxford	Sept 3-8
Chemo. of Exper./Clinical Cancer	Annette Larsen	Queen's College, Oxford	Sept 17-22
Combinatorial Chemistry	Thomas Beattie & Stephen Kaldor	Il Ciocco, Italy	May 28-Jun 2
Computational Chemistry	Terry Stouch	Queen's College, Oxford	Jul 2-7
Cyclic Nucleotide Phosphodiesterases	Marco Conti & Miles Houslay	Queen's College, Oxford	Sept 10-15
Glycolipid & Sphingolipid Biology	Guido Tettamanti	Il Ciocco, Italy	May 14-19
Intermediate Filaments	Birgit Lane	Queen's College, Oxford	Jul 30-Aug 4
Light Emission from Solids	Aron Vecht	Queen's College, Oxford	Jul 9-14
Macromolecular Org. & Cell Function	Natalie Cohen & Hans Westerhoff	Queen's College, Oxford	Aug 6-11
Mammary Gland Biology	Nancy Hynes & Charles Streuli	Il Ciocco, Italy	May 21-26
Molecular & Cellular Neurobiology	Yi Rao	Hong Kong	Jun 4-9
Molecular Cytogenetics	Daniel Pinkel & Barbara Trask	Queen's College, Oxford	July 23-28
Mutagenesis	Josef Jiricny	Queen's College, Oxford	Aug 20-25
Myelin	Steven Pfeiffer & Klaus-Armin Nave	Il Ciocco, Italy	May 7-12
Neural Cholecystokinin	Margery Beinfeld	Queen's College, Oxford	Aug 13-18
Periodontal Diseases	Harvey Schenkein	Queen's College, Oxford	Jul 16-21
*Photosensory Receptors & Signal Transduction	John Spudich & Winslow Briggs	Il Ciocco, Italy	Apr 30-May 5
Pineal Cell Biology	Josephine Arendt	Queen's College, Oxford	Aug 27-Sept 1

*GRC sponsored meetings

2000 SUMMER — *CONNECTICUT/NEW HAMPSHIRE/RHODE ISLAND*

Conference Title	Chair	Location	Date
Adhesion, Science of	John Dillard	Tilton School	Aug 6-11
Atomic & Molecular Interactions	David Chandler	Colby-Sawyer College	Jul 2-7
Bacterial Cell Surfaces	Joe Lutkenhaus & Ian R. Booth	Colby-Sawyer College	Jun 25-30
Basement Membranes	Louis F. Reichardt	Connecticut College	Jun 17-22
Bioanalytical Sensors	Leanna Levine	Proctor Academy	Jul 23-28
Biocatalysis	Monica Palcic & Gregg Whited	Kimball Union Academy	Jul 9-14
Bioengineering & Orthopedic Science	Richard Coutts	Proctor Academy	Jul 30-Aug 4
Biological Regulatory Mechanisms	David Smith & Francine Perler	Holderness School	Jul 30-Aug 4
Biomineralization	Malcolm Snead	Colby-Sawyer College	Aug 13-18
Bioorganic Chemistry	Carolyn R. Bertozzi & Stephen V. Frye	Proctor Academy	Jun 18-23
Biopolymers	Peter A. Kollman & Kathleen Hall	Salve Regina University	Jun 18-23
Cancer	Daniel Haber	Salve Regina University	Aug 6-11
Cardiac Regulatory Mechanisms	Donald M. Bers	Colby-Sawyer College	Jul 23-28
Catalysis	Robert S. Weber	Colby-Sawyer College	Jun 25-30
Cell Biology of the Neuron	Thomas Martin & Kristen M. Harris	Plymouth State College	Jun 18-23
Cellular & Molecular Mycology	Beth J. Didomenico & Tom Adams	Holderness School	Jun 18-23
Ceramics, Solid State Studies in	Gregory S Rohrer	Kimball Union Academy	Aug 6-11
*Chemical Physics Summer School	Shaul Mukamel	Roger Williams University	Jun 18-30
Chemotactic Cytokines	Steve Kunkel	Kimball Union Academy	Jul 23-28
Chromatin Structure & Function	Susan Gasser	Tilton School	Jul 16-21
Complex Fluids	Thomas A. Witten	Salve Regina University	Aug 13-18
Correlated Electron Systems	Andrew Millis & John A. Mydosh	Plymouth State College	Jun 25-30
Corrosion - Aqueous	Gerald Frankel	Colby-Sawyer College	Jul 23-28
Developmental Physiology	Kenneth R. Robinson	Plymouth State College	Jul 2-7
Diamond Synthesis	Tom Owano	Salve Regina University	Jun 25-30
Drug Metabolism	Brian Burchell	Holderness School	Jul 9-14
Education in Materials Science	Marc J. Degraef	Plymouth State College	Jul 30-Aug 2
Electrodeposition	John L. Stickney	Colby-Sawyer College	Aug 13-18
Electron Donor Acceptor Interactions	Jan Verhoeven	Salve Regina University	Aug 13-18
Electronic Processes in Organic Mater.	Dietrich Haarer	Salve Regina University	Jul 30-Aug 4
Energetic Materials	Richard Behrens	Tilton School	Jul 2-7
Environmental Endocrine Disrupters	Brent D. Palmer	Plymouth State College	Jun 18-23
Environmental Sciences: Water	Steven J. Eisenreich	Holderness School	Jun 25-30
Enzymes, Coenzymes & Met. Pathways	Hung-Wen Liu,& Chris P. Whitman	Kimball Union Academy	Jul 16-21

Conference Title	Chair	Location	Date
Fuel Cells	Richard Bellows	Roger Williams University	July 9-14
Green Chemistry	Tracy C. Williamson & Istvan T. Horvath	Connecticut College	Jul 15-20
Hemostasis	Lawrence F. Brass	Plymouth State College	Jul 9-14
Heterocyclic Compounds	Paul L. Feldman	Salve Regina University	Jul 9-14
High Pressure, Research at	Isaac Silvera	Kimball Union Academy	Jun 25-30
High Temp. Materials, Proc. & Diag.	Nathan Jacobson	Plymouth State College	Jul 23-28
Hormonal & Neural Peptide Biosynthesis	Robert S. Fuller	Colby-Sawyer College	Jul 16-21
Illicit Substance Detection	Lyle Malotky & Richard Lacey	Connecticut College	Jul 8-13
In Vivo Magnetic Resonance (New)	Michael B. Smith	Proctor Academy	Aug 20-25
Industrial Ecology	Braden R. Allenby	Colby-Sawyer College	Jun 11-16
Inorganic Chemistry	Nadine De Vries	Salve Regina University	Jul 23-28
Interfaces, Chemistry at	Leonid Turkevich	Kimball Union Academy	Jul 2-7
Ion Channels	David C. Gadsby	Tilton School	Jul 9-14
Laser Interactions with Materials	David B. Geohegan	Proctor Academy	Jun 11-16
Lasers in Medicine & Biology	J. Stuart Nelson & Stefan Andersson-Engels	Connecticut College	Jun10-15
Lipoprotein Metabolism	Henry Ginsberg	Kimball Union Academy	Jul 30-Aug 4
Lysosomes	Juan S. Bonifacino	Proctor Academy	Jun 25-30
Mammalian Gametogenesis & Embryogenesis	Gerald M. Kidder	Connecticut College	Jul 1-6
Mechanisms of Toxicity	James L. Stevens	Plymouth State College	Jul 23-28
Medicinal Chemistry	Graham Johnson	Colby-Sawyer College	Aug 6-11
Meiosis	Michael Lichten	Colby-Sawyer College	Jun 18-23
Membrane Transport Proteins	Michael Kavanaugh	Connecticut College	Jul 22-27
Membranes: Materials & Processes	Richard D. Noble	Connecticut College	Jul 29-Aug 3
Microbial Stress Response	Thomas V. O'Halloran	Salve Regina University	Jul 16-21
Microbial Toxins & Pathogenicity	James Kaper	Proctor Academy	Jul 16-21
Mitochondria & Chloroplasts	David B. Stern	Connecticut College	Jun 24-29
Modeling of Flow In Permeable Media	Linda M. Abriola	Proctor Academy	Aug 6-11
*Molecular & Ionic Clusters	Philippe Brechingnac & Nadine Halberstadt	Toulouse, France	Apr 16-21
Molecular Basis of Microbial One-Carbon Metab.	Dan Arp	Connecticut College	Jul 8-13
Molecular Biology, Diffrac. Methods in	Andrew Howard	Proctor Academy	Jul 2-7
Molecular Electronic Spectroscopy	Robert W. Field	Colby-Sawyer College	Jul 30-Aug 4
Molecular Genetics	Robert Kingston	Connecticut College	Jul 22-27
Multiphoton Processes	John Hepburn	Tilton School	Jun 18-23
Muscle: Excitation/Contraction Coupling	David H. Maclennan	Colby-Sawyer College	Jun 11-16
Nanostructure Fabrication	Christie Marrian	Tilton School	Jul 23-28
Natural Products	Robert Webb	Plymouth State College	Jul 30-Aug 4
Neural Development	David J. Anderson	Salve Regina University	Jul 2-7
*New Frontiers in Science & Technology Policy	Will Lepkowski, Daryl Chubin & Martin Apple	Holderness School	Aug 20-25
Nitrogen Fixation	Lance Seefeldt	Colby-Sawyer College	Jul 2-7
Nuclear Chemistry	William Lynch	Colby-Sawyer College	Jun 18-23
Nuclear Waste & Energy	Ken L. Mossman & Jordi Bruno	Colby-Sawyer College	Jul 16-21
Nucleic Acids	Alan B. Sachs & Marlene Belfort	Salve Regina University	Jun 25-30
Organic Geochemistry	John I. Hedges	Holderness School	Aug 13-18
Organic Reactions & Processes	Michael Harmata	Roger Williams College	Jul 16-21
Organic Structures & Properties	Michael D. Ward & Mike J. Zaworotko	Connecticut College	Jun 17-22
Organometallic Chemistry	William Jones	Salve Regina University	Jul 30-Aug 4
Origin of Life	Antonio Lazcano	Plymouth State College	Jul 9-14
Oscillations & Dyn. Instab. in Chem. Sys.	Stephen K. Scott	Roger Williams College	Aug 20-25
Peptide Growth Factors	Carl-Henrik Heldin	Kimball Union Academy	Aug 13-18
Photonuclear Reactions	C.W. (Kees) De Jager & Annalisa D'Angelo	Tilton School	Jul 30-Aug 4
Photosynthesis	Gary Brudvig	Kimball Union Academy	Jun 18-23
Physical Metallurgy	Rusty Gray & John Lewandowski	Holderness School	Jul 23-28
Physics Research & Education (New)	Jan Tobochnik & Harvey Gould	Plymouth State College	Jun 11-16
Plant & Fungal Cytoskeleton	Zach Cande	Proctor Academy	Aug 13-18
Plant Cell Walls	Deborah P. Delmer	Kimball Union Academy	Aug 20-25
Plant Molecular Biology	Robert Last	Holderness School	Jul 16-21
Plant Senescence	Anthony B. Bleecker	Plymouth State College	Jul 16-21
Plasma Processing Science	David B. Graves	Tilton School	Aug 13-18
Point & Line Defects in Semiconductors	Thomas Kennedy	Colby-Sawyer College	Jul 9-14
Polymer Physics	Timothy Lodge	Connecticut College	Jul 29-Aug 3
Polymers (East)	Mark Green	Connecticut College	Jun 10-15
Proteoglycans	Renato Iozzo	Proctor Academy	Jul 9-14
Proteolytic Enzymes & Their Inhibitors	Wolfram Bode	Colby-Sawyer College	Jul 9-14
Radiation Chemistry	Klaus-Dieter Asmus	Plymouth State College	Jun 25-30
Reproductive Tract Biology	Geula Gibori & Susan Fisher	Connecticut College	Jul 1-6
Salt & Water Stress in Plants	Elizabeth A. Bray	Tilton School	Aug 20-25
Second Messengers & Protein Phosphorylation	Lee Witters & Bruce Kemp	Kimball Union Academy	Jun 11-16
Separation & Purification	Rakesh Agrawal	Colby-Sawyer College	Aug 6-11
Signal Transduction by Eng. Extracell Matrices (New)	Mohammad A. Heidaran	Tilton School	Jun 25-30
Signaling by Adhesion Receptors (New)	Filippo G. Giancotti	Salve Regina University	Jul 23-28
Solar Radiation & Climate	Bruce Wielicki & Thomas Ackerman	Connecticut College	Jun 24-29
Solid State Chemistry I	Robert Cava	Colby-Sawyer College	Jul 30-Aug 4
Stereochemistry	Frank G. Fang	Salve Regina University	Jun 11-16
Synaptic Transmission	Larry Trussell	Connecticut College	Jul 15-20
Tetrapyrroles, Chemistry & Biology of	Paul Ortiz de Montellano	Salve Regina University	Jul 16-21
Theo Foundations for Product Design & Mfg.	Ronald Howard & William E. Alzheimer	Plymouth State College	Jun 11- 16
Theoretical Biology & Biomathematics	Charlie Smith & Edward Pate	Tilton School	Jun 11-16
Thin Film Mechanical Behavior	George Pharr	Plymouth State College	Jul 16-21
Tribology	David Rigney	Holderness School	Jul 2-7
Vascular Cell Biology	David Cheresh	Plymouth State College	Jul 2-7
Vibrational Spectroscopy	Edwin Heilweil	Salve Regina University	Aug 6-11
Visual System Development	Kevin Moses & Tom Reh	Roger Williams University	Jun 4-9
Water & Aqueous Solutions	Marie Claire Bellissent-Funel & Jose Teixeira	Holderness School	Aug 6-11

*GRC sponsored meetings

Fish or cut bait!

Use our phage display cDNA libraries or clone your own

Powerful, new

T7Select™

cDNA Libraries
Phage Display and Biopanning Systems

Select.
(biopanning selection)

Sequence.

Discover!

Fast! Use our cDNA libraries or make your own • **Powerful.** Enjoy elution options like SDS, NaCl, Urea, Guanidine, EDTA, DTT and pH **Unique.** Clone and Display peptides and proteins up to 1200 aa • **Convenient.** Use our optimized reagents and procedures to get results, faster and easier **Sensible.** Biopanning gets you clones—not dots on a film.

Circle No. 67 on Readers' Service Card

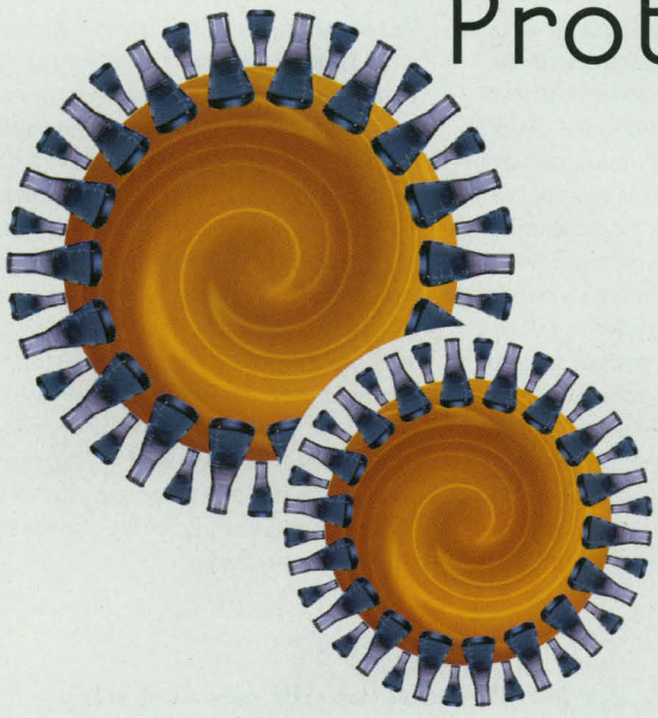
For more information:

phone 800.526.7319 in the US and Canada 0800-06931.000 in Germany 0800-622935 in the UK

For local distributors anywhere in the world, please refer to Novagen's web site.

email novatech@novagen.com *web* www.novagen.com

Novagen



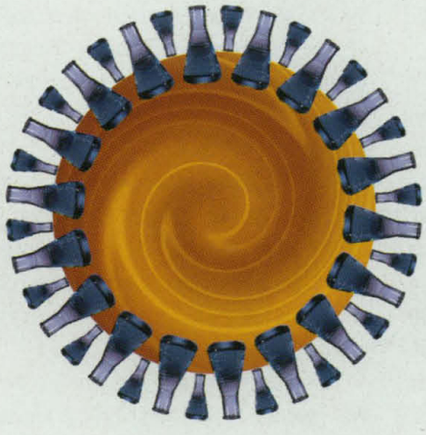
Protein + Protein

Genetic Information Comes To Life

Each living cell is packed with proteins that continuously interact with each other to control the cell's growth and eventual fate. Research teams have developed a variety of chemical and biochemical techniques to understand the who, what, where, when and why of those interactions.

Interactions

by Peter Gwynne and Guy Page



"DNA makes RNA makes protein." That classic paradigm of molecular genetics describes how genetic information travels. Information stored in genes and chromosomes moves via RNA to its active implementation as proteins. At that point, the "central dogma" stops. But like the Energizer bunny, the cell keeps going and going. It has the further task of turning a hodge-podge of protein products into the organized and regulated activity of life.

The usual graphic representation of a living cell shows a few organelles — the nucleus, mitochondria, and golgi bodies, for example — floating inside the cell membrane in a medium that resembles empty space. In reality, this medium, variously referred to as cytosol or the cytoplasm, is a thick soup full of proteins. Cells are stuffed with the proteins they produce that carry on the life processes. Because of their sheer numbers and variety, the proteins must be carefully managed. This management takes place in large part through the use of protein-protein interactions (PPIs)— proteins regulating and managing one another.

continued ➢

The enzymes of the TCA cycle offer one intriguing example. Biochemistry students learn that this collection of enzymes turns our basic nutritional input into the raw chemical building blocks from which we reconstruct ourselves through a process that seems to have very little coordination among the enzymes themselves. Enzyme 1 converts A to B; at some point, Enzyme 2 finds B and converts it to C; later, Enzyme 3 finds C and make D from it, and so on.

What actually occurs in this process is very different from this textbook picture. Rather than floating freely, the enzymes of the TCA cycle are physically bound together in a meta-structural unit called a metabolon. This functions like a closely integrated bucket brigade on the molecular level. When Enzyme 1 completes its job of converting compound A to B, B is moved immediately to Enzyme 2, which is located next to Enzyme 1. Thus, the process is managed by structuring the interaction between these enzymes. That serves to accelerate the procedure by orders of magnitude.

them? Answers have followed. We know what RNA polymerase looks for when it seeks a specific gene. And we know, more or less, what it does when it finds one. Much of this process depends on the interaction between the enzyme and specific sections of DNA.

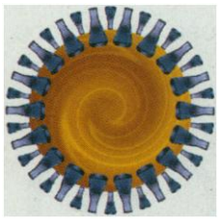
However, mysteries remain. We don't know why RNA polymerase chooses to decode some genes and not others, how it decides when to do so, and how it decides the intensity with which to work on any single gene. We still need to understand better the interactions among the proteins that make up RNA polymerase itself.

The most-studied RNA polymerase is the bacterial enzyme from *Escherichia coli*. Steady work on this enzyme and its regulation has provided intimate details of its structure and function. Simply put, one part of the enzyme decodes DNA information, and another decides what information to decode. Roughly three decades ago, a team headed by Dick Burgess of the University of Wisconsin discovered that a part of the *E. coli* enzyme that he called the sigma factor makes the

another messenger RNA, and the third transfer RNA."

While bacterial genes are usually switched off or on like light switches, the controls in higher cells act more like light dimmers, allowing many different levels of gene activity. In addition, the cells face a much more complex array of genetic control problems when they try to communicate with one another in the internal environment of a complex organism. At the same time, these cells are responding to changes in their external environments.

All these responses and controls occur as a result of the interaction of transcription factors — a virtual army of proteins — with RNA polymerase. Transcription factors can stimulate or repress; and they can switch between the two activities, according to the circumstances. They can work together, or they can compete with one another. Their activities can be modified by other proteins, which themselves are responding to yet other proteins. If the situation seems to have an Alice-in-Wonderland complexity, it does. And the difficult part has only just begun.



All the differences between cells stem from the choices that cells make about what information gets decoded and when. The regulation of this process is, understandably, one of the most complex and intriguing questions in all of biology.

Holy Grails and Prima Donnas

Protein-protein interaction is also a critical component of a subject that is perhaps the true Holy Grail of molecular genetics research: transcription regulation. Genetic transcription is the process by which the cell "decodes" information stored in DNA and copies it into RNA — the "DNA makes RNA" part of the process. Selecting which information will be decoded, and when, is the most fundamental and important decision that any cell makes.

All the differences between cells stem from the choices that cells make about what information gets decoded and when. The regulation of this process is, understandably, one of the most complex and intriguing questions in all of biology.

The prima donna of gene regulation is RNA polymerase. This enzyme, which does the decoding, is the central cellular focus of regulation. For a long time, scientists in the field have asked two key questions: How does RNA polymerase find genes, and how does it copy

decision. The team originally identified a single factor, now called sigma 70. However, Burgess recalls, "at the time we proposed multiple sigma factors."

They got it right. "There are seven sigma factors in *E. coli*," says Burgess. "Each confers a different promoter binding specificity on RNA polymerase. The relative abundance of the seven varies according to the growth conditions. Some sigma levels rise under conditions of stress, and create more transcription of their particular class of genes."

As complex as this situation is, it pales in comparison with the regulation of genetic transcription in higher cells. The eukaryotic RNA polymerase is much more complicated than the bacterial enzyme, and the problems it faces are more demanding. "Some of the subunits of the eukaryotic polymerase are closely related to the subunits in the bacterial polymerase," says Burgess. "Usually, the eukaryotes have as many as 12 subunits. In addition, there are three families of polymerases in higher organisms. One transcribes ribosomal RNA,

A Cluster of Key Questions

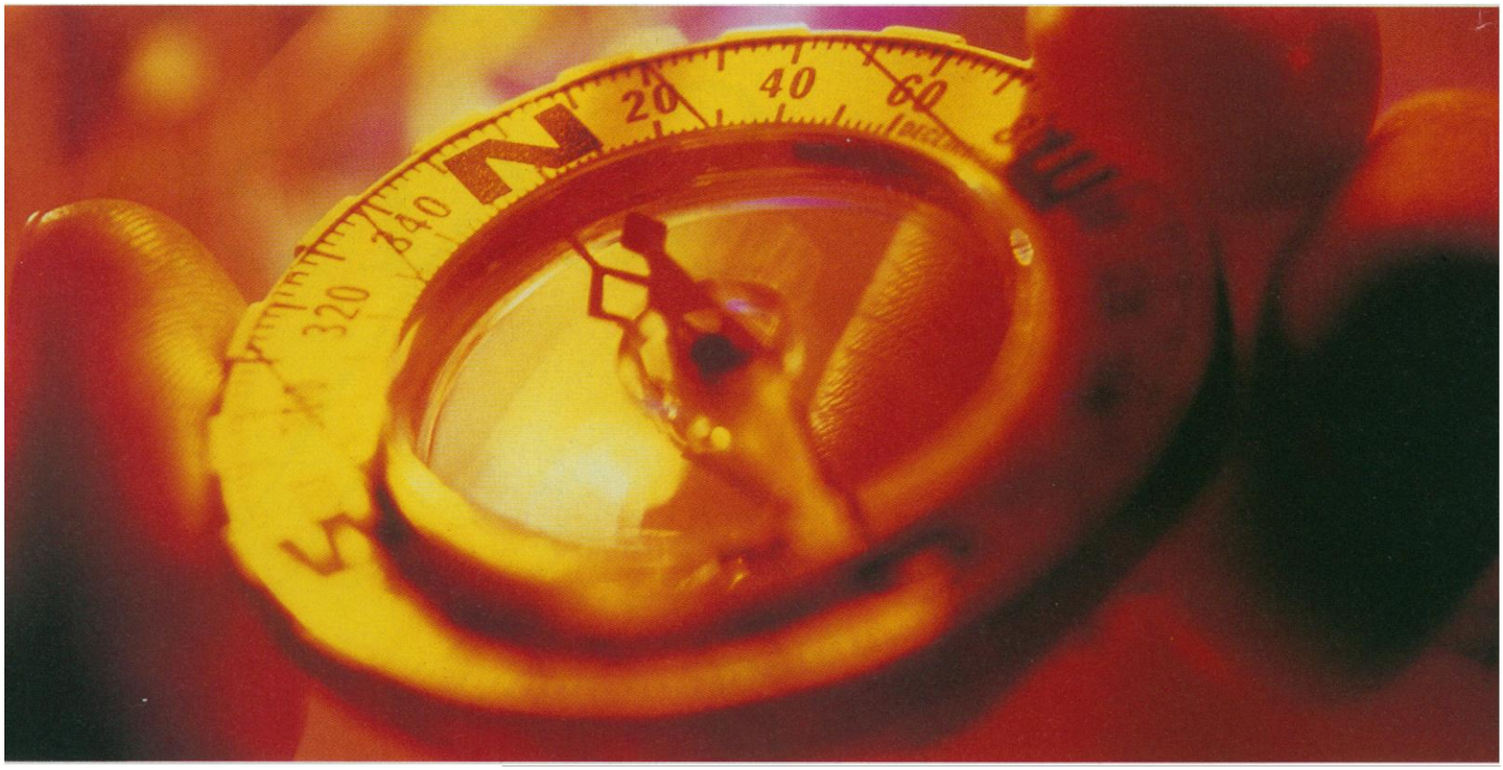
The problem of protein-protein interactions can be reduced to a cluster of questions, "Who's touching whom? How does it do it? Where does the touching take place? When does it happen? Why does it occur? And what are the consequences?"

The first question is the most direct. It asks which proteins in a complex are actually interacting with each other. Even this most basic question is very difficult to answer. To understand why we don't have a conclusive response, it's useful to compare the problem to that of analyzing genetic structure.

When researchers explore a gene and its function, they need first to learn which gene is involved in the problem they're studying. In some cases the answer is simple: If you're studying hemophilia, for example, the hemoglobin gene is a leading candidate. In other situations, the answer gets somewhat more complicated. In any case, once researchers have targeted the correct gene, they can clone it, sequence it, and modify it

continued ➢

Looking for a specific molecular interaction? We can point you in the right direction.



Invitrogen offers three unique products to expedite your search for molecular interactions.

Versatile Yeast Two-Hybrid System

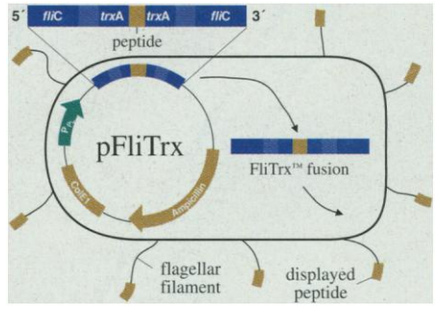
The LexA-based Hybrid Hunter™ Yeast Two-Hybrid System is the most versatile two-hybrid system available. Small vectors with expanded multiple cloning sites facilitate subcloning and improve transformation efficiencies. In addition, a unique selectable marker allows you to perform constitutive screens with virtually any two-hybrid library. If your prey is potentially toxic, a strain is included for induced screening strategies with LexA-based libraries. Expedite your protein hybrid hunt with Hybrid Hunter™.

Mammalian Display Vector

pDisplay™ is the only vector designed to target and display peptides on the surface of mammalian cells. This vector is ideal for analyzing the interaction of eukaryotic proteins with known or prospective ligands.

Peptide Display without the Phage

The FliTrx™ Random Peptide Display Library is an *E. coli*-based library of constrained random dodecapeptides. FliTrx™ eliminates the use of time-consuming phage protocols. Easy panning protocols make FliTrx™ an ideal tool for high-throughput screening.



Heading Our Way

Identifying molecular interactions? Let Invitrogen point you in the right direction. Our high-quality products will help you find your interactions effectively and efficiently. Give us a call today.

European Headquarters:
Invitrogen BV
P.O. Box 2312
9704 CH Groningen
The Netherlands
Tel: +31 (0) 50 5299 299
Fax: +31 (0) 50 5299 281
Email: tech_service@invitrogen.nl
www.invitrogen.com

International Toll Free Numbers:
Tel: 00800 5345 5345*
Fax: 00800 7890 7890*
*This number operates in all European countries excluding Finland and Sweden
Finland:
Tel: 990800 5345 5345
Fax: 990800 7890 7890
Sweden:
Tel: 009800 5345 5345
Fax: 009800 7890 7890

Distributors:
Austria 0222 889 18 19
Australia 1 800 882 555
China 010 6255 3477
Hungary 01 280 3728
India 91 80 8391453
Israel 02 584 1111
Italy 02 38 19 51
Japan 03 5684 1622
Malaysia 03 432 1357
Poland 058 344 19 80
Portugal 01 453 7085
Singapore 65 2922130
South Korea 02 569 6902
Spain 03 450 2601
Taiwan 886 2 238 10844
Thailand 246 7243

From all other countries, call our European headquarters at +31 (0) 50 5299 299.

United States Headquarters:
Invitrogen
1600 Faraday Avenue
Carlsbad, California 92008
Tel: 1-800-955-6288
Fax: 760-603-7201
Email: tech_service@invitrogen.com
http://www.invitrogen.com

Circle No. 51 on Readers' Service Card

Unlocking Secrets

the Inner of Life

Drug discovery and basic life science. Research areas that are under constant development. Buzzing with activity. Every week, brand new proteins are discovered.

In the Key of Life. By studying the role of proteins in human cells, you can gain new knowledge about life itself. About health and diseases. This involves a thorough understanding of what molecules do. And why they do it.

Key Questions. Do two molecules bind to each other? How specific is the interaction? How much? How fast? How strong?

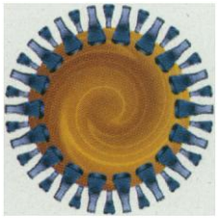
In basic research, current studies address signal transduction, receptor-ligand binding, and immune response mechanisms. Among other things. In the pharmaceutical industry, researchers are racing to describe the functions of newly found proteins. To help them design and discover new drugs.

The Key to Success. These are difficult issues. But Biacore can provide the answers. Our high-tech instruments offer researchers unique tools to detect and monitor biomolecular interaction. This knowledge is key to success in both basic and applied R&D. It will open closed doors for you.

BIACORE

www.biacore.com

Circle No. 50 on Readers' Service Card



DNA ... has a very predictable structure, that allows researchers a great deal of inference. They can make no inferences about protein complexes, since all things are possible in principle.

to study its properties, based on the well-established understanding of how genes are built and how they work. This basic approach also applies to many single proteins. Biochemists can break open a cell, extract the protein of interest, purify it using a battery of chromatography methods, and study its properties by using well-established methods.

In each of these cases, the subject of study, whether a single gene or a single protein, remains stable and constant. That's not the case with protein-protein interactions, which are transitory almost by definition. Any protein-protein interaction has the central purpose of effecting some type of regulatory change — speeding up, slowing down, or redirecting — in response to environmental circumstances. For that reason, the associations between proteins involved in these interactions are not as strong as the bonds between bases in DNA or between amino acids in a single protein. A researcher who extracts a complex of two or more associated proteins from a cell has no guarantee that all the parts of the complex will come out together, or that proteins that don't really belong to the complex will not somehow have attached themselves to it. Moreover, no structural rules predict how the interaction should have taken place. Consequently, researchers can't compare what should have occurred with what did occur during the reaction.

DNA, by contrast, has a very predictable structure, that allows researchers a great deal of inference. They can make no inferences about protein complexes, since all things are possible in principle. Researchers who try to understand how proteins enter and leave myriad associations in the cell start out with two strikes against them. First, the biological network is enormously complex. Second, the association between proteins is extremely transitory in nature.

Finding Answers through Technology

Given these disadvantages, how can anyone hope to solve such a conundrum? "There are two major ways of attacking the problem," says Tomasz Heyduk of the University of St. Louis. One uses the power of molecular biology and the ease of particular manipulations. Methods in this group are very powerful and very amenable to a large-scale search for partners of proteins. The other involves approaches that detect and analyze PPI by some more or less direct biophysical or biochemical techniques."

Techniques applied to understanding PPI include such established methods as cross-linking, fluorescence energy transfer analysis, immunoprecipitation, selective protease digestions and Western blotting. In addition, relatively new genetic techniques such as phage display and two-hybrid analysis have joined the armamentarium. Certain spectroscopic techniques, including fluorescence polarization and surface plasmon resonance, have also proved useful. Finally, rigorous analysis through x-ray crystallography has contributed essential information in several cases.

Heyduk's first set of techniques focuses on the fundamental issue of who's touching whom. Scientists trying to answer that question face an obvious problem: the transitory nature of protein complexes. Once formed, complexes simply don't stay linked for long. An early approach to studying PPI, chemical cross-linking, aims to catch the proteins in the interaction by hooking them together before they have a chance to split apart. Treating a crude cell lysate with a chemical cross-linker such as formaldehyde permits neighboring proteins in a complex to become attached. These proteins will stay attached during subsequent purification.

Capture by Cross-linking

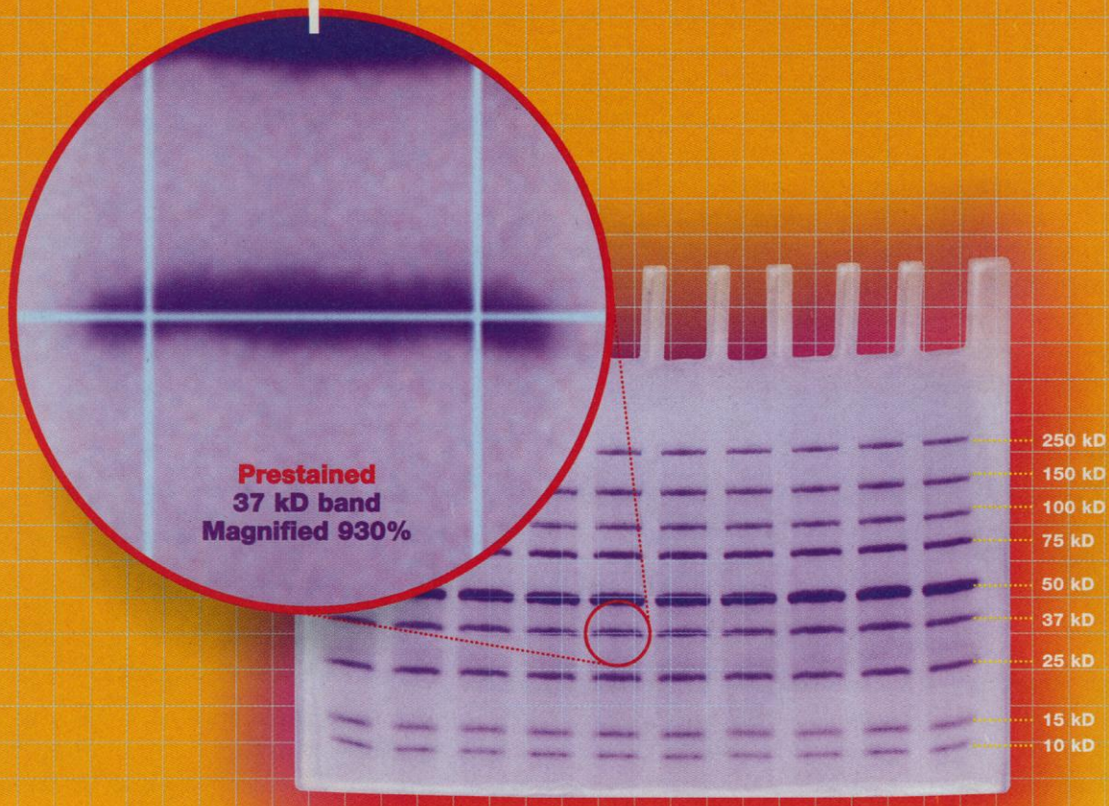
"Cross-linking enables you to look at more controlled systems, one on one," explains Bob Vigna, marketing manager for protein products at Pierce Chemical, which produces several types of chemical reagents. "Cross-linking agents are potentially very good at trapping or capturing networks of proteins."

Despite their value, cross-linkers have some obvious limitations. They don't work for all proteins. A protein that does not have the right chemical functional group in the right place will be invisible to a cross-linking strategy. The flip side of this problem is that cross-linkers are relatively non-specific. They will link any proteins that happen to be in the immediate vicinity, of the protein under study, whether or not they have a functional reason for being there. A protein that has nothing to do with a complex can be hauled along during purification simply by being in the wrong place at the wrong time. Cross-linking agents "are probably not able to deal with as many system as *in vitro* methods," says Vigna. He notes, however, that "*in vitro* systems suffer from false positives."

Cross-linkers can answer the "who's touching whom?" question, and part of the "when?" question. However, they can't answer the how, where or why questions. Thus, some scientists have turned to a related immunological technique that uses antibodies to trap and co-precipitate proteins in a complex. In immuno-coprecipitation, an antibody raised against

continued ➢

incredibly precise



new Precision Protein Standards™

New Ready-to-Use Prestained and Unstained Standards That Migrate to Their True Molecular Weight.

Engineered from the ground up and highly purified to yield bands of unrivaled clarity and sharpness. Precision Protein Standards migrate to their true molecular weight, so you get reliable molecular weight determinations every time, without lot-to-lot variability, even prestained! See us at **precision.bio-rad.com** for additional information.

Order Today and Try Them Now!

Catalog #	*Description*
161-0362	Precision Protein Standards, Unstained, 150 applications (10 µl/application), 1500 ul
161-0372	Precision Protein Standards, Prestained, 50 applications (10 µl/application), 500 ul

What Will You Discover Next?

Visit our Life Science web site at discover.bio-rad.com.
Call toll free at 1-800-4BIORAD (1-800-424-6723); outside the US, call (510) 741-6996.

BIO-RAD

Circle No. 60 on Readers' Service Card

one protein is used to "precipitate" that protein, along with anything attached to it. This is a relatively gentle technique that allows the recovery of the coprecipitated species. It is also extremely specific in terms of targeting the right protein. The technique requires an antibody against a portion of the complex. But this has not proved a problem for studies of RNA polymerase. In this case, the core complex is readily purified in quantities sufficient for raising antibodies.

Another related concept, affinity chromatography, was first developed for use with antibodies as purification agents. "Affinity systems operate in much the same way as cross-linking agents," explains Vigna. "You immobilize and capture the complex by cross-lining on a support, or by natural affinity, and elute the natural species off and examine it." Researchers prepare a conventional affinity chromatography column by linking an antibody to a solid matrix such as Sepharose. In theory, when a mixture of proteins is passed over the column, only the protein that the antibody recognizes binds; the remainder flows through. The same concept can be applied to the identification of proteins that interact in complexes. Instead of using an antibody as the molecule linked to the column, the researcher uses one of the proteins in the complex. Such a column will — again, in theory — extract those proteins capable of interacting with the bound protein from a mix of proteins.

This approach has a conceptual elegance, and is relatively easy to use in several circumstances. It also has certain limitations. It can be difficult to produce enough raw material of sufficient purity. More important, the target protein and the bound protein must link together with enough strength to keep the target protein on the column while allowing non-associating proteins to pass through.

The Two-hybrid System

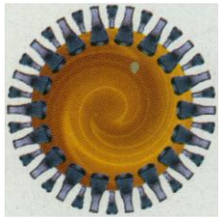
Another technique with great potential for determining "who's touching whom" is the yeast two-hybrid system,. Developed in 1989 by Stan Fields, then at the State University of New York, Stony Brook, and now with the University of Washington, this concept takes advantage of the modular structures of the higher cell transcription factors. A transcription factor has two functions: It finds the right spot on a piece of DNA where RNA polymerase should start making RNA; and it tells the RNA polymerase to start work. Physically distinct and separable domains in the transcription factor carry out these two functions. One domain binds DNA, while the other signals the start of transcription. The two domains can be split and reconnected just like modular building blocks. However, transcription can happen only when both domains are present.

In the two-hybrid system, researchers use genetic engineering technology — available from several commercial suppliers — to link two candidate proteins to the two domains, with one protein attached to each. Two candidate proteins that interact with one another in a cellular environment will, when they interact, bring together the two domains of the transcription factor that has been artificially separated in the two-hybrid system. As a result, the protein-protein interaction will create a fully functional transcription factor whose presence can be detected by using a standard genetic expression test. "Two-hybrid technology is one of the most important breakthroughs of the 1990s," asserts Li Zhu, director of molecular biology for CLONTECH. "It has really opened up a new area of research, allowing people to study proteins using molecular biology techniques, so that you don't need to purify proteins, and you can let yeast give you all the answers."

Several research teams, including groups at Harvard University, Baylor University and Long Island's Cold Spring Harbor Laboratories, have devised different versions of the two-hybrid method. Those have formed the bases of several commercial versions marketed specifically for studies of the protein-protein interaction, among them Invitrogen, Origene, Promega, and Stratagene. CLONTECH launched its Matchmaker system 3 version, based on the two-hybrid work by Philip James at the University of Wisconsin. "Histidine is the usual marker in two-hybrid systems, but it has a problem of giving false positives," says Zhu. "James reported that adding adenine as an additional selection marker significantly reduces the false positives."

A prerequisite for the two-hybrid system is that researchers must obtain the gene clones of interest to them. With the growing availability of clone banks and the advance of gene cloning methodology, however, this is a less restrictive requirement than it once was. One major advantage of the two-hybrid system is that researchers can use one cloned gene of interest as "bait," to screen a library consisting of hundreds or thousands of random clones, to identify novel interacting partners, or "prey." None of the other *in vitro* or *in vivo* methods can fulfill this function.

Scientists have also extended the concept to "three-hybrid" systems, to study interactions among RNA, and interactions involving three proteins. And in line with the broad vision of the human genome project, Fields has proposed using the two-hybrid system to catalog all the protein interactions in a cell.



A prerequisite for the two-hybrid system is that researchers must obtain the gene clones of interest to them. With the growing availability of clone banks and the advance of gene cloning methodology, however, this is a less restrictive requirement than it once was.

Fluorescence Polarization

Spectroscopy provides another way of exploring who's touching whom, via fluorescence polarization (FP). This approach, envisioned more than seven decades ago and first created in practical form more than 30 years back, has gained new momentum in its application to the analysis of macromolecules such as protein and DNA. It simply measures the rate at which fluorescent molecules spin and rotate in solution. Since larger molecules tend to move more slowly than smaller molecules, FP actually measures the size of the molecules by monitoring their rotation rates. When two proteins interact to form a complex, the complex is larger than either of the two proteins alone. FP can detect this change in size and report whether two proteins are in fact capable of specific interactions with one another.

Fluorescence polarization has two chief benefits. It is quantitative. And it is sensitive enough to work at near physiological concentrations. "It's a truly homologous technique," explains Randy Bolger, scientist in charge of sales and marketing for fluorescence polarization at PanVera Corporation, one of two main commercial sup-

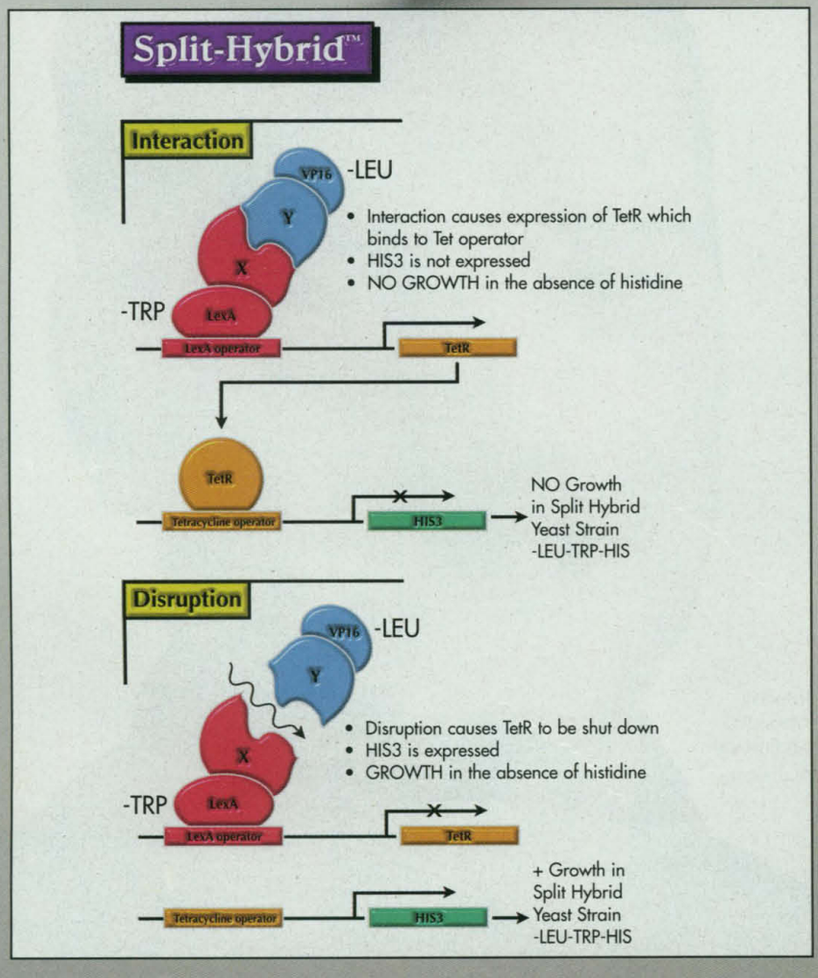
continued ➢

BIO 101

THINK POSITIVE WITH SPLIT-HYBRID™

SPLITTING A HYBRID?

Positive Selection for *in vivo* Disruption of Protein-Protein Interaction Using a Two Component Reporter



Mutational analysis of interacting proteins is cumbersome. The Split-Hybrid System was designed specifically to ease studies of interacting proteins obtained by two-hybrid or classical methods (1).

It's in the Strains: The Split-Hybrid Yeast Kit* uses unique yeast strains and tet/3AT-modulation of reporter sensitivity to analyze the most challenging of protein interactions. The system is also amenable to searching protein/peptide libraries for disrupting activities.

Cat# 2020-200 Split Hybrid™ Yeast Kit

Call or check our website for the protocol and additional details.

www.bio101.com

yeast@bio101.com

tel: 800-424-6101 fax: 760-598-0116

Circle No. 59 on Readers' Service Card

(1) Shih, *et al.* (1996) PNAS 93, 13896.

*All sales of the Split-Hybrid Kits are made as conditional sales only to independent academic, non-commercial or non-profit research organizations and are for non-commercial use. No license to practice the technology is implied or granted by the conditional sale. Any commercial use sponsored use will require the express grant of a commercial license.

Divided We Stand!

Ejvind is smiling!

His team just found and validated another 12 protein-protein interactions in our project on splicing

Visit our Website or contact us to learn how our functional proteomics technology can make you smile as well

Dr Ejvind Moertz
Head of Proteomics Applications at Protana
moertz@protana.com

PROTANA
the functional proteomics leader

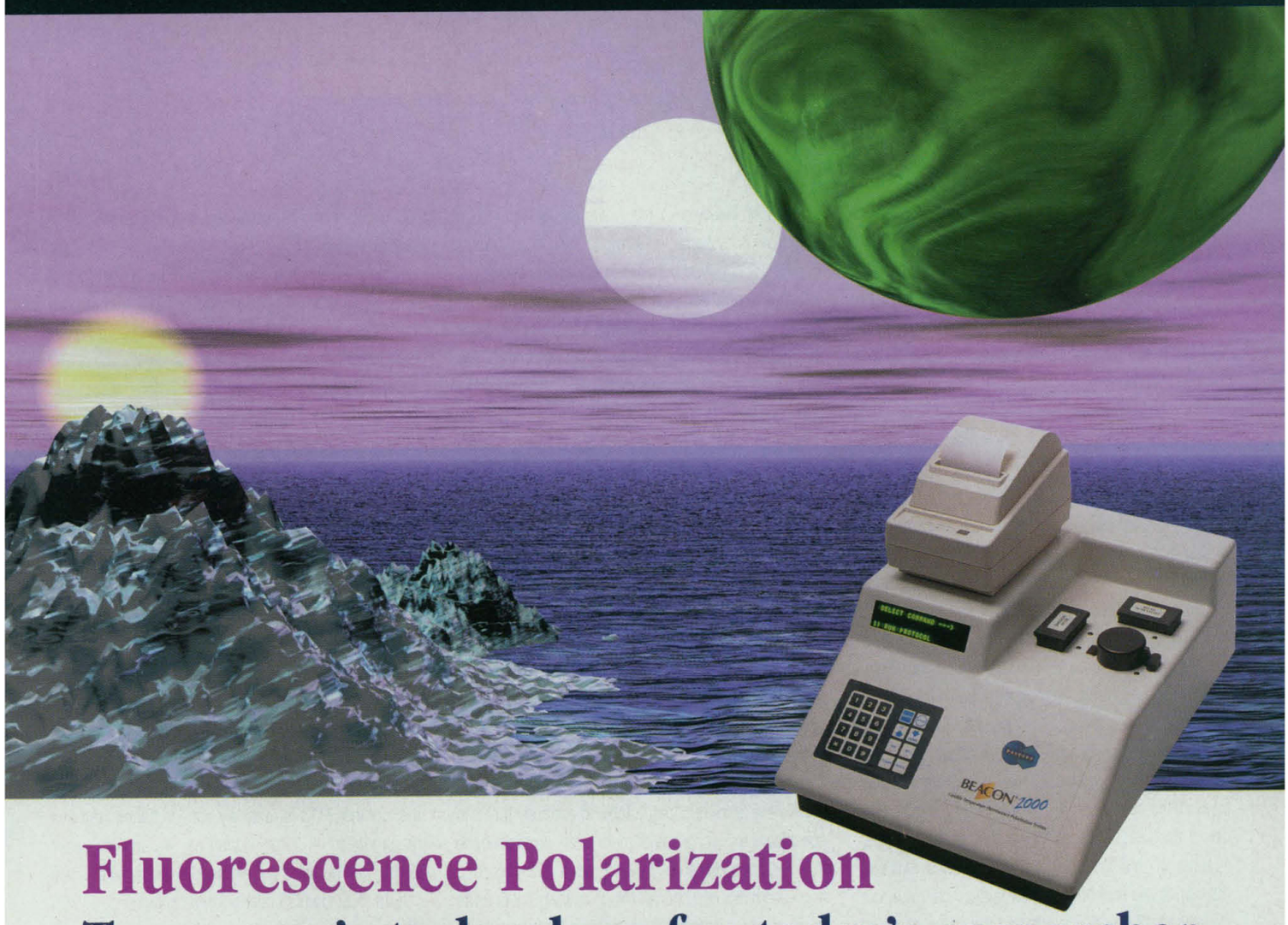
MDS Protana A/S, Staermosegaardsvej 16
DK-5230 Odense M, Denmark

Telephone: (+45) 63 15 20 30
Facsimile: (+45) 63 15 20 40

E-mail: protana@protana.com
Website: www.protana.com

Circle No. 46 on Readers' Service Card

The Future is Here



Fluorescence Polarization

Tomorrow's technology for today's researcher

PanVera offers a complete line of Fluorescence Polarization products including instruments, assays and proteins.

Replace gel shifts, ELISAs, Western blots, filter binding

Measure equilibrium binding, enzyme activity, protein degradation, antibody affinity

Benefit from real-time measurements that are nonradioactive, sensitive, and homogeneous

The Beacon® 2000 Family
Technology for the the New Age

PANVERA

Circle No. 55 on Readers' Service Card

For more information,
call or visit our website.

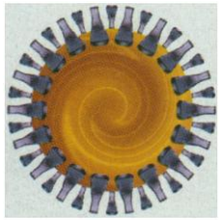
Beacon is a registered trademark of PanVera Corporation.

PanVera Corporation • 545 Science Dr., Madison WI 53711
Phone: 608.233.9450 • Fax: 608.233.3007
E-Mail: info@panvera.com

800.791.1400
In the USA and Canada

www.panvera.com

Lit.#L0043 Rev. 10/99



After determining that two proteins interact with one another, scientists ask "where?" In other words, which portions of the proteins do the interacting?

pliers of FP technology (the other being LJL Systems). "You're viewing molecular binding in solution; there's no separation of any kind. And you're viewing the binding in real time, without adding any artifacts. So assays are easy to perform. You put two binding partners in solution and watch them bind. And because you're doing it in real time, you can do kinetics."

The technique has taken time to catch on in life science research laboratories. The reason, speculates Bolger, is that "it's been in the realm of biophysicists, who have had to hand-build their own instruments. That's pretty intimidating for basic molecular biologists or chemists." Now, however, user-friendly instrumentation is available for basic research applications (from PanVera) and HTS (from LJL, Tecan, and BMG).

Another technology, surface plasmon resonance, also uses spectroscopy to measure changes in molecular size. The instrument monitors changes in refractive index that occur at a liquid/metal interface when biomolecules interact. "We measure mass, which can be easily translated into figures relevant to protein interactions," explains Ulf Jonsson, chief scientific officer of BiaCore, a Swedish firm that is the principal supplier of this technology. "Since surface plasmon resonance is a real-time technology, you can measure everything. We have not reached the stage at which the technology is available in every lab studying protein-protein interactions. But that's a matter of broadening scientists' awareness of this technology."

Placing the Contacts

After determining that two proteins interact with one another, scientists ask "where?" In other words, which portions of the proteins do the interacting? Several techniques can help to answer that question.

The simplest and most direct method is footprinting. This approach seeks to determine what portion of one protein is covered or protected by another protein in an interaction. "You tag a protein of interest, and apply some way of modifying or cleaving the proteins; then you observe the interactions by comparing the labeling or cleaving in the presence or absence of potential interactions," explains Heyduk. An interacting protein will cover up certain portions of the target protein and prevent either the chemical interaction or protease digestion from occurring at those locations. Analysis of the results, usually by gel electrophoresis, can show specifically where the two proteins touch one another.

Heyduk's research team and others have recently started to use chemical probes, such as hydroxyl radicals. These have the advantage of being smaller than protein probes. "We've seen very nice mapping of protein-protein and protein-DNA contacts, and even of small ligand-induced changes in protein conformation," says Heyduk.

Another approach to the question of where interaction takes place involves Western blotting, which was originally developed to analyze protein mixes using antibodies as probes. In the standard Western blot, a protein mix is separated on an electrophoresis gel and then transferred from the gel to a membrane. The membrane is treated with a labeled antibody that can specifically recognize one or more of the proteins in the mix. The antibody can be labeled with a radioisotope, a fluorescent tag, or a chemiluminescent tag. If it finds its target location, its location on the membrane shows up on film or a phosphor imager.

Far-Western blotting applies this concept to protein interactions by replacing the antibody with one of the partners of the interaction. Protein A, for example, might be separated on the gel and transferred to a membrane, while Protein B may be labeled and used as a probe. In recent experiments, Burgess' lab has found that if Protein A is fragmented in some way, the individual fragments can be probed with Protein B. That helps to locate the points of interaction more precisely.

Phage display is a novel genetic technique that offers great potential for the analysis of protein-protein interactions. "It's an information-tagging technology that allows you to identify rapidly what you pull out of an experiment," says Chris Noren of New England Biolabs, one of several producers of commercial phage display systems.

Phage display takes advantage of the genetic structure of the bacterial virus (or phage) M13, and the way that this virus builds its protein coat. M13 has a protein with which it decorates its surface as it grows. The developers of the phage display method discovered that they could insert foreign (that is, non-M13) proteins into the M13 protein, which would then carry them to the phage surface and display them, just as if they were M13 proteins, while the DNA encoding the displayed protein is contained within the phage virion. This allows rapid identification of selected sequences by DNA sequencing. Phage displaying a given polypeptide sequence can be specifically captured from vast pools of displayed sequences via an *in vitro* affinity interaction with an immobilized target specific for that sequence. Individual tight-binding ligand sequences can be identified from a pool of several billion displayed sequences in only a few days.

This efficient biological system is complemented by the fact that M13 is relatively easy to handle and can be produced in large quantities. In addition, says Noren, "the particles are extremely robust, so that you can do experiments under rigorous conditions — with detergents, in high and low temperatures, and with pH's between 2 and 12. This quality distinguishes the technology from *E. coli* cell surface systems. And because the phage is much smaller, you can have a much more complex library in a small volume." One final advantage, Noren adds, "is that M13 does not lyse the cell. That makes it easy to purify from the culture."

The Complete Picture

Many of the techniques used to examine points of interaction between proteins treat the proteins as if they were linear strings of amino acids. In fact, proteins are three-dimensional structures whose folding patterns are crucial to their activities. A complete analysis of how and where proteins interact must take proteins' three-dimensional structure into account.

continued ➢

Catch the Big One!

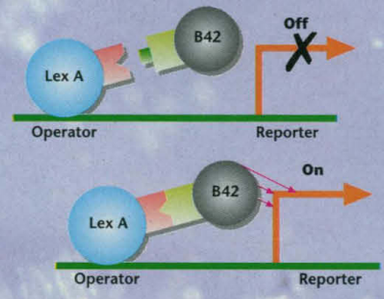
DupLEX-A™ Yeast Two-Hybrid System

HUNDREDS HAVE PUBLISHED USING THE PROVEN LEX-A SYSTEM!

More than 35 Libraries Available Now!

With DupLEX-A™, use your protein as "bait" to go "fishing" for a novel interacting protein. The advantages of our system over other methods of determining novel protein-protein interactions include:

- ability to obtain toxic interactions
- ability to use autoactivating baits
- libraries supplied as DNA and cells



Cancer Libraries

- 5 Different Prostate-Specific Libraries (incl. LNCaP)
- 8 Different Breast-Specific Libraries (incl. MCF7)

Item	Catalog #
Complete DupLEX-A YT-H System	DKT-100

Libraries sold separately

INTERNATIONAL DISTRIBUTORS

France, Clinisciences,
(tel) +33 1 42 53 14 53 (fax) +33 1 46 56 97 33
Germany and Benelux Countries, Eurogentec,
(tel) +32 4 366 0150 (fax) +32 4 365 5103
Italy,
(tel) +39 02 580134 50 (fax) +39 02 580134 38

For all other countries, call 301 340 3188

United Kingdom, Cambridge Bioscience,
(tel) +44 (1223) 316855 (fax) +44 (1223) 360732
Spain +93 404 52 08, Sweden +46 08 30 60 10
Switzerland +41 061 795 96 10

OriGene Technologies, Inc.

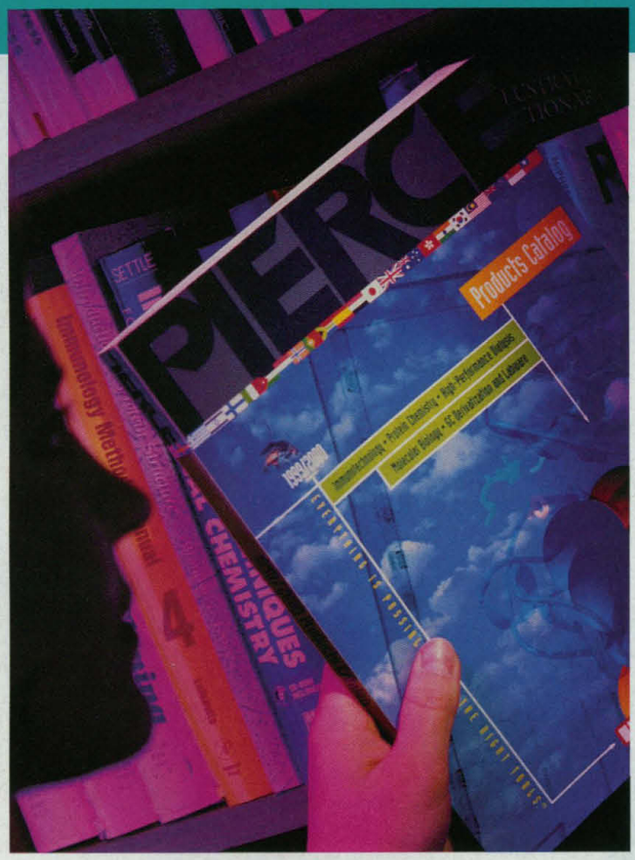
6 Taft Court, Suite 300
Rockville, Maryland 20850
To Order Call 1-888-267-4436
Phone: 301-340-3188
Fax: 301-340-9254
e-mail: custsupport@origene.com
Internet: http://www.origene.com

Circle No. 48 on Readers' Service Card

PIERCE

EVERYTHING IS POSSIBLE...WITH THE RIGHT TOOLS.®

Protein Chemistry



Do what other life scientists do when they need a protein cross-linking reagent ...

Reach for the Pierce Catalog.

It's no secret why they do. To the world, the Pierce Double-Agents™ bifunctional cross-linkers mean:

- More than 25 years of expertise in the synthesis and testing of bifunctional reagents
- An unsurpassed selection – choose from more than 80 reagents
- A firm commitment to quality and lot-to-lot reliability through ISO 9001 certification
- A proven ability to provide large-scale reagent quantities for critical manufacturing processes
- A knowledgeable, helpful Technical Assistance Team that's just a phone call, fax or e-mail away
- An expert staff of life scientists who continually bring new and innovative reagents and chemistries to your laboratories (more than 30 new reagents this year!)
- Excellent technical resources including the Double-Agents™ Cross-Linking Reagents Selection Guide and the best *how-to-use* product information available
- The only online Cross-Linking Agent Selection Guide (http://www.piercenet.com)

Call us for a free copy ...

Do what life scientists around the world do and request your 1999/2000 Pierce Catalog and Double-Agents™ Cross-Linking Reagents Selection Guide. They're all you need to find the proper reagent for your specific application.

Call 800-874-3723 for product information.
Outside the U.S., call 815-968-0747 for the name of your local distributor.
Circle No. 45 on Readers' Service Card

PIERCE

3747 N. Meridian Rd. • PO Box 117 • Rockford, IL 61105 U.S.A. • Tel: 815-968-0747 • Fax: 815-968-7316 • E-mail: TA@piercenet.com • Internet: http://www.piercenet.com

a PerBio Science Company

One approach uses fluorescence resonance energy transfer (FRET). When a fluorescent molecule is illuminated, it absorbs energy of a specific wavelength from the incoming light. Later, it releases that energy as light of a different wavelength. Significantly, the light emitted by some fluorescent molecules has exactly the right wavelength to be absorbed by other fluorescent molecules. When two such molecules are located close to one another, the energy emitted by Fluorophore 1 can be absorbed by Fluorophore 2, and re-emitted at Fluorophore 2's wavelength. The efficiency with which this process happens depends on the proximity of 1 and 2. So placing Fluorophores 1 and 2 on two different proteins in a complex permits a researcher to measure how far apart those proteins are, by examining how well energy flows between the two fluorophores.

Complete understanding of protein locations requires more than that, however: Enter x-ray crystallography, which has improved markedly in detection and computational techniques since it debuted more than 80 years ago. Each crystal structure elucidated in this way pretty much tells the story about "who's touching whom, how, and where." The when and why remain for the biochemists to reason out.

Advances in computational technology have also stimulated growth in the area of computer modeling of complex systems. Working with existing (and expanding) databanks, theoretical biologists have become more and more adept at developing useful pictures of how biological structures might exist and operate in complex cellular environments. This kind of work is, of course, done without any wet lab experimentation. The biological systems under study are developed, modeled and tested entirely on the computer. With more powerful computing capability, this area of research will become increasingly influential in the years to come.

Also coming along the pike is the application of microarrays to protein-protein interactions. "Within the next two to five years, we'll see protein arrays take off," predicts John Tonkinson, senior scientist at Schleicher & Schuell. "Our latest technology is a nitrocellulose-based polymer slide for arrays that is compatible with fluorescence-based detection systems. The surface is thinner and more durable that traditional membranes, and produces a better matrix than glass for high-density arraying of biomolecules, including proteins."

Plainly, there's strength in numbers and variety for exploring protein-protein interactions. No single methodology will reveal all the secrets. "There's value in attacking the problem in different ways," says Heyduk. "The interpretation of the results might be very much enhanced by taking advantage of the different approaches."

Where will the investigations of protein-protein interactions lead? "Eventually, we will have to understand what these proteins do and how they do it," says Heyduk. "That will involve an understanding of the consequences of the interactions."

Peter Gwynne is a freelance science writer based on Cape Cod, Massachusetts. Guy Page is managing director of Ferguson Forth Page, a consulting firm in Madison, Wisconsin.

PROTEIN + PROTEIN List of Resources

Advertisers

BiaCore . . . . . www.biacore.com
Bio101 . . . . . www.bio101.com
Bio-Rad Laboratories . . . . . www.bio-rad.com
Invitrogen . . . . . www.invitrogen.com
Novagen . . . . . www.novagen.com
Origene Technologies . . . . . www.origene.com
Pan Vera . . . . . www.panvera.com
Pierce Chemical . . . . . www.piercenet.com
Protana . . . . . www.protana.com

Chemical Cross-linking and Tagging

Amersham Pharmacia Biotech . . . . www.apbiotech.com
Bio-Rad Laboratories . . . . . www.bio-rad.com
Invitrogen/Novex . . . . . www.invitrogen.com
JT Baker . . . . . www.jtbaker.com
Molecular Probes . . . . . www.probes.com
Pierce Chemical . . . . . www.piercenet.com
Schleicher & Schuell . . . . . www.s-and-s.com
Sigma-Aldrich . . . . . www.sigma-aldrich.com

Two Hybrid Systems

BD/CLONTECH . . . . . www.clontech.com
Invitrogen/Novex . . . . . www.invitrogen.com
Origene . . . . . www.origene.com

Physical Systems

BiaCore . . . . . www.biacore.com
PanVera . . . . . www.panvera.com
LJL Biosystems . . . . . www.ljlbio.com

Phage Display

Display Systems Biotech . . . www.asiaonline.net.hk/~twcbio
New England Biolabs . . . . . www.neb.com
Novagen . . . . . www.novagen.com

Note: Readers can find out more about the companies listed by accessing their sites on the World Wide Web (WWW). If the listed company does not have a site on the WWW, or if it is under construction, we have substituted that company's main phone number. Every effort has been made to ensure the accuracy of this information.

The companies in this article were selected at random. Their inclusion in this article does not indicate endorsement by either AAAS or *Science*, nor is it meant to imply that their products or services are superior to those of other companies.

Science
www.scienceonline.org

Classified Advertising

To obtain information on rates, deadlines, editorial features, and bonus distribution schedules, call our sales office or visit *Science* Careers at www.scienceonline.org and click on "How to Advertise." All advertising is subject to publisher's approval.

UNITED STATES

Display Classified Advertising

Bren Peters
Tel: 202-326-6541
Fax: 202-289-6742
Kristin Westapher
Tel: 202-326-6555
E-mail: science_displayads@aaas.org

Line Classified Advertising

Christina Geiger
Tel: 202-326-6532
Fax: 202-289-6742
Kathleen Clark
Tel: 202-326-6722
E-mail: science_classifieds@aaas.org

Line ads are not agency commissionable. Ads submitted should not include any bold, italicized, or abbreviated words. *Science* will edit and typeset ads according to *Science* style requirements. *Science* cannot provide proofs of typeset line ads. *Science* will provide an estimated cost of line ads at time of placement. This is an approximate cost only. Please provide contact name, telephone, billing information, and purchase order numbers with your order.

Online Classified Advertising

Beth Dwyer
Tel: 202-326-6534
Fax: 202-289-6742
E-mail: science_internet@aaas.org

Every employment ad placed in *Science* will be featured in our job database online for 4 weeks. Call to find out how to link to thousands of additional job seekers online with *Science* Professional Network.

www.scienceonline.org

Ad Materials: Send to: *Science* Classified Advertising, 1200 New York Avenue, NW, Room 911, Washington, DC 20005

EUROPE

Line, Display, and Online Classified Advertising

Deborah Cummings
Tel: +44 (0) 1223 326 500
Fax: +44 (0) 1223 326 532
E-mail: european_ads@science-int.co.uk

Ad Materials: Send to: Advertising Dept., Bateman House, 82-88 Hills Road, Cambridge CB2 1 LQ, United Kingdom

Discounts: A 3% cash discount is granted to all prepaid ads.
Credit Cards: *Science* accepts American Express, MasterCard, and VISA. Discount does not apply to credit cards.
Cancellations: Deadline for cancellation is Tuesday, 10 days prior to issue date.

To **Subscribe** to *Science* call:
202-326-6417 or 1-800-731-4939

POSITIONS OPEN

SENIOR FACULTY POSITION (Genetics/Genomics), Sigfried and Janet Weis Center for Research, Henry Hood Research Program, Penn State College of Medicine. Outstanding scientists are sought for a faculty position in the Weis Center for Research located on the Danville Campus of the Pennsylvania State University College of Medicine. The center is adjacent to the Geisinger Medical Center, one of the two major teaching hospitals of the Penn State Geisinger Health System. The Center is a modern research facility that includes 65,000 square feet of laboratories, offices, animal facilities, and research conference areas. It is located in a pleasant semirural living environment with convenient access to the major metropolitan areas of New York and Baltimore. We are seeking candidates interested in leading an institution-wide program in Genetics/Genomics. The successful candidate will participate in the formulation of the new Department of Integrative Molecular Medicine and Genetics that is to be established in Penn State's College of Medicine, and is to be based primarily at the Danville Campus. We seek candidates with an oustanding record of research accomplishments in genetics. It is preferred that the candidate's areas of expertise complement existing strengths in cell and molecular biology. Substantial resources are available for start-up funds for the new faculty as well as access to core facilities of the department. Interested and qualified individuals are encouraged to send their curriculum vitae, statement of research and teaching interests, and the names, addresses, and telephone numbers of four people who can be contacted for references by September 1, 2000 to: **Mrs. Barbara Brown, Administrative Assistant, Sigfried and Janet Weis Center for Research (SFV), 100 North Academy Avenue, Danville, PA 17822-2601.** *Affirmative Action/Equal Opportunity Employer.*

MICROBIOLOGY FACULTY POSITION
ASSISTANT PROFESSOR

Carthage College invites applications from outstanding candidates for a tenure-track faculty position in the Department of Biology. Candidates should hold the Ph.D. by September 2000. Postdoctoral experience is desirable. The successful candidate will teach introductory biology, microbiology, immunology or virology, and advanced courses in their area of expertise. A strong commitment to undergraduate teaching in the liberal arts tradition and involvement in undergraduate student research is expected. Carthage is situated on the Lake Michigan shore, midway between Milwaukee and Chicago, with easy access to colleges and universities in northeastern Illinois and southeastern Wisconsin. Applicants should submit a curriculum vitae, statement of teaching philosophy and research interests, and three letters of recommendation to: **Professor Charlotte Chell, Chair, Division of the Natural Sciences, Carthage College, Kenosha, WI 54140.** Application deadline is January 1, 2000. *Women and minorities are encouraged to apply.*

CHAIR, DEPARTMENT OF DERMATOLOGY

The University of Pittsburgh School of Medicine seeks candidates for the Chair, Department of Dermatology. The Department includes 13 full-time faculty members, as well as research faculty members and volunteer faculty. Candidates must have an outstanding record of performance in academic dermatology, and demonstrated leadership abilities to direct major clinical, research, and training programs. In particular, the School seeks to develop an outstanding research effort to complement its superb clinical and teaching programs. Nominations and/or letters of interest from prospective candidates will be accepted until February 1 2000, and should include current curriculum vitae. Address correspondence to: **Chair of the Dermatology Search Committee, Mark L. Zeidel, M.D., Chair, Department of Medicine, University of Pittsburgh School of Medicine, Room 1218 Scaife Hall, 3550 Terrace Street, Pittsburgh, PA 15261.**

POSITIONS OPEN

The Department of Biology at Swarthmore College invites applications for two one-year faculty positions at the **ASSISTANT PROFESSOR** level, in the areas of neurobiology and evolutionary biology. Applicants should have a Ph.D., teaching experience, and a strong commitment to undergraduate education. All application materials should be received by January 21, 2000.

NEUROBIOLOGY: Teaching responsibilities will be an undergraduate course in neurobiology with weekly neurophysiology laboratories, a senior-level seminar in some area of neurobiology which also will include laboratory work, and participation in a team-taught introductory course in cellular and molecular biology. Applicants should submit a curriculum vitae, three letters of recommendation, and a statement of teaching and research interests to: **Dr. Kathleen Siwicki, Neurobiology Search, Department of Biology, Swarthmore College, Swarthmore, PA 19081-1390.**

EVOLUTIONARY BIOLOGY: Teaching responsibilities include a broadly-based, intermediate-level course in evolution with weekly laboratories, an advanced seminar with laboratory in some area within evolutionary biology, and participation in the Department's introductory biology sequence. Applicants should submit a curriculum vitae, three letters of recommendation, and a statement of teaching and research interests to: **Dr. Colin Purrington, Evolutionary Biology Search, Department of Biology, Swarthmore College, Swarthmore, PA 19081-1390.**

Swarthmore College is an Equal Opportunity Educator and Employer and specifically invites and encourages applications from women and minorities.

Education: The Woodrow Wilson School of Public and International Affairs at Princeton University is seeking candidates for a position as **ASSISTANT PROFESSOR, ASSOCIATE PROFESSOR** or **FULL PROFESSOR** of Science, Technology, Environment and Public Policy. Candidates must have demonstrated ability to illuminate public policy choices through analysis of scientific/engineering, as well as economic/political possibilities and constraints, and/or the application of social science tools to issues of scientific/engineering policy. Interest in and ability for leadership role in small but lively teaching and research program. Priority areas include: life sciences and biotechnology, environmental management and global change, information and communications, research and development, and national security. Send résumé, statement of research/teaching interests, three publications/pieces of written work, and names and addresses of three references as soon as possible. Consideration of applications begins December 1, 1999 and should be sent to: **Administrative Assistant to the Dean, STEP Search, Woodrow Wilson School of Public and International Affairs, Princeton University, Princeton, NJ 08544-1013.** *Princeton University is an Affirmative Action/Equal Opportunity Employer.*

NEUROSCIENTIST/ANATOMIST

Pikeville College School of Osteopathic Medicine seeks individual with expertise in neuroanatomy for position starting between January and July, 2000. Teaching responsibilities include Neuroscience (course director) and Gross Anatomy. Doctorate required; postdoctoral experience preferred. Review of applications begins December 1, 1999. Send curriculum vitae, statements of teaching philosophy and research interests, and names of three references to: **Search Committee, PCSOM, 214 Sycamore Street, Pikeville, KY 41501.**

UTAH STATE UNIVERSITY WORDMARK

Plant Stress Physiology tenure-track faculty position is available at Utah State University to conduct research, mentor students, and teach. Requires Ph.D. in related area. Review begins December 31, 1999. See **website: http://personnel.usu.edu** (2-143) for full description. *Affirmative Action/Equal Opportunity Employer.*

PHARMACOLOGIST

Chemopreventive Agent Development Research Group
Division of Cancer Prevention, National Cancer Institute, NIH

GS-0405-14; Vacancy Announcement #: NCI-99-2730

The Chemopreventive Agent Development Research Group, DCP, NCI plans, develops, and directs an extramural preclinical agent discovery, efficacy, and safety testing program and a clinical testing program for the chemoprevention of cancer, which can be defined as the use of natural or synthetic agents administered to prevent, inhibit, or reverse one or more stages of carcinogenesis. The Pharmacologist in the Chemopreventive Agent Development Research Group will be responsible for: (1) managing and directing pharmaceutical support contracts related to agent acquisition, synthesis, formulation, characterization, and supply of preclinical and clinical finished agents, (2) chemistry, manufacturing, and control issues related to Investigational New Drug applications to the FDA, (3) other preclinical and clinical agent development activities in his/her additional areas of professional competence, such as in the areas of preclinical toxicology and clinical phase 1 pharmacokinetics, and (4) liaison management with the pharmaceutical industry. Candidates for this position are required to have a Ph.D., Pharm.D., D.V.M., Sc.D. or equivalent training and general knowledge and experience in the field of pharmacology, medicinal chemistry, or pharmaceutical science and specific knowledge and experience in research in one or more areas of pharmacology, pharmaceutical science, regulatory affairs, toxicology, drug development, carcinogenesis, and/or other relevant scientific disciplines that included at least 30 semester hours in chemistry and physiology, and 12 semester hours in pharmacology. The salary range will be from $68,570 to $89,142.

To apply for this position, please address the following rating criteria: (1) Knowledge of pharmacology and the scientific disciplines appropriate for the position; (2) Ability to communicate orally and in writing; (3) Ability to plan and manage research programs involving complex administrative and scientific issues; (4) Ability to review and evaluate scientific studies related to program objectives; (5) Ability to interact productively with other scientists.

Please submit your application/resume to: NIH/National Cancer Institute, Human Resource Management & Consulting Branch, EPS, Suite 550, 6120 Executive Blvd., Rockville, MD 20852-7211. For further information regarding application procedures, you may call the staffing office at 301-402-2789. Applications must be postmarked no later than December 3, 1999.

NIH is an Equal Opportunity Employer. Applicants must be US Citizens.

VICE CHANCELLOR FOR RESEARCH

UCLA

Applications and nominations are invited for the position of Vice Chancellor for Research effective **July 1, 2000.**

The Vice Chancellor for Research will provide coordinated and full-time executive leadership for research at UCLA. The position will report to the Chancellor through the Executive Vice Chancellor and is expected to have responsibility for the following major areas:

- Campuswide research policy, planning, initiatives and coordination
- University-industry relations and technology transfer
- Research growth and investment strategies
- The welfare of human and animal research subjects
- Scientific integrity and the management of conflict of interest
- Reviews of organized research units and advice to Deans on their management

In pursuing those responsibilities, the Vice Chancellor for Research will work collaboratively with UCLA's provosts, deans, department chairs, faculty and Academic Senate, building on campus strengths, finding synergies, and supporting collaboration for the greater benefit of UCLA and individual academic units. The incumbent will work closely with the Vice Chancellor for Graduate Studies and Dean of the Graduate Division in coordinating areas of mutual relevance. Also, the incumbent will work closely with the Associate Vice Chancellor for Information Technology in developing plans and policies related to research computing. The Vice Chancellor for Research will be a member of the Chancellor's Executive Committee, and will have a close working relationship to Sponsored Research and Extramural Fund Management.

The Vice Chancellor for Research will be responsible for representing the university to external agencies, serving as a legislative liaison, and promoting international and cooperative research arrangements with governments, other universities and private industry. The Vice Chancellor for Research must be cognizant of all State and Federal regulations and compliance requirements on animal, human, and biological safety, conflict of interest, scientific ethics, and patent and other intellectual property matters.

Candidates should have demonstrated leadership and experience in academic administration in a research university setting; a good understanding of federal and corporate funding opportunities; a distinguished personal record of funded research; demonstrated experience in the development of collaborative research ventures; and sensitivity to the research needs of all disciplines represented at major research universities.

Candidates must have the academic credentials to qualify for a tenured appointment at UCLA. Salary will be commensurate with background and experience.

For additional information, please go to: **http://www.apo.ucla.edu/apoweb/vc-research/.**

To be ensured full consideration, nominations and applications should be sent by **December 31, 1999 to:**

VC Research Search Committee
c/o Ms. Rene Dennis
Office of the Chancellor
University of California
3109 Murphy Hall
Los Angeles, CA 90095-1407
Facsimile: (310) 206-9643
E-mail: rdennis@conet.ucla.edu

Please review the Position Description as well.

UCLA is an equal opportunity employer

US Environmental Protection Agency
Office of Research and Development

EPA is seeking a highly qualified scientific leader for the position of Deputy Assistant Administrator for Science, Office of Research and Development, Washington, D.C. The successful candidate for this position will coordinate and provide oversight to a broad spectrum of environmental science issues involving human health and ecology. The candidate will also lead efforts on both long-term and annual research planning to meet the needs of the EPA Program and Regional offices, Congress, and the public.

The Office of Research and Development conducts an Agency-wide integrated program of research and development relevant to pollution sources, pollution prevention and control approaches, transport and fate processes, health and ecological effects, measurement and monitoring, and risk assessment. The Office rigorously disseminates its scientific and technical knowledge and, upon request, provides technical reviews, expert consultations, technical assistance, and advice to environmental decision makers in federal, state, local, and international governments.

ORD implements its activities through its offices in EPA Headquarters, Washington, D.C., and its national centers and laboratories.

To meet the requirements of this position, applicants must have a bachelor's degree (or equivalent) in one of the following: General Biological Sciences or General Physical Sciences. Preferred candidates would possess recognized scientific expertise as evidenced by multiple publications in peer-reviewed literature and invitations to participate in national and international meetings/ panels. Candidates must also have competence and substantive specialized (scientific, policy, administrative or managerial) experience in a type of work or a combination of functions directly related to the position. In addition, applicants must meet the executive and technical qualifications described in the vacancy announcement for this position. Call or write to: **USEPA OARM/ OHROS/SES Human Resources Staff (3650), 401 M Street, S.W., Washington, D.C. 20460. The telephone number is (202) 260-6374. Request announcement number EPA-00-SES-ORD-6167.** You may download a full text announcement via Internet at www.usajobs.opm.gov "OPM control number IH3466".

U.S. Citizenship Required

Applications must be postmarked by the closing date January 7, 2000

EPA is an Equal Opportunity Employer

Faculty Positions
Division of Clinical Pharmacology & Therapeutics,
Department of Pediatrics
University of Pennsylvania
School of Medicine

The Division of Clinical Pharmacology & Therapeutics invites applications for two Research Track faculty positions at the Assistant or Associate Professor level. Applicants must have a Ph.D. or a Pharm.D. with advanced education and training. One position is for a pharmacokineticist with a research interest in population modeling. The second position is for a pharmacogeneticist with a research interest in drug metabolizing enzymes of infants and children. Competitive salary and startup packages are available. Rank will be determined by experience and qualifications.

Send CV, a brief description of research accomplishments, future research and career goals, and the names of three references to:

Peter C. Adamson, M.D.
Division of Clinical Pharmacology, Children's Hospital of Philadelphia. ARC907B, 3516 Civic Center Boulevard
Philadelphia, PA 19104-4318

The University of Pennsylvania is an EO/AA employer. Women and minorities are encouraged to apply.

Virology Faculty Position
Department of Microbiology and Immunology
The University of Texas Medical Branch at Galveston
http://microbiology.utmb.edu

We invite applications for a tenure-track position at the Asst./Assoc. Professor level. We seek an individual capable of independent, innovative research focusing on molecular aspects of viral replication and/or pathogenesis. We offer a competitive start-up package, excellent laboratory space, and access to a BSL-4 facility expected to be operational by 2002. UTMB provides an interactive environment with opportunities for collaborations with numerous faculty sharing interests in virology and infectious diseases, including members of the Sealy Center for Structural Biology and the WHO Collaborating Center for Tropical Diseases. The review process will begin January 1, 2000 and will continue until the position is filled. Please send a curriculum vitae, a summary of past accomplishments, future research plans, and the names, addresses, and telephone numbers of three references to:

Dr. Shinji Makino, Chair
Virology Search Committee
Department of Microbiology and Immunology
The University of Texas Medical Branch
Galveston, TX 77555-1019

UTMB hires only persons authorized to work in the United States; UTMB is an AAIEO Employer. AFFDIV

St. Jude Children's Research Hospital
ALSAC • Danny Thomas, Founder

POSTDOCTORAL POSITION
DNA Topoisomerase I

A postdoctoral position is available to study cellular responses to DNA damage induced by DNA topoisomerase I-targeted antitumor agents, such as camptothecin. These NIH supported studies focus on genetic and biochemical analyses of alterations in DNA topoisomerase I function and the role of DNA damage checkpoints and repair in regulating cell sensitivity to DNA lesions induced by this enzyme. Candidates with a recent Ph.D. or M.D. degree interested in using yeast genetics or in developing transgenic mouse models to understand the cytotoxic mechanism of antineoplastic drugs that poison DNA topoisomerase I are encouraged to apply.

St. Jude Children's Research Hospital (Danny Thomas Founder) is an outstanding biomedical research center and provides an exceptional training environment for scientific endeavors and career development. Stipends and benefits are highly competitive.

Applicants should submit a letter of interest, curriculum vitae and names of three references to: **Dr. Mary-Ann Bjornsti, Pharmaceutical Sciences, St. Jude Children's Research Hospital, 332 N. Lauderdale, Memphis TN 38105. E-mail: Mary-Ann.Bjornsti@stjude.org.** An Equal Opportunity/ Affirmative Action Employer.

THE 2000 LOUISA GROSS HORWITZ PRIZE

The Louisa Gross Horwitz Prize was established under the will of the late S. Gross Horwitz through a bequest to Columbia University and is named to honor the donor's mother. Louisa Gross Horwitz was the daughter of Dr. Samuel David Gross (1805–1889), a prominent surgeon of Philadelphia and author of the outstanding *Systems of Surgery*, who served as president of the American Medical Association.

Each year since its inception in 1967, the Louisa Gross Horwitz Prize has been awarded by Columbia University for outstanding basic research in the fields of Biology or Biochemistry. The purpose of this award is to honor a scientific investigator, or group of investigators, whose contributions to knowledge in either of these fields is deemed worthy of special recognition.

The prize consists of an honorarium and a citation, which are awarded at a special presentation event. Unless otherwise recommended by the Prize Committee, the prize is awarded annually. The 1999 awardees were Pierre Chambron, M.D., Director, Institute de Génétique et de Biologie Moleculaire et Cellulaire, Université L. Pasteur, and Professor at the College de France Illkirch-Strasboug, France; Rober Roeder, Ph.D., Professor and Head, Laboratory of Biochemistry and Molecular Biology, The Rockefeller University; Robert Tijan, Ph.D., Investigator, Howard Hughes Medical Institute, and Professor, Molecular and Cell Biology, University of California at Berkeley.

QUALIFICATIONS FOR THE AWARD

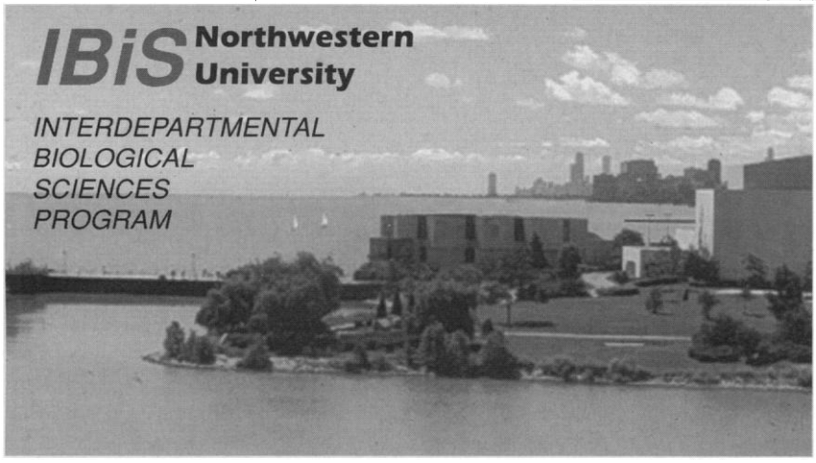
The Prize Committee recognizes no geographical limitations. The prize may be awarded to an individual or a group. When the prize is awarded to a group, the honorarium will be divided among the recipients, but each member will receive a citation. Preference will be given to work done in the recent past.

Nominations for prospective recipients should be given to the Chairman of the Louisa Gross Horwitz Prize Committee, Dr. Carol Prives. Nomination letters should include:

1. A summary, preferably less than 500 words, of the research on which this nomination is based.
2. A summary, preferably less than 500 words, of the significance of this research in the fields of biology or biochemistry.
3. A brief biographical sketch of the nominee, including positions held and awards received by the nominee.
4. A listing of up to ten of the nominee's most significant publications relating to the research noted under item 1.
5. A copy of the nominee's curriculum vitae.

An original and twelve (12) copies of each nomination should be sent to: Dr. Carol Prives, Chairman of the Louisa Gross Horwitz Prize Committee, Office of the Vice President for Health Sciences and Dean of the Faculty of Medicine, Columbia University, 630 West 168th Street, New York, NY 10032.

Deadline for the receipt of nominations is January 14, 2000.



Interdepartmental Biological Sciences (IBiS) is a new and innovative PhD program designed to train students to become independent, creative research scientists, educators and professionals.

The interdisciplinary IBiS program encourages students to cross departmental boundaries in choosing courses and research projects in any one or more of the following areas: biochemistry and biophysics, biotechnology, cell and molecular biology, genetics and developmental biology, reproductive biology, and systems biology.

The program brings together distinguished faculty from six departments in Northwestern University's (NU) Judd A. and Marjorie Weinberg College of Arts and Sciences and the Robert R. McCormick School of Engineering and Applied Science, and from the Evanston Northwestern Hospital Research Institute (ENHRI). IBiS faculty have cutting-edge research expertise in biochemistry, bioinorganic chemistry, biophysics, cell biology, developmental biology, genetics, immunology, molecular biology, reproductive biology, structural biology, virology, neurobiology, physiology, biomedical, chemical and civil engineering, biology of cancer and disease, and molecular pharmacology. The program is supported by the extensive resources and state-of-the-art facilities and instrumentation available at NU and ENHRI.

Outstanding students from diverse backgrounds including, but not limited to, the biological, chemical or physical sciences are encouraged to apply. All students accepted to the program receive a competitive stipend.

The IBiS program is centered at the college campus of Northwestern University located on the shore of Lake Michigan in Evanston approximately ten miles north of downtown Chicago. For further information about the program or to request application materials, visit or contact:

http://x.biochem.nwu.edu/ibisprogram
e-mail: ibis@nwu.edu
tel: 1-800-545-1761 or 1-847-467-1826
fax: 1-847-467-1380
Interdepartmental
Biological Sciences Program
Northwestern University
2-104 Hogan Hall
2153 North Campus Drive
Evanston, Illinois 60208-3500 USA

NU is an EO/AA employer

VAN ANDEL RESEARCH INSTITUTE

Postdoctoral Fellowships

The Van Andel Research Institute is an independent organization dedicated to becoming one of the world's pre-eminent private medical research institutes by building on the extraordinary discoveries in molecular biology and genetics and recruiting world-class investigators. Visit **www.vai.org** to learn more.

George F. Vande Woude, Ph.D. -- Research Director
Molecular basis of cancer.

Principal Investigators:

Nick Duesbery, Ph.D. -- Developmental Cell Biology
Cellular aspects of oogenesis and meiosis vertebrate model organisms.

Han-Mo Koo, Ph.D. -- Cancer Pharmacogenetics
Molecular mechanisms underlying chemosensitivity of tumor cells and the development of novel therapeutic strategies.

Cindy Miranti, Ph.D. -- Integrin Signaling and Tumorigenesis
Integrin signalling and function in tumorigenesis.

Bin Tean Teh, M.D., Ph.D. -- Cancer Genetics
Identification and investigation of the functions of cancer-related genes in endocrine tumors and nasopharyngeal cancer.

Craig Webb, Ph.D. -- Tumor Metastasis and Angiogenesis
Molecular mechanisms of tumor metastasis and angiogenesis in the identification of novel targets for therapeutic intervention.

Michael Weinreich, Ph.D. -- Chromosome Replication
Cell cycle control of DNA replication.

Bart Williams, Ph.D. -- Cell Signaling and Carcinogenesis
The Wnt signaling pathway in carcinogenesis and the development and utilization of mouse model systems to study tumor initiation and progression.

Nian Zhang, Ph.D. -- Mammalian Developmental Genetics
Pattern formation during mammalian embryo development and germ cell development.

Opportunities in our Special Programs:

Brian Cao, Ph.D. -- Monoclonal Antibody Production
Production, characterization, engineering and humanization of monoclonal antibodies for cancer research, developmental biology and clinical studies.

Brian Haab, Ph.D. -- Microarray Technology
Protein and DNA microarray technology, discovery of novel diagnostic protein and DNA markers in cancer.

Jim Resau, Ph.D. -- Analytical, Cellular & Molecular Microscopy
Analytical and molecular quantification of imagery produced using confocal, multiphoton and electron microscopy.

Fellowships are awarded on an equal opportunity basis to recent recipients of a Ph.D., M.D. or an equivalent degree in the biological or biochemical sciences. Appointments are made for one year, renewable annually with supervisor's approval, for a total of three years.

Annual stipends generally start at $32,000 depending upon experience.

Applications are accepted at any time during the calendar year for open positions. Interested candidates are encouraged to apply well in advance of their availability date.

To apply, send a letter describing your research interests, curriculum vitae, and the names and addresses of three references to:

Investigator's Name of Interest
ATTENTION: Human Resources Department
The Van Andel Research Institute
201 Monroe N.W. Suite 400
Grand Rapids, Michigan 49503

Website: www.vai.org
Equal Employment Opportunity

St. Jude Children's Research Hospital
ALSAC • Danny Thomas, Founder

POSTDOCTORAL POSITION
Apoptosis in yeast

A postdoctoral position is available to investigate cellular factors regulating the maturation and activity of human apoptotic caspases in yeast (J. Biol. Chem. 1999. 274:3189). The research focuses on utilizing this genetically tractable system to identify mammalian and yeast gene products essential for regulating the proteolytic cascade triggered by death receptors and antitumor agents. Candidates with a recent Ph.D. or M.D. degree, and a strong background in molecular biology or yeast genetics are encouraged to apply.

St. Jude Children's Research Hospital provides exceptional resources and an outstanding training environment for career development. Stipends and benefits are highly competitive.

Applicants should submit a letter of interest, curriculum vitae and names of three references to: **Dr. Mary-Ann Bjornsti, Pharmaceutical Sciences, St. Jude Children's Research Hospital, 332 N. Lauderdale, Memphis TN 38105. E-mail: Mary-Ann.Bjornsti@stjude.org** An Equal Opportunity/Affirmative Action Employer.

Merck Research Laboratories, a world leader in biological and pharmaceutical research, is currently seeking to expand efforts in our Cancer Research Department. We are located in **West Point, PA** (only 25 miles NW of Philadelphia).

Ph.D. SCIENTISTS

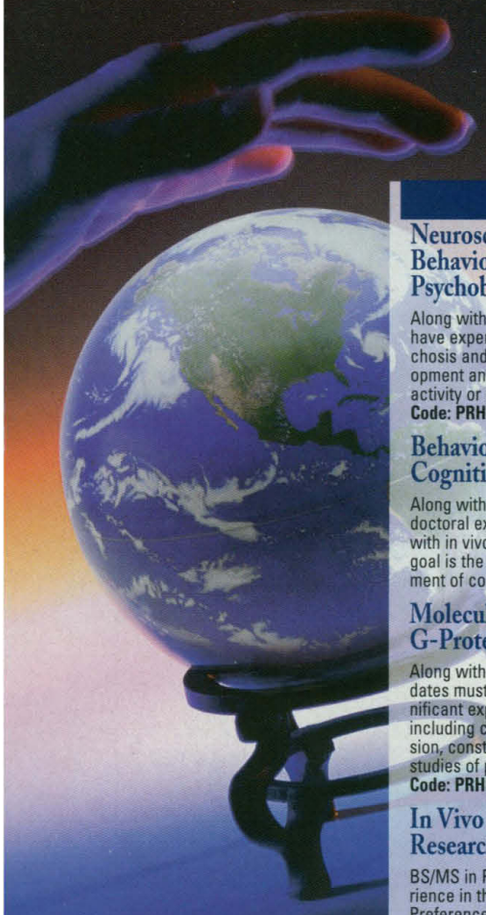
Several doctoral-level positions are available. These positions all require a Ph.D. or equivalent in Biology, Biochemistry, or a related field. A minimum of 2 years' postdoctoral experience is desirable. The first position is for a **Biochemist** with a working knowledge of modern molecular biology techniques. The second position is available for a **Molecular/Cell Biologist** with a background in the area of cancer/tumor biology. The third position is available for a **Cell Biologist** with experience in small animal techniques; proficiency in molecular biology or biochemistry and a working knowledge of molecular oncology are desirable.

All candidates must be able to work well in a team environment. Good communication skills and computer literacy are also required.

We offer excellent salaries, benefits programs, and opportunities for professional growth at our modern research facilities. To be considered, please send your curriculum vitae with a cover letter and the names of 3 references to: **Merck Research Laboratories, Cancer Research Department, Ad# JG/B-208, WP16-101, P.O. Box 4, West Point, PA 19486.** Only candidates considered for interviews will receive responses. We are an Equal Opportunity Employer, M/F/D/V.

1999 FORTUNE America's Most Admired Companies

www.merck.com
MERCK



Bristol-Myers Squibb

Pharmaceutical Research Institute

Our work touches many lives.

The innovative R&D work we do at Bristol-Myers Squibb Pharmaceutical Research Institute enhances the lives of people everywhere under the stars. Your contribution could make all the difference in the world.

Bristol-Myers Squibb uses resume scanning technology. Please submit resumes, including Code #, to appropriate address. Resumes should be printed on plain white bond paper, using standard type and fonts (no italics, graphics or staples please).

www.bms.com

Equal Opportunity Employer, M/F/D/V

Wallingford, Connecticut

Neuroscience Drug Discovery Group Behavioral Pharmacologist Psychobiology, Ph.D.

Along with a Ph.D. in Behavioral Neurosciences, candidates should have experience in in vivo models of affective diseases and psychosis and 2-3 years relevant postdoctoral experience in the development and performance of in vivo models that predict clinical activity or novel therapeutics in depression, anxiety and psychosis. **Code: PRHD141A**

Behavioral Pharmacologist Cognition, Ph.D.

Along with a Ph.D., candidates must have 2-3 years relevant postdoctoral experience in Behavioral Neurosciences and experience with in vivo models of cognition. Join a multidisciplinary team whose goal is the discovery and development of novel agents for the treatment of cognitive deficits. **Code: PRHD141B**

Molecular Neurobiologist G-Protein Coupled Receptors, Ph.D.

Along with a Ph.D. and two years postdoctoral experience, candidates must have experience with G-protein coupled receptors, significant experience with modern molecular biological techniques including construction of cDNA libraries, analysis of gene expression, construction of heterologous expression systems, functional studies of protein activity, and analysis of genomic information. **Code: PRHD141C**

In Vivo Physiologist/Pharmacologist Research Associates, BS/MS

BS/MS in Physiology or Pharmacology with 2-3 years relevant experience in the development and performance of in vivo techniques. Preference will be given to candidates with experience using rodent models of Stroke. **Code: PRRH141NLA**

Analytical Research & Development Senior Research Investigator, Ph.D. Separation Science

Along with a Ph.D. and extensive experience in a GLP environment and with HPLC method development, candidates should be able to act as a departmental resource and interdepartmental contact for the separation sciences. This is a multidisciplinary problem-solving environment, developing, locking-in and utilizing HPLC separation methods for drug development support. Experience with capillary electrophoresis/mass spectrometry (CE/MS) desirable. **Code: PR141MA5394AA**

Research Investigator, Ph.D. Structural Characterization

Along with a Ph.D. and extensive LC/MS/MS experience, candidates should have strong structure elucidation skills applied to the characterization of pharmaceutical molecules. This is a multidisciplinary problem-solving environment, applying liquid chromatography/mass spectrometry (LC/MS) techniques for structure elucidation support of drug development activities and the structural profiling of lead compounds. Experience with fast separation techniques and UNIX systems desirable. **Code: PR141MA5393AA**

In Vivo Genitourinary Drug Discovery Physiologist/Pharmacologist

Ph.D. in Physiology or Pharmacology with 2-3 years relevant Postdoctoral experience in the development and performance of in situ/in vivo techniques, preferably with a strong emphasis in urogenital models. **Code: PRRH141NLB**

BS/MS in Physiology or Pharmacology with 2-3 years relevant experience with in vivo techniques. Preference will be given to candidates with experience in models of urogenital function. **Code: PRRH141NLC**

New Brunswick, New Jersey

Biopharmaceutics Research Investigator, Ph.D.

Along with a Ph.D. in Pharmaceutical Chemistry/Analytical Chemistry and 2+ years pharmaceutical industry experience in a pre-formulation/formulation environment, candidates should be knowledgeable in the physiochemical properties of new drug entities and their relation to the drug's ultimate in vivo disposition. Experience with physiochemical characterization and formulation development is required. **Code: PRRG141MP**

Clinical Supplies Associate

Responsibilities include preparing documentation to support clinical protocols, developing/maintaining central documentation retention system, and preparing purchase approval forms and monthly budget reports. Along with a Bachelor's degree and 5 years experience, candidates should have PC, Microsoft Word, Excel Project and SAP skills and a basic knowledge of the clinical supplies process. Knowledge of budget and financial concepts desired. **Code: PRRG141PC**

Princeton, New Jersey

Cell Biologist, Ph.D.

Along with a Ph.D. in Cell Biology, Cell Physiology, or Biochemistry and up to 5 years postdoctoral or industry experience, candidates should have expertise in mammalian cell culture techniques and a broad knowledge of mammalian cell physiology, cell cycle, apoptosis, and protein trafficking. In addition, experience in tissue culture media formulation and protein analytical techniques and FACS, and familiarity with heterologous gene expression systems and molecular biology techniques desired. **Code: PRMS141SG**

Process Development & Optimization

Lead the development effort for scale-up of production processes for protein therapeutics. Along with a Ph.D. degree, candidates should have 10+ years pharmaceutical industry or biotechnology process development experience and proven team leadership skills. At least 5 years management experience in cell culture and/or fermentation development is required. **Code: PRMS141MO**

Cardiovascular Clinical Director/ Associate Director, M.D.

Our ideal candidates will have solid cardiovascular experience and a thorough understanding of clinical development through experience in either an academic or pharmaceutical industry setting. **Code: RRN141HP**

Dermatology Clinical Director/ Associate Director, M.D.

Our ideal candidate will have solid dermatology experience and a thorough understanding of clinical development through experience in an academic pharmaceutical industry or private practice setting. Solid clinical training and clinical trial experience required. **Code: PRRN141MS**

Clinical Research Scientist

PharmD or MS with 3+ years experience in clinical pharmacology/early clinical drug development. Excellent computer and scientific writing skills preferred. You will design, implement, and conduct clinical pharmacology studies for investigational new drugs within a variety of therapeutic areas. Manage and monitor multiple trials and draft reports. **Code: PRRR141SD**

In Vivo Immunologist

Ph.D. with 5-10 years postdoctoral experience in in vivo models of immunology and inflammation. Solid understanding of immunological principles involved in pathogenisis of autoimmune disease and transplantation. Supervisory experience required. Background in pharmaceutical industry/drug discovery desired. **Code: PRSM141AA**

For Wallingford positions, send resumes to:
Bristol-Myers Squibb Company
Pharmaceutical Research Institute
P.O. Box 5101, 5 Research Parkway
Wallingford, CT 06492-7661
FAX: 203-677-7762

For Princeton and New Brunswick positions, send resumes to:
Bristol-Myers Squibb Company
Pharmaceutical Research Institute
P.O. Box 4000
Princeton, NJ 08543-4000
FAX: 609-581-8841

Research Scientist

AMGEN, a world leading biopharmaceutical company, is seeking a highly motivated enzymologist. The candidate will play a leadership role within Protein Chemistry group in developing biochemical assays that are amenable to high throughput screening.

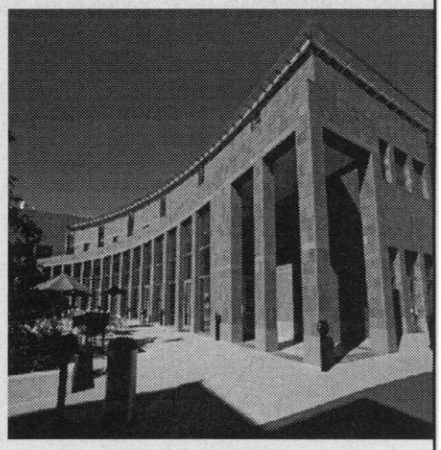
Responsibilities include: coordination of target assay transfer from the discovery biology groups to HTS; identification, selection, and implementation of target appropriate assay readout technologies, reagents, and strategies. A broad understanding of enzymology, reaction kinetics, modern screening and automation technologies, and a demonstrated track record of successful assay development are required.

The qualified candidate must have a Ph.D. in Biochemistry or a related discipline, with 1-5 years pharmaceutical industry experience. Preferred requirements include: screening assay development and/or protein purification experience, specifically in the areas of Neurosciences, Oncology, Metabolic Disorders or Immunology.

Amgen's Thousand Oaks location positions you within easy access of everything from sandy beaches to snow-capped mountains, as well as the cosmopolitan excitement of Los Angeles. Yet you'll be far enough removed so your family can enjoy quiet residential living in a community that's rated among the safest in America.

We offer a highly competitive compensation and benefits package that includes a retirement and savings plan, an on-site fitness center, and three weeks vacation. Please send your resume to: **Amgen Staffing, Ad Code: 445, P.O. Box 2569, Thousand Oaks, CA 91319-2569,** or e-mail in ASCII text, Attn: Ad Code 445, to **jobs@amgen.com** EEO/AA Employer M/F/D/V.

Visit our website at **www.amgen.com**



AMGEN®

Assistant Professor
EVOLUTIONARY PHYSIOLOGY
in the
Department of Biological Sciences
Simon Fraser University

The Department of Biological Sciences is seeking a tenure track faculty member in the area of EVOLUTIONARY PHYSIOLOGY. The appointment will be made at the Assistant Professor level with the start date on or after September 1, 2000. We seek an integrative scientist who studies the evolutionary consequences of fundamental physiological processes in animals and the adaptive responses of such processes to selective pressures. Candidates whose research focuses on evolution of complex physiological systems, physiological approaches to life history theory, or the evolution of metabolism and energy allocation are preferred, but applications from strong candidates from other relevant fields will be considered.

The successful candidate will pursue a vigorous, externally funded research program that includes the training of graduate students. She or he will contribute to teaching at the undergraduate level, and develop and teach upper division undergraduate and graduate courses in their area of expertise.

A Ph.D. degree is required, and appropriate post-doctoral experience is preferred. Applicants should send, no later than January 31, 2000, a Curriculum Vitae, three representative reprints, a one-page summary of their research objectives, and three letters of reference to:

Dr. Norbert H. Haunerland, Chair
Department of Biological Sciences
Simon Fraser University
8888 University Blvd.
Burnaby, B.C. V5A 1S6
Canada
FAX: 604-291-4312

The department web page can be accessed via **http://www.biol.sfu.ca**. This advertisement is directed to Canadian citizens and permanent residents. This position is subject to final budgetary approval.

Simon Fraser University is committed to the principle of equity in employment and offers equal employment opportunities to qualified applicants.

University of Minnesota UMD Duluth

INSECT ECOLOGIST

The Department of Biology, University of Minnesota-Duluth (www.d.umn.edu/biology) seeks applications for a tenure-track **ASSISTANT PROFESSOR** or, under exceptional circumstances, **ASSOCIATE PROFESSOR** (non-tenured) in Insect Ecology. Successful candidates will develop a well-rounded teaching and research program at undergraduate and graduate levels. Essential qualifications include a Ph.D. or other terminal degree (e.g., D.Sc., D.Phil.) in the Biological Sciences; evidence of research excellence in insect ecology such as peer-reviewed papers, grants, or awards; college teaching experience or demonstrated potential; one peer-reviewed paper as senior author, and demonstrated oral and written communication skills.

Send: letter of application; arrange three letters of reference to be sent and provide names, postal and email addresses, and phone numbers of two additional references; curriculum vitae; statement of teaching experience, philosophy, and interests; statement of research experience and interests; reprints or preprints of up to five relevant publications; and unofficial transcripts or list of relevant courses and year taken to **Dr. Gerald Niemi, Insect Ecologist Search Committee Chair, Department of Biology, University of Minnesota, Duluth, MN 55812.** Review of completed applications will begin on January 4, 2000 and will continue until the position is filled. We encourage applications from under-represented minorities in the Biological Sciences.

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

SCIENTIST AND POST-DOCTORAL POSITIONS /PLANT GENOMICS

Agriculture and Agri-Food Canada (AAFC) Research Branch is a dynamic National Agricultural Research organisation with the mandate to maximise the competitiveness of the Canadian Agri-Food sector. AAFC is internationally recognised as a leader in cereal and oilseed genetics, breeding, quality, and pathology. Due to a major new investment, AAFC is expanding its genomics based research in the above areas. We shall be hiring scientists as visiting postdoctoral fellows and for both permanent and term positions over the next several years. We are seeking individuals at both entry and leadership levels. At present we are actively recruiting for the following positions:

Soybean Genetic Mapping (Term, Harrow, Ont.) Ref#: AGR4914SB39
Candidates should have doctoral training in plant molecular biology and genetics. Experience in genome mapping, physical mapping, map-based gene cloning, and functional analysis of disease resistance genes are essential.

Plant Model Systems Genetics (Permanent - London, Ont.) Ref#: AGR4740SB39
A scientist at the doctoral level is required to develop an active program aimed at using *Medicago truncatula* as a model system for soybean genomics research. Experience in the application of plant model systems to crop improvement is essential.

Soybean Disease Resistance (Permanent - London, Ont.) Ref#: AGR4739SB39
A scientist at the doctoral level is required to develop a program aimed at isolating and understanding genes for resistance to diseases of soybean. Experience required in the isolation of plant resistance genes.

Transgene Geneticist (Permanent - Saskatoon, SK) Ref#: 99-AGR-SK-OC-116
Working with traditional breeders and molecular biologists, establish a research program to optimise the stability and expression of a diverse range of single and multiple gene traits in oilseed crops. Objectives include the development of a molecularly-based understanding of gene over-expression and suppression to accelerate the development of transgenic oilseeds.

Molecular Bio-Informatics Biologist (Term - Winnipeg, Man.) Ref#: AGR4684JE
M.Sc. in Biological discipline required. Duties will include the design implementation, and maintenance of a state of the art bioinformatics system, evaluating existing software and designing novel software where necessary.

Marker Assisted Breeding Biologist (Term - Saskatoon, SK) Ref#: 99-AGR-SK-OC-135
Develop molecular maps and markers associated with economically important traits in oilseed *Brassicas*. Assist with the implementation of a marker based screening program in support of canola breeding. Assist with isolation, cloning, and sequencing of genes controlling novel traits.

Soybean Seed Quality (2 Postdoctoral Positions-London, Ont.) Ref#: AGR4946SB39
Two positions are available for research on molecular genetic factors controlling seed quality traits in soybean, including the protein and natural product composition. Experience in protein purification and analysis of plant phenolic constituents. Ph.D. required in Life Sciences.

Wheat Genomics (1 Postdoctoral position - Winnipeg, Man.) Ref#: AGR4947SB39
Recent Ph.D. and experience in cereal tissue culture/ transformation, vector construction, and analysis of gene expression in transgenic plants.

Viral Genomics (1 Postdoctoral Position, Summerland, B.C.) Ref#: AGR4948SB39
The position will specifically be insect virus genomics and genome analysis. Person should have good molecular biology, tissue culture and computer skills.

HOW TO APPLY:
Candidates are encouraged to apply online by viewing the more detailed specific advertisements on our web site at: **http://jobs.gc.ca/toronto** under the heading "Employment Opportunities". Each position provides an Apply Online feature which will open a specific application and also provide you with the opportunity of cutting and pasting your cover letter and resume. **Candidates must apply no later than 30 December, 1999.**

Candidates who choose to apply by regular post or by fax may do so by forwarding a detailed resume and cover letter clearly stating their citizenship, the title(s) of the position(s), the reference number(s), and location(s) to the following address:

Bert Innes
c/o Agriculture and Agri-Food Canada
London SCP-FRC
1391 Sandford Street
London ON N5V 4T3

Fax: 519-457-3997

Canada

If you apply online, **DO NOT** send a duplicate by fax or regular mail.
We are committed to Employment Equity.

Monterey Bay Aquarium Research Institute

POSTDOCTORAL FELLOWSHIPS

The Monterey Bay Aquarium Research Institute (MBARI) is seeking applicants for 2-year postdoctoral appointments in all areas of marine science and engineering. Founded in 1987 and supported by the David and Lucile Packard Foundation, MBARI is a non-profit oceanographic research institute, dedicated to the development of state-of-the-art instrumentation, systems, and methods for scientific research.

Located in Moss Landing, California, the heart of the nation's largest marine sanctuary, MBARI emphasizes a balance of science and engineering, with established programs in remotely operated vehicle (ROV) control technology, ocean physics, chemistry, geology, and biology, as well as information management and ocean instrumentation research and development. Fellowships may require occasional trips to sea.

MBARI's research center in Moss Landing includes state-of-the-art science and engineering laboratories, as well as an operations facility to support its two research vessels. The Institute deploys a remotely operated vehicle to depths of 1,000 meters in the Monterey Bay for the purpose of scientific investigation, and recently launched a new advanced ROV, designed and built at the Institute, that takes unique research capabilities to depths of 4,000 meters.

Applicants should be recent Ph.D. recipients, or 2000 degree candidates. Applications should be received by January 31, 2000 and must include: A curriculum vita, at least three professional letters of recommendation, and succinct statements of both the applicant's doctoral research and the applicant's proposed research goals at MBARI. Selections will be announced by April 3, 2000. Please note that candidates must complete their Ph.D. degree prior to commencing the two-year appointment between October 2000 and March 2001.

To glimpse MBARI's current activities, please visit our World Wide Web page at **http://www.mbari.org**.

MBARI offers a competitive compensation package, including medical, dental, vision, and retirement benefits. First year salary is $37,000; second year $40,000. Interested individuals should address applications to: **MBARI, Postdoc-2000, 7700 Sandholdt Road, Moss Landing, CA, 95039-0628**.

EOE

MBARI Welcomes Diversity

Health Care

DIRECTOR, ADMINISTRATION

Gaithersburg, Maryland

We currently seek a Director of Administration for our Paffenbarger Research Center (PRC) located in Gaithersburg, Maryland. This position is responsible for the day-to-day administrative operations of PRC along with directing or acting as principal investigator on independent research projects; managing cooperative projects and programs with NIST; and occasionally acting as liaison between PRC and various dental professional, industrial representatives and federal research funding agencies. This position requires a DDS and/or PhD with 5+ years background in dental and/or material research; technical writing and editing experience; knowledge and experience in public relations and publishing, including desktop publishing operations; public speaking experience; authorship of published peer reviewed articles and/or research results; grantsmanship training; grant administration experience; and proven grant success from a federal agency. If you qualify, please send your resume and salary requirements to: American Dental Association, Dept. KB/HR, 211 E. Chicago Ave., 5th Fl., Chicago, IL 60611. EOE

The University of Texas at Austin

FACULTY POSITIONS

Department of Chemistry and Biochemistry
The Institute for Cellular and Molecular Biology

We invite applications for faculty with research interests in the general area of structure and function of macromolecules. The ideal candidates will complement existing faculty in structural and mechanistic biochemistry and interact with faculty in molecular biology and chemistry. Priority will be given to individuals using interdisciplinary approaches. Candidates will be expected to establish a premier research program and to teach at the undergraduate and graduate levels. One or more appointments will be made at the Assistant Professor level. Outstanding senior and Chair candidates are also encouraged to apply. Austin is located in the Texas hill country and provides an outstanding quality of life. The University affords a stimulating environment for research and teaching in modern biochemistry.

Please send a CV including publications, a brief research description, and three letters of reference before Feb. 1, 2000 to:

Dr. Kenneth A. Johnson
Department of Chemistry and Biochemistry
The Institute for Cellular and Molecular Biology
The University of Texas at Austin
2500 Speedway, A4800
Austin, TX 78712

Homepages • http://www.cm.utexas.edu/ and http://www.icmb.utexas.edu/
The University of Texas at Austin is an Equal Opportunity Employer.

Tenure-Track Faculty Positions

University of Pittsburgh School of Medicine

University of Pittsburgh School of Medicine has committed to enhance further its Basic Research faculty. We seek several research-oriented individuals to join our well-funded faculty as Assistant or Associate Professors. The desired candidates will have a MD or Ph.D. from any subdiscipline of the Life Sciences including pharmacology, biochemistry, molecular biology and neurobiology. We are especially interested in individuals who will complement our existing strengths in membrane trafficking, ion channels, G-protein mediated signaling, cell death, drug discovery and drug resistance.

Successful candidates will be expected to develop outstanding independent research programs. Very attractive start-up packages have been committed for the successful candidates. Interested applicants should provide a one-page statement on their proposed research, a curriculum vitae, and the names and contact information of three professional references. The application deadline is February 15, 2000. Application should be sent to:

John S. Lazo, Ph.D., Chairman
Department of Pharmacology
University of Pittsburgh, School of Medicine
Chair, Search Committee
W1340 Biomedical Science Tower
Pittsburgh, PA 15261

TENURED POSITION
Division of Intramural Research Programs
National Institute of Mental Health

The National Institute of Mental Health invites applications for a tenured investigator using neuroimaging techniques to study the pathophysiology of mental illness. Such techniques could include fMRI, PET, and/or MRS. The candidate is expected to develop an independent research program and will be provided the personnel and budget to conduct the research. The candidate should have an M.D. or a Ph.D in the area of cognitive neuroscience or a related discipline and postdoctoral experience.

Applicants should send a curriculum vitae statement or research interests, and have three letters of recommendation sent by **December 15, 1999** to:

Dr. Robert Desimone, Scientific Director
National Institute of Mental Health
Building 10, Room 4N222
9000 Rockville Pike
Bethesda, Maryland 20892-1381

NIH is an Equal Opportunity Employer

Science

Associate Editor in the Physical Sciences

Join the expanding editorial team at Science. We are seeking a new Associate Editor in the physical sciences. Applicants should have a broad range of interests and research experience in physics, chemistry, or materials science. Applicants should have two or more years of postdoctoral experience, have published in the peer-reviewed literature, and show a breadth of knowledge of cutting-edge research in several fields. Responsibilities include managing the review, selection, and editing of manuscripts; solicitation of reviews and special issues; and fostering contacts and communication with the scientific community. The position is for either our Washington, DC, or Cambridge, UK, offices.

To apply, please submit a cover letter describing your qualifications and salary requirements, résumé, and contact information for three or more references to:

Mr. Gregory Stokes
American Association for the Advancement of Science
Human Resources Department, Suite #100
1200 New York Avenue, NW
Washington, DC 20005

EOE/Nonsmoking work environment

CWRU

DIRECTOR OF VETERINARY RESEARCH RESOURCES

Case Western Reserve University School of Medicine is seeking a Director of Veterinary Research Resources (VRR) to oversee a large and multifaceted animal care and use program. The School of Medicine (SOM) is a major research institution that garners over $150 million in NIH funds, standing 11th in the nation. There is already significant strength in mouse genetics, and exponential growth of programs in mouse models of disease is projected.

The VRR program is responsible for the care and housing of laboratory animals used at the SOM. This program supports research activities in all departments, including genetic models for diseases of the lung and heart, brain, and musculoskeletal system, as well as cancer. Its current facilities include an Animal Resource Center (ARC) with conventional and barrier capabilities, plus two satellite facilities, one of which is primarily committed to transgenic mice. Candidate will assist in design, oversee construction of, and occupy a new facility in the near future.

The successful candidate should have senior management experience in an animal research mouse facility and will be expected to contribute to teaching and/or training programs. The individual should be familiar with standards of AAALAC accreditation and regulatory compliance issues.

Required knowledge and skills: As a member of the research team of the SOM, have strong interpersonal, leadership and management skills, as well as effective oral and written communication. Experience in working with developing mouse models, and ability to interact with the research faculty in building animal research programs is essential.

Qualifications and experience: A degree in an appropriate biological science, DVM, with Board Certification in Laboratory Animal Medicine preferred; however, a combination of education and experience may be substituted for the required educational qualifications. Experience must include over 5 years in a senior supervisory position with line authority in laboratory animal medicine (position must have encompassed responsibility for personnel management, facility operation, and responsibility for financial operations). Experience with facility planning highly desirable.

Salary is competitive and commensurate with credentials and experience. Qualified candidates should submit letter of interest and curriculum vitae to: **VRR Search Committee, Department of Human Resources, Case Western Reserve University, 10900 Euclid Avenue, Cleveland, OH 44106-7047. Electronic submissions (preferred) to: VRRsearch@po.cwru.edu**

In employment as in education, CWRU is committed to Affirmative Action and Equal Opportunity.

FACULTY POSITION
Carnegie Institution of Washington
Department of Plant Biology
Stanford, California

The Carnegie Department of Plant Biology is seeking to fill several faculty positions in the area of Plant Cell and Molecular Biology. The successful candidates are expected to have a Ph.D. and demonstrated ability to carry out independent and innovative research. The institutional philosophy is to encourage scientific discoveries by providing outstanding individuals with the freedom and long-term support to explore the frontiers of science. Carnegie faculty enjoy complete freedom with respect to the choice of research topic and have no obligatory teaching or administrative responsibilities. Opportunities exist for participation in graduate and undergraduate education through a concurrent courtesy appointment in the Department of Biological Sciences at Stanford University. Please send a curriculum vitae, statement of research interests, and three letters of reference by January 15, 2000, to: **Chris Somerville, Carnegie Institution, 260 Panama Street, Stanford, CA 94305.** *The Carnegie Institution is an Affirmative Action/Equal Opportunity Employer.*

MICROBIAL PHYSIOLOGIST
Eastern Michigan University

The Department of Biology invites applications for a tenure-track **ASSISTANT PROFESSOR** Microbial Physiologist beginning fall 2000. The applicant should be capable of teaching courses in Microbiology, Microbial Physiology, and Recombinant DNA Techniques and have a research program in microbial physiology. The position requires a Ph.D. plus evidence of teaching excellence and research productivity. The individual hired will be expected to develop a research program capable of attracting external funding and involving undergraduate and graduate students. Preference will be given to candidates who complement the expertise and diversity of the department and can help teach any of the following undergraduate core courses: Genetics, Cellular and Molecular Biology, Ecology, Evolution. The department has 22 faculty and M.S. concentrations in Ecology and Organismal Biology, Molecular and Cellular Biology, Physiology, and General Biology. For more information on the department visit **website: http://www.emich.edu/public/biology/bioweb.htm.** Applicants must submit a letter of interest, curriculum vitae, statement of teaching interests and philosophy, summary of research interests, three reprints, unofficial copies of transcripts, and three letters of reference by December 13, 1999, to **Position F2014 Search Committee, 202 Bowen, Eastern Michigan University, Ypsilanti, MI 48197 (FAX: 734-487-7995).** For additional information contact **Robert Neely**, Department Head, at **Telephone: 734-487-4242** or **James VandenBosch**, Search Chair, at **Telephone: 734-487-4242.** *Affirmative Action/Equal Opportunity Employer.*

RESEARCH POSTDOCTORAL FELLOW

For research institute, responsible for investigating cytokine adjuvancy regulatory mechanisms of antigen presentation and immunopathology studies centered on patient-derived material from ongoing clinical trials. Requires: Ph.D. or equivalent in immunology or related field, one year experience in job offered or one year experience as researcher. Experience must include HIV-1 cellular immunology, murine antigen presentation model systems, cytokine regulatory networks, or macrophage biology. Experience can be gained while pursuing degree. Thirty-five hours per week. Send résumés to **Science, Attn.: Room 911, Box 87, 1200 New York Avenue NW, Washington, DC 20005.**

POSITIONS OPEN

MOLECULAR MEDICINE RESEARCH LABORATORY

Applications are invited for **SCIENTISTS** in the following domains: Molecular Biology: Ph.D. (five years research experience) with expertise in Regulation of Gene Expressions. Microbiology: Ph.D. (five years research experience) with expertise in Down Stream Processing. Organic Chemistry: Ph.D. (five years research experience) with expertise in Chiral Synthesis. Applicants should submit a curriculum vitae, a brief statement of research interests, copies of recent publications, and two references to: **Dr. Shrikant Mishra, Molecular Medicine Research Laboratory, USV Limited, B.S.D.Marg, Govandi Station Road, Govandi, Mumbai—400 088, India. Telephone: 91-22-556 40 48-51. FAX: 91-22-551 56 08.** Complete applications should be received before January 20, 2000. *USV Limited is a research-led institution and is an Affirmative Action/Equal Opportunity Employer.*

ASSISTANT PROFESSOR—TENURE-TRACK, CELL/MOLECULAR BIOLOGIST: The Department of Biological, Geological, and Environmental Sciences of Cleveland State University invites applications from cell/molecular biologists to fill a tenure-track position at the **ASSISTANT PROFESSOR** level beginning August 21, 2000. Applicants must hold a Ph.D., have postdoctoral or equivalent experience, and demonstrate the potential for excellence in research and teaching. The successful candidate will be expected to establish an independent, funded research program and participate in undergraduate and graduate teaching. We are particularly interested in applicants addressing questions in Cell or Developmental Biology. The Department offers B.S. and M.S. degrees in Biology and a Ph.D. in Regulatory Biology through a joint program with the Lerner Research Institute of the Cleveland Clinic Foundation. No later than January 5, 2000, candidates must submit a curriculum vitae, a description of research plans and teaching philosophy, and arrange for three letters of recommendation to be sent to: **Dr. F. Paul Doerder, Chair, Faculty Search Committee, Department of Biological, Geological, and Environmental Sciences, Cleveland State University, 2399 Euclid Avenue, Cleveland, OH 44115-2406.** For additional information, consult the Department's **website: (http://www.bges.csuohio.edu)**, the Lerner Research Institute **website: (http://www.lerner.ccf.org/)**, **e-mail:** the Search Committee **(cellsearch@csuohio.edu)**, or contact **Dr. Doerder, Telephone: 216-687-2442.** *Cleveland State University is an Affirmative Action/Equal Opportunity Employer committed to nondiscrimination. Minorities/Females/Disabled/Veterans encouraged.*

FACULTY POSITIONS IN BIOPHYSICS AND IN NONLINEAR AND NON-EQUILIBRIUM PHYSICS
Department of Physics
University of California, San Diego

The Department plans to make tenured or tenure-track faculty appointments in experimental biophysics and in experimental nonlinear and non-equilibrium physics beginning July 1, 2000. Applicants should have a Ph.D., a strong research record, and ability and interest in teaching. Salaries will be based on the University of California pay scale. Applications consisting of a curriculum vitae, publications list, a summary of research interests, and the names of at least three references should be sent to: **Faculty Search Committee (Biophysics or NLD), Department of Physics S 0354, University of California, San Diego, CA 92093-0354.** Review of applications began December 1, 1999, and will continue until the position is filled. *Affirmative Action/Equal Opportunity Employer.*

POSITIONS OPEN

BIOLOGICAL CHEMISTRY POSITIONS RANK OPEN

The University of Toledo is undertaking a major initiative in biological chemistry and invites applications and nominations for three open-rank faculty positions to begin fall 2000 or later. Applicants must have a Ph.D. and postdoctoral experience. The successful candidates will be expected to conduct outstanding, externally-funded research in biological (or biologically related) chemistry. The University of Toledo is the home of the Ohio Crystallography Consortium. Individuals who either require macromolecular crystallography facilities or could benefit from existing local expertise are encouraged to apply. Joint appointments within the Departments of Biology or Medicinal and Biological Chemistry will be encouraged. Further information on the positions and the new research facilities in Wolfe Hall can be found on the Department of Chemistry **website: (http://utchem.org)**. Applicants for senior appointments should send a curriculum vitae along with a research plan to: **Faculty Search Committee Chair, Department of Chemistry, University of Toledo, Toledo, OH 43606.** Applicants at the Assistant Professor level should also arrange to have three letters of recommendation sent. Review of applications will begin after January 3, 2000, and continue until the positions are filled. *The University of Toledo is an Equal Opportunity/Affirmative Action Employer and Educator.*

POSTDOCTORAL POSITION
Mount Sinai School of Medicine

Mount Sinai School of Medicine is a leader in medical education and research. We have a postdoctoral position available to study the role of adhesion molecules in hematopoiesis. (See *NEJM* **335:**43, 1996; *Cell* **84:**563, 1996; *PNAS* **95:**14423, 1998; *JEM* **188:**465, 1998). Candidates with a background in molecular/cellular biology and experience with murine models are strongly encouraged to apply. A publication in an international journal is a prerequisite. For consideration, please send curriculum vitae, a brief description of research experience, and the names of three references to: **Dr. Paul S. Frenette, Department of Medicine (Hematology), Box 1079, Mount Sinai School of Medicine, One Gustave L. Levy Place, New York, NY 10029-6574. FAX: 212-849-2574.** *We are an Equal Opportunity Employer fostering diversity in the workplace.*

NEW ENGLAND REGIONAL PRIMATE RESEARCH CENTER
Harvard Medical School

POSTDOCTORAL POSITION immediately available for a NIH-funded multidisciplinary study of the pathogenesis of AIDS focused on the intestinal immune system. Current work utilizes the SIV/macaque model and is directed at determining how SIV/HIV targets and disrupts the intestinal immune system and alters intestinal structure and function. Candidates should have a M.D., D.V.M. or Ph.D. and experience with flow cytometry and mucosal immunology. Please send curriculum vitae, cover letter indicating your research interests and experience, and names of three references to: **Dr. Andrew A. Lackner, NERPRC-Harvard Medical School, One Pine Hill Drive, P.O. Box 9102, Southborough, MA 01772-9102. E-mail: Alackner@hms.harvard.edu.**

POSTDOCTORAL POSITIONS are available immediately to study 1) the halotype organization of the human gene regions involved in immune system development and its possible association with autoimmune diseases, and 2) the genetic basis of breast cancer. Experience in molecular biology is essential. Background in human genetics is preferred. Send curriculum vitae and two letters of recommendation to: **Dr. Honghua Li, Department of Molecular Genetics and Microbiology, University of Medicine and Dentistry of New Jersey–Robert Wood Johnson Medical School, 675 Hoes Lane, Piscataway, NJ 08854-5635.** Visit our **website: www.umdnj.edu.** *The University of Medicine and Dentistry of New Jersey is an Affirmative Action/Equal Opportunity Employer, Minority, Female, Disabled, Veterans, and a member of the University Health System of New Jersey.*

Position Announcement for

Bioinformatics Specialist

The International Rice Research Institute (IRRI) is seeking a highly motivated bioinformatics specialist to support its research and networks in functional and comparative genomics and molecular breeding.

IRRI is one of 16 international research centers supported by the Consultative Group on International Agricultural Research (CGIAR), which is cosponsored by the Food and Agriculture Organization of the United Nations, the World Bank, the United Nations Development Programme, and the United Nations Environment Programme. The CGIAR's membership comprises donor countries, international and regional organizations, and private foundations. IRRI is a nonprofit, autonomous organization engaged in research and training on rice-related technology with headquarters in Los Baños, Philippines, 65 km south of Manila. IRRI scientists work in partnership with agricultural research institutions in major rice-growing countries worldwide to improve the well-being of present and future generations of rice farmers and consumers, particularly those with low incomes.

Responsibilities

The bioinformatics specialist will work with the institute data management team to integrate local and international molecular and genomic data with traditional information on genealogy and phenotypic evaluation of rice germplasm, as well as provide support to projects requiring bioinformatic input. There will be opportunities for an active research role in functional and comparative genomics and molecular breeding. The bioinformatics specialist will also facilitate publication and sharing of bioinformatic resources, extension of bioinformatics to IRRI's partners in national agricultural research programs, and links to advanced research institutes developing bioinformatics tools and resources.

Qualifications

The central importance of rice in plant genomics offers exciting and challenging opportunities for candidates to develop initiatives with research partners worldwide. Candidates should have a strong track record in bioinformatics, proven communication and team-building skills, knowledge of appropriate information technology, and knowledge of general and molecular biology.

This position is located at the Institute's headquarters. Salary and conditions of service are internationally competitive. The Institute provides a gender-sensitive work environment and particularly welcomes women.

Applications

Send a comprehensive curriculum vitae and names, addresses, fax numbers, and e-mail addresses of three referees by 31 December 1999 to **Dr. Hei Leung, Bioinformatics Search Committee, International Rice Research Institute, MCPO Box 3127, 1271 Makati City, Philippines.** E-mail: H.Leung@cgiar.org. Web site: http://www.cgiar.org.irri

Please refer to code IR99-BS-01.

LABORATORY DIRECTOR

A Midwest corporation is establishing a specialized, technically sophisticated analytical service for support of drug exploration and development, with initial emphasis on ELISAs. The ideal lab director will be a strong manager with technical proficiency, having experience with GLP, GMP, drug development and FDA regulatory issues. Ability and experience are more important than specific educational achievement, but a PhD in Analytical Biochemistry or a Bio-medical discipline, ABCC/NRCC certification and CLIA experience would each be a plus. The successful candidate will establish and maintain a highly professional laboratory with GLP/GMP documentation, will oversee the entire analytical process from preparation of protocols to sample receipt to data transmission and will interact with Pharmaceutical companies regarding their analytical needs.

This position is an opportunity for a skilled and industrious person to initiate a major new business venture by a rapidly growing Biotech company. Salary and benefits are excellent in a location that offers an outstanding quality of life, whether your preference is for the arts or year-around outdoor sports.

Interested applicants should submit a resume to:

PO Box 18568
Minneapolis, MN 55418-0568

No Agencies Please
Equal Opportunity Employer

National Cancer Institute
Experimental Immunology Branch
National Institutes of Health

Postdoctoral Positions:

T cell Development and Intrathymic Signaling; T cell Receptor Structure and Function; Alfred Singer, M.D. (Alfred_Singer@nih.gov)

Transplantation Immunology; Ronald Gress, M.D. (gressr@exchange.nih.gov)

Receptor-triggered Granule Exocytosis in T Cell Effector Function; Pierre Henkart, Ph.D. (Pierre_Henkart@nih.gov)

Cellular and Molecular Regulation of T cell and B cell activation; Richard Hodes, M.D. (Richard_Hodes@nih.gov)

Genetic Control of Vertebrate Embryonic Development; Michael Kuehn, Ph.D. (Michael_Kuehn@nih.gov)

DNA Repair/Recombination Mechanisms; Andre Nussenzweig, Ph.D. (Andre_Nussenzweig@nih.gov)

Protein Trafficking in Lymphocytes; Paul Roche, Ph.D. (Paul_Roche@nih.gov)

Novel PKCs in immune cell signaling; S/T phosphorylation in cytoskeletal reorganization; Stephen Shaw M.D. (Sshaw@nih.gov)

Innate Immunity and Targeted Cellular Cytotoxicity; David Segal, Ph.D. (segald@mail.nih.gov)

Immune dysregulation in HIV/AIDS, Cancer, and Autoimmune Diseases; Gene Shearer, Ph.D. (Gene_Shearer@nih.gov)

Molecular Mechanisms Regulating MHC Class I Gene Expression; Dinah Singer, Ph.D. (Dinah.Singer@nih.gov)

Applicants must possess PhD, MD or equivalent with no more than five years of postdoctoral experience.

To apply, submit a cover letter, curriculum vitae, and the names of three references to the hiring scientist via email. More information at http://rex.nci.nih.gov/RESEARCH/basic/eib/eibpage.htm

FAIRFIELD UNIVERSITY
DEPARTMENT OF BIOLOGY
Biochemist/Health Sciences Advisor

ASSISTANT PROFESSOR, tenure-track position. Responsibilities include undergraduate teaching, research, and advising for the premedical and other allied health sciences in biology and other majors in the College of Arts and Sciences. This search is directed at outstanding scientists in any area of research in biochemistry. Expertise with molecular techniques is necessary. Preferred teaching responsibilities include a two-semester, upper-division lecture/laboratory course in biologically-based biochemistry. Participation in the introductory biology course, the development of upper-division specialty courses in area of expertise, undergraduate research, and grant-writing initiatives is expected. Individual is expected to work closely with colleagues to develop a comprehensive undergraduate program in molecular and cell biology. Position to start September 2000. Candidates with a Ph.D. (some postdoctoral experience preferred) and a strong commitment to undergraduate teaching and research are encouraged to apply. Start-up funds are available. Salary and benefits are competitive. Qualified candidates should send a letter of application that clearly addresses the above qualifications, a curriculum vitae, graduate transcripts, statement of teaching goals, and statement of research interests and goals (including how you would involve undergraduates), selected reprints, and arrange for three letters of reference to be sent to: **Search Committee Chair, Biochemist/Health Sciences Advisor Position, Biology Department, Fairfield University, Fairfield, CT 06430**. The deadline for completed applications is January 15, 2000. *Women and minorities are encouraged to apply. Fairfield University is an Affirmative Action/Equal Opportunity Employer.*

PHYSICAL OCEANOGRAPHER
COASTAL/ESTUARINE PROCESSES

The University of South Alabama announces the availability of a tenure-track faculty position in the Department of Marine Sciences. We seek a faculty colleague with interests in the area of coastal physical processes who will strengthen the overall teaching and research capabilities of our growing program in marine sciences. The new faculty member is expected to develop a vigorous extramurally funded research program in areas that could include estuarine circulation/particle transport and physical exchanges associated with shallow shelf and coastal plume/frontal regions. The successful candidate must be willing and able to interact with biological oceanographers and marine ecologists on interdisciplinary research problems. Teaching expectations typically include two graduate-level courses per year. This position is expected to be filled at the **ASSISTANT PROFESSOR** level, although appointment at the **ASSOCIATE** rank is possible for highly qualified individuals. Salary will be provided for nine months per year, and a competitive start-up package will be available. Applicants should send a curriculum vitae, a brief statement of teaching and research interests, selected reprints, and the names and contact information (including e-mail addresses) of three references to: **Dr. Ron Kiene, Chairman Search Committee, Department of Marine Sciences, University of South Alabama, Mobile, AL 36688**. Further information on the Marine Sciences Department can be found at **website: http://www.southalabama.edu/marine_sciences/index.html**. Review of applications will begin 1 February 2000. *Affirmative Action/Equal Employment Opportunity/Minority/Female/Disabled.*

POSITIONS OPEN

CHAIRED DIRECTOR
University of Notre Dame
Environmental Research Center

The University of Notre Dame invites applications for the position of **GILLEN CHAIR AND PROFESSOR** in the Department of Biological Sciences to serve as Director of the University of Notre Dame Environmental Research Center (UNDERC). We seek a scientist with a well-established national and international reputation who can provide visionary leadership for UNDERC. The Director will (1) oversee research and teaching at the field station, which is supported by an endowment, (2) promote scientific use of UNDERC by Notre Dame faculty, other institutions and research centers, and government agencies, (3) participate in the graduate program in Ecology, Evolution, and Environmental Biology on campus. The ability to foster collaborative and interdisciplinary research is especially desired. The Director will recruit and supervise staff including a Ph.D.-level Associate Director and an Administrative Assistant. The UNDERC property consists of 7,500 acres of forested land in northern Wisconsin and the Upper Peninsula of Michigan including 30 lakes, wetlands, and streams with a combined surface area of 1,350 acres. UNDERC maintains a winterized laboratory and classroom building, a "wet" laboratory, and housing for up to 60 students and researchers. The position of Director is a full-time, 12-month position with salary commensurate with experience. Interested applicants should send (1) a curriculum vitae, (2) a brief statement of experience and research interests, and (3) a cover letter addressing administrative philosophy and interest in field station development to: **Chair, UNDERC Director Search Committee, Department of Biological Sciences, University of Notre Dame, Notre Dame, IN 46556-0369, U.S.A.** Review of applications will commence on January 15, 2000, and continue until the position is filled. For more information, visit the UNDERC **website: http://www.underc.nd.edu**; the biology **website: http://www.science.nd.edu/biology**, or contact the Search Chair (**e-mail: Gary.A.Lamberti.1@nd.edu**) or Department Chair (**e-mail: John.G.Duman.1@nd.edu**). *The University of Notre Dame is an Equal Opportunity/Affirmative Action Employer. Women and minorities are encouraged to apply. The University is responsive to the needs of dual-career couples.*

ASSISTANT/ASSOCIATE PROFESSOR
Wright State University

The Department of Biological Sciences invites applications for a tenure-track **ASSISTANT** or **ASSOCIATE PROFESSOR** specializing in biology education. This is a joint position between the Departments of Biological Sciences and Teacher Education in the two Colleges of Science and Mathematics (67 percent) and Education and Human Services (33 percent). The successful applicant will provide leadership in emerging science and mathematics preservice programs at both the undergraduate and graduate levels. Teaching may include courses for biology majors, preservice teachers, undergraduates in general education sciences, and/or courses in an area of specialization. Candidates must have a Ph.D. or Ed.D., (to be considered for associate professor, candidates must have demonstrated an ability to contribute in an outstanding way to scholarly teaching and service functions as defined in the Wright State University faculty handbook) and a graduate degree in biology or two years of work-related experience in the biological field. Experience in teaching precollege science is desirable. The successful applicant is expected to have demonstrated scholarship in science education and the ability to obtain extramural funding. A letter of application, curriculum vitae, statements of scholarship and teaching interests, and names of three references should be sent to: **Biology Educator Search Committee, Department of Biological Sciences, Wright State University, Dayton, OH 45435**. Review of applications will begin December 1, 1999. For further information see **website: http://biology.wright.edu.** *Wright State University is an Affirmative Action/Equal Opportunity Employer.*

POSITIONS OPEN

SCIENTIFIC REVIEW ADMINISTRATORS
Opening Dates: November 15, 1999
Closing Dates: December 13, 1999

The Division of Extramural Activities of the National Cancer Institute (NCI), National Institutes of Health, is seeking several individuals to join a multidisciplinary group of Scientific Review Administrators to manage the initial peer review of research grant applications submitted to the NCI. These activities are based in Rockville, Maryland, a suburb of Washington, D.C., but some travel (site visits) will be involved. Application information is listed in the specific vacancy announcement indicated below. Candidates should have independent research experience and expertise in current methods of cancer research in one or more of the areas listed. Candidates should also be familiar with the NIH grant application, review, and support process. Candidates must be United States citizens. The salary range for these positions is $48,796 to $89,142 (1999 rate with locality). Number of vacancies—six. Position titles: Six positions will be selected from the following seven job titles/series: Biologist, Microbiologist, Health Scientist Administrator, Medical Officer, Chemist, Epidemiologist, and Psychologist. Seeking applicants possessing experience and expertise in the following areas:

1. Biomedical technology development, imaging, and/or bioinformatics as applied to cancer research.
2. Molecular or cellular biology of cancer pathogenesis, developmental therapeutics, and/or molecular pharmacology of therapeutics with applications to cancer.
3. Translational and/or clinical oncology research in cancer biology, detection, diagnosis, and/or treatment.
4. Cancer epidemiology and/or cancer communications related to cancer prevention, cancer control, or tobacco use and its effects.

To obtain information about the application process or documents required for consideration for any of these positions, candidates may contact the **National Cancer Institute, Office of Human Resources and Consulting Branch**, at **Telephone: 301-402-2789** and reference vacancy announcement number **NCI-99-3002**. To obtain a FAX of this information, call **Telephone: 1-800-728-5627** or **301-594-2953** and enter the FAX ID number **1935**. The announcement is also listed on the NIH CareerHere **website: http://careerhere.nih.gov.**

Selection for these positions will be based on merit, with no discrimination for nonmerit reasons such as race, color, gender, national origin, age, religion, sexual orientation, or physical or mental disability. The NCI/NIH is an Equal Opportunity Employer.

ASSISTANT/ASSOCIATE PROFESSOR
OF PHARMACOLOGY

The Division of Basic Medical Sciences at Mercer University School of Medicine invites applications for a tenure-track position to begin around July 2000. The successful applicant will have a Ph.D. in pharmacology (or the equivalent) with at least two years of postdoctoral training and will be expected to participate in problem-based medical education as well as develop an independent research program capable of competing for extramural funding. Preference will be given to individuals with research and teaching experience in the chemotherapy of microbial, viral, and/or neoplastic diseases, but candidates with a strong background in other areas will also be considered. Applicants should send a curriculum vitae, statement of research and teaching interests, and the names of three references to: **Robert J. Moon, Ph.D., Division of Basic Medical Sciences, School of Medicine, Mercer University, 1550 College Street, Macon, GA 31207**. For more information about Mercer University School of Medicine, visit our **website: www.mercer.edu.** *Equal Opportunity/Affirmative Action Employer. Minorities are encouraged to apply.*

SENIOR SCIENTIST/LEADER
Mammalian Cell Expression

Right now AMGEN, a world leading biopharmaceutical company, is seeking a leader for an existing mammalian expression group that supports Discovery Research activities. The successful candidate will work in multidisciplinary project teams, designing and implementing state-of-the-art **mammalian cell expression** systems to generate recombinant proteins and cell lines suitable for high throughput screens.

This requires extensive experience in the development and implementation of **mammalian cell expression** systems optimal for scale up protein production or assay development. A demonstrated scientific research record, extensive bench level experimental experience, a proven ability in developing novel expression strategies and technologies, and excellent communication skills are of primary importance. Lab management experience and leadership potential are essential. The minimal requirement is for a Ph.D. degree and 5 or more years' postdoctoral or industrial experience, with training in molecular biology, cell biology or immunology.

Amgen's Thousand Oaks location positions you within easy access of everything from sandy beaches to snow-capped mountains, as well as the cosmopolitan excitement of Los Angeles. Yet you'll be far enough removed so your family can enjoy quiet residential living in a community that's rated among the safest in America.

We offer a highly competitive compensation and benefits package that includes a retirement and savings plan, an on-site fitness center, and three weeks vacation. Please send your resume to: **Amgen Staffing, Ad Code: 440, P.O. Box 2569, Thousand Oaks, CA 91319-2569, or e-mail in ASCII text, Attn: Ad Code:440, to jobs@amgen.com** EEO/AA Employer M/F/D/V.

Visit our website at **www.amgen.com**

AMGEN®

Department of Health and Human Services
Executive Director, JIFSR

The U.S. Department of Health and Human Services (DHHS) is seeking candidates for the position of Executive Director, Joint Institute for Food Safety Research (JIFSR). The Executive Director will manage JIFSR and report directly to the Executive Research Committee (ERC) appointed by the President's Council on Food Safety. The JIFSR focuses on coordinating research efforts and investments in food safety research within the Federal government as well as leveraging with those undertaken by the states, academia, non-profit organizations and industry. The candidate selected for this position will be detailed/appointed to DHHS for a period of up to two years on an Intergovernmental Personnel Act assignment or under another appropriate authority.

Salary is negotiable. Candidates must have extensive knowledge of the research needs associated with food safety and public health, possess a Ph.D., M.D., D.V.M., or equivalent degree in a relevant field of science and be an international expert recognized for his/her leadership and vision in the food safety community.

Further information regarding vacancy announcement and qualification requirements may be obtained from Ms. Patricia Foley at (301) 827-4120 or from the Office of Personnel Management website at www.usajobs.opm.gov

Applications may be sent to:

Ms. Patricia Foley
Office of Human Resources and Management Services
Food and Drug Administration
5600 Fishers Lane, HFA-400, Rm. 7-59
Rockville, MD 20857
FAX: 301-443-6684
Deadline for applications is January 15, 2000.

St. Jude Children's Research Hospital
ALSAC • Danny Thomas, Founder

POSTDOCTORAL POSITION CANCER RESEARCH

A Postdoctoral position is available immediately to study the function of death receptors of the TNF receptor superfamily and their signaling pathways in the chemotherapeutic response of human neoplastic diseases. The current focus of the laboratory is on the role of Fas and TRIALS Signaling in the induction of apoptosis and cell death in solid tumors. Studies encompass the areas of molecular and cell biology, biochemistry, and pharmacology, and include the use of cultured human tumor cell lines and xenografts in scid mice for approaches in developmental therapy. Applicants should have a recent Ph.D. degree in pharmacology, molecular biology, biochemistry, or a related discipline, or hold Pharm.D or M.D. degrees. Submit curriculum vitae with names of three references to: **Dr. Janet Houghton, Department of Molecular Pharmacology, St. Jude Children's Research Hospital, 332 North Lauderdale, Memphis, TN 38105.** *Affirmative Action/Equal Opportunity Employer.*

mayo

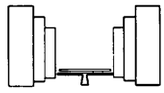
MAYO CLINIC
Division of Gastroenterology and Hepatology
Postdoctoral Research Position

A postdoctoral position is available in an established and active laboratory to study molecular properties of ion channels in smooth muscle and in Interstitial Cells of Cajal, the putative pacemaker of the gastrointestinal tract. Ongoing studies include ion channel cloning, second messenger regulation and characterization of electrical properties of ion channels using intracellular recording on intact tissues and the patch clamp technique on isolated cells.

Candidates must have an M.D. or Ph.D. degree. Please send curriculum vitae and the names of three references to:

Gianrico Farrugia, M.D.
Division of Gastroenterology and Hepatology
Mayo Clinic
200 First Street SW
Rochester, MN 55905
www.mayo.edu/research/gi_phys_lab/

Mayo Foundation is an affirmative action and equal opportunity employer and educator.



The Salk Institute

Postdoctoral Position in HIV molecular biology.

Research will focus on the role of chemokine receptor gene regulation in AIDS pathogenesis, the role of HIV accessory genes in HIV replication, and developing small animal models for HIV infection.

Send Curriculum Vitae, a statement of research interests, and the names and addresses of three references to:

Nathaniel R. Landau, Ph.D.
The Salk Institute
10010 N. Torrey Pines Road
La Jolla, CA 92037 USA

The Salk Institute is an Equal Opportunity Employer

www.salk.edu

THE UNIVERSITY OF ARIZONA COLLEGE OF MEDICINE

The Department of Medicine, Section of Pulmonary and Critical Care Medicine invites applications for a research-trained physician-scientist faculty member at the **ASSISTANT PROFESSOR** or **ASSOCIATE PROFESSOR** level. The Pulmonary and Critical Care Medicine Section is a multi-disciplinary group within the University of Arizona Respiratory Sciences Center which is committed to the basic, clinical, and translational research in all aspects of pulmonary and critical care medicine. Candidates must be board certified/eligible in Pulmonary and Critical Care Medicine. Preferred is an individual with research expertise in the basic immunology, genetics, or cell and molecular biology of asthma who has a proven research record. **Stuart F. Quan**, M.D., Chief of Pulmonary and Critical Care Medicine, invites interested candidates to send their curriculum vitae, a cover letter, and a list of at least three references to:

Department of Medicine
P.O. Box 245099
Tucson, AZ 85724-5099

Academic rank, tenure status, and salary will be commensurate with qualifications, experience, and similar positions within the College of Medicine. [See **website: http://hr2.hr.arizona.edu/ (reference #995281)**]. Application review begins December 30, 1999, and will continue until position is filled. *The University of Arizona is an Equal Employment Opportunity/Affirmative Action Employer—Minorities/Women/Disabled/Veterans.*

DEPARTMENT OF BIOLOGICAL SCIENCES

The Department of Biological Sciences seeks a full-time tenure-track population geneticist at the **ASSISTANT PROFESSOR** level beginning fall semester 2000. The successful candidate will teach introductory courses and other courses which may include genetics and population genetics. Ph.D. in one of the biological sciences and a strong commitment to undergraduate teaching is required. Final determination will be based upon successful interview which will include teaching demonstration performance. Teaching experience is preferred and competence in molecular techniques is strongly preferred. Applicants should specify the population genetics position and submit a curriculum vitae, transcripts, and three letters of reference to: **Raymond G. Milewski, Chair, Search and Screening Committee, Department of Biological Sciences, East Stroudsburg University, East Stroudsburg, PA 18301.** For more information, **e-mail: Ray.Milewski@po-box.esu.edu.** Visit our **website: www.esu.edu.** Application materials must be received by January 3, 2000. *East Stroudsburg University is an Equal Opportunity Employer. Minorities and women are strongly encouraged to apply.*

SENIOR FACULTY POSITION CONDENSED MATTER PHYSICS
Michigan State University

The Department of Physics and Astronomy at Michigan State University, **website: www.pa.msu.edu,** is seeking candidates for a Senior faculty position in experimental condensed matter physics. The Department is seeking to broaden its research scope to include nontraditional subjects with potential for interdisciplinary interactions with other departments, such as the biological sciences, chemistry, and materials science. The new Senior faculty member will have substantial input in the hiring of two Junior faculty to stengthen the initiative. University support for this new initiative is strong. A new science building scheduled for completion in 2001 will house the Departments of Microbiology, Physiology, and Physics and Astronomy, and will be connected to the Chemistry and Biochemistry buildings. Applicants should send a résumé, publication list, and the names of at least three references to: **Chairperson, Department of Physics and Astronomy, Michigan State University, East Lansing, MI 48824-1116.** *Michigan State University is an Affirmative Action/Equal Opportunity Institution.*

POSITIONS OPEN

The Department of Marine Science at Coastal Carolina University invites applicants for a tenure-track **PROFESSOR** and **DEPARTMENT CHAIR** beginning in the fall of 2000. Candidates with expertise in any field of coastal marine and/or estuarine science, who have demonstrated abilities in: curriculum development, research involving students, and academic program/faculty assessment, are encouraged to apply. Candidates are also expected to have had previous administrative experience involving supervisory and fiduciary responsibilities, a strong record of multidisciplinary research experience, and a history of teaching excellence. The Department Chair will lead the department, and will also assist the Dean of Natural and Applied Sciences in developing a master's degree program in coastal marine and wetland studies. The Marine Science department has 500 undergraduate majors and 13 faculty members. Applicants should send curriculum vitae, a statement of philosophy regarding research, teaching, and personnel management, five (5) representative reprints, along with the names, telephone numbers, and postal and e-mail addresses of five (5) references to: **Dr. Val Dunham, Dean, School of Natural and Applied Science, Coastal Carolina University, P.O. Box 261954, Conway, SC 29528-6054.** Additional information about the institution and the Department may be obtained through the university's **website: http://www.coastal.edu.** Deadline for applications is February 1, 2000. *Coastal Carolina University is an Equal Opportunity/Affirmative Action Employer.*

PLANT ECOLOGIST

The Department of Biology of Swarthmore College invites applications for a tenure-track appointment at the **ASSISTANT PROFESSOR** level, to begin September 2000. We seek a plant ecologist with field experience who is committed to combining teaching and research at a small liberal arts college. Teaching responsibilities include an intermediate-level course in general ecology, an advanced seminar in a major area within plant ecology, and participation in the Department's introductory biology sequence. Expertise and experience in conservation biology will be viewed with favor. There will be opportunities to participate in the College's environmental studies programs. The successful candidate will be expected to establish an active research program that will provide opportunities for undergraduate participation. A Ph.D. is required; postdoctoral research experience and teaching experience are desirable. Applicants should submit a curriculum vitae, three letters of recommendation, and statements of teaching and research interests by January 7, 2000, to:

Mark Jacobs, Chair
Department of Biology
Swarthmore College
Swarthmore, PA 19081-1390

Swarthmore College is an Equal Opportunity Educator and Employer, and specifically invites and encourages applications from women and minorities.

ASSISTANT PROFESSOR

Tenure-track position in **Animal Diversity** in the Department of Zoology, Ohio Wesleyan University (**website: www.owu.edu/~news/jobs.htm**) starting August 2000. Teaching responsibilities include introductory zoology and advanced courses in invertebrate zoology, marine biology, and conservation biology over a two-year cycle. A Ph.D., evidence of excellence in undergraduate teaching, and a commitment to undergraduate research are required. Applicants should mail a statement of teaching and research interests, curriculum vitae, transcripts, up to five reprints, and arrange to have sent three letters of recommendaton to: **Dr. John Gatz, Department of Zoology, Ohio Wesleyan University, Delaware, OH 43015-2398** by January 7, 2000. *Ohio Wesleyan University is an Affirmative Action/Equal Opportunitiy Employer. Women and minorities are encouraged to apply.*

POSITIONS OPEN

IMMUNOLOGIST
The Ben May Institute for Cancer Research
The University of Chicago

The University of Chicago is seeking applicants for a tenure-track position at the **ASSISTANT PROFESSOR** level. The Ben May Institute for Cancer Research (BMICR) is a basic research unit that for 46 years has been committed to the study of cancer and immunology. The current faculty is committed to an interdisciplinary approach using established and newly-emerging biochemical, genetic, molecular, and structural biological tools to attack basic problems in cancer biology and immunology. We are seeking outstanding individuals interested in diverse aspects of immunology including, but not limited to: signal transduction, molecular immunology, and immunotherapy. The BMICR is closely interfaced with the University of Chicago Gwen Knapp Center for Lupus and Immunology Research. Additionally, the BMICR is closely affiliated with the graduate degree-granting Committees on Immunology, Virology, and the graduate program in Pathology. Candidates should have sufficient research experience to demonstrate both significant accomplishments and outstanding potential. Curriculum vitae, bibliography, a brief statement of research interest, and three letters of recommendation should be sent to: **Jeffrey Bluestone, Chairman, Faculty Search Committee, Ben May Institute for Cancer Research, 5841 South Maryland Avenue, MC6027, Chicago, IL 60637.** *Affirmative Action/Equal Opportunity Employer.*

CANCER BIOLOGIST
The Ben May Institute for Cancer Research
The University of Chicago

The University of Chicago is seeking applicants for a tenure-track position at the **ASSISTANT PROFESSOR** level. The Ben May Institute for Cancer Research (BMICR) is a basic research unit that for 46 years has been committed to the study of basic mechanisms of cancer. The current faculty is committed to an interdisciplinary approach using established and newly emerging biochemical, genetic, molecular and structural biological tools to attack basic problems in cancer biology. We are seeking outstanding individuals interested in diverse aspects of cancer biology including, but not limited to: cell growth and differentiation, signal transduction and structural biology. The BMICR is closely interfaced with the University of Chicago National Cancer Institute-designated Comprehensive Cancer Center and the University of Chicago Center for Molecular Oncology. Additionally, the BMICR is closely affiliated with the graduate degree-granting Committee on Cancer Biology. Candidates should have sufficient research experience to demonstrate both significant accomplishments and outstanding potential. Curriculum vitae, bibliography, a brief statement of research interest and three letters of recommendation should be sent to: **Marsha Rosner, Chairman, Faculty Search Committee, The Ben May Institute for Cancer Research, 5841 South Maryland Avenue, MC6027, Chicago, IL 60637.** *Affirmative Action/Equal Opportunity Employer.*

CELL BIOLOGY/MOLECULAR BIOLOGY

The Biology Department at Queens College of The City University of New York seeks a tenure-track **ASSISTANT PROFESSOR**, beginning September 2000. We seek a candidate with a doctoral degree, postdoctoral experience, and a record of research achievement in the areas of cell biology and/or molecular biology. Responsibilities will include establishment of an active research program and teaching at the undergraduate and M.A./Ph.D. level. Salary range will be $32,703–$57,049. Send letter detailing research/future plans, curriculum vitae, and arrange for submission of three letters of recommendation. Complete applications, including letters of recommendation, must be received by January 25, 2000. Send to: **Dr. Corinne A. Michels, Chair, Search Committee, Department of Biology, Queens College of CUNY, Flushing, NY 11367-1597.**

A **postdoctoral Scientist** position is available at the **University of Wisconsin** to study the mechanisms by which the microtubule arrays of the neuron are established. The work will involve all aspects of executing experiments to elucidate the cellular and molecular mechanisms by which the microtubule arrays of the neuron are established during neuronal development. This will require primary cell culture of vertebrate neurons, and a battery of microscopic assays including electron microscopy, immunocytochemistry, and live-cell imaging.

The successful candidate will bring to the laboratory expertise in biochemistry and molecular biology, and these techniques will also be applied to the studies on neuronal microtubules. The position will involve formulating research questions, designing and executing the necessary experiments to resolve the questions, interpreting data and preparing research articles for publication. **Requirements include:** Ph.D. in Cell and Molecular Biology, Developmental Biology, Neurosciences, or other related biological science area; and expertise in microscopy or molecular biology. A period of evaluation will be required. The minimum salary is $31,200 annually with excellent fringe benefits. Actual salary will depend on qualifications.

Please submit resume and cover letter referring to **Position Vacancy Listing #35862 by December 30, 1999, to Dr. Peter W. Baas, The University of Wisconsin, 332 SMI, 1300 University Avenue, Madison, WI 53706-1532.** Applications may also be faxed to 608-262-7306 or sent via email to pwbaas@facstaff.wisc.edu by December 30, 1999.

Associate Scientist, Fluorescence Instrumentation Specialist

Merck Research Laboratories, a division of **Merck and Co., Inc.** and a world leader in biological and pharmaceutical research, is currently seeking a full-time **Associate Scientist, Fluorescence Instrumentation Specialist** to join our Fluorescence Cell Analysis Facility in **Rahway, NJ** (approximately 25 miles from New York City).

The successful applicant will be part of a centralized team which focuses sophisticated fluorescence technologies on drug discovery. You will support high throughput screening programs and basic research investigations through flow cytometry, or cell-based screening through fluorescence imaging. The flow cytometry will involve fluorescence-activated cell sorting as well as multi-parameter flow cytometry. Specific duties include the implementation of sorting protocols as well as the operation/maintenance of an 8 parameter FACStar Plus Cell Sorter and/or other B-D flow cytometers. Cell-based screening will entail the development and implementation of fluorescent imaging screening protocols and the operation/maintenance of a microscope screening system. Both roles require interaction with external collaborators as well as investigators who utilize the facility.

A minimum of a B.S. in Biology, Biochemistry, Computer Science or a related field is required. Applicants with advanced degrees will also be considered. 3-5 years' experience in the application of fluorescence flow cytometry and cell sorting or microscope-based imaging to biological problems and excellent computer skills are also required. In addition, computer literacy with 1 or more of the following platforms is essential: VAX™/Open VMS™, PC/Windows NT™, Macintosh™/MAC OS™ or HP™/Pascal.

Merck is committed to providing employees with a stimulating work environment, as well as a competitive salary and benefits package. For consideration, please forward your resume and a cover letter, including salary requirements, to: **Merck Research Laboratories, Ad# 113, P.O. Box 2000, RY80-A3, Rahway, New Jersey 07065.** We are an Equal Opportunity Employer, M/F/D/V.

1999 FORTUNE America's Most Admired Companies

www.merck.com MERCK

St. Jude Children's Research Hospital
ALSAC • Danny Thomas, Founder

POSTDOCTORAL POSITION

A postdoctoral position is available immediately to participate in an established research program studying the role of DNA repair functions in sensitivity to anti-cancer drugs. Candidates with a recent Ph.D. degree interested in applying molecular, genetic, and biochemical apporaches to DNA repair are encouraged to apply. Experience in molecular biology is required, experience with proteins involved in nucleic acid metabolism would be a distinct advantage. Interested applicants should submit their curriculum vitae, and names of three references to:

John L. Nitiss
Molecular Pharmacology Department
St. Jude Children's Research Hospital
332 N. Lauderdale
Memphis, TN 38105
E-mail: john.nitiss@stjude.org

EO/AAE

COURSES & TRAINING

Traineeships in Oceanography for Minority Undergraduates

The Woods Hole Oceanographic Institution offers special educational opportunities in oceanography for minority undergraduate U.S. citizens or permanent residents. These awards are designed to provide training and research experience in Woods Hole for students who have completed at least two semesters of undergraduate study in physical or natural science, mathematics, or engineering and have an interest in marine sciences, oceanographic engineering, or marine policy.

Traineeships may be awarded for a ten to twelve week period in the summer or for a semester during the academic year and may be renewed the following year. The Trainee is paid a stipend of $335 per week, plus a round trip travel allowance from their home school or university to Woods Hole. This program is conducted with support from and in cooperation with the Woods Hole Field Center, U.S. Geological Survey.

Application deadline for Summer 2000 is February 15, 2000.

Application forms can be obtained from WHOI's website:
http://www.whoi.edu/education/
or write:

WOODS HOLE OCEANOGRAPHIC INSTITUTION

Education Office, MS #31
Woods Hole Oceanographic Institution
360 Woods Hole Road
Woods Hole, MA 02543-1541
or call (508) 289-2219
or email: education@whoi.edu

WOODS HOLE OCEANOGRAPHIC INSTITUTION 1930

An equal opportunity/affirmative action employer.

TENURE-TRACK POSITION
MOLECULAR AND CELLULAR BIOLOGY
PHARMACOLOGY/BIOCHEMISTRY

The Department of Basic Sciences and Oral Research at the University of Colorado School of Dentistry invites applications for a tenure-track position at the **ASSISTANT** or **ASSOCIATE PROFESSOR** level. Applicants should have a Ph.D. or equivalent degree with postdoctoral research experience in the area of molecular biology, biochemistry, and/or molecular pharmacology. Individuals with research interests in the signal transduction pathways involved in mammalian developmental biology, cell growth, and differentiation and/or programmed cell death should apply. Prior teaching experience is desirable. The successful applicant will be expected to develop an externally funded research program and contribute to the teaching program at the graduate and undergraduate level. Joint appointment will be available to a suitable applicant in the Departments of Biochemistry and Molecular Genetics, Pharmacology, or Cellular and Structural Biology, in the School of Medicine. Applicants should submit curriculum vitae, brief description of research interests, reprints, and three letters of reference forwarded to:

Chair, Faculty Search Committee
Department of Basic Sciences and Oral Research
University of Colorado School of Dentistry
4200 East 9th Avenue, C-286
Denver, CO 80262

For full consideration completed applications should be received by December 20, 1999.

The University of Colorado Health Sciences Center is committed to Equal Opportunity and Affirmative Action.

ASSISTANT RESEARCH BIOCHEMIST

An Assistant Researcher in Biochemistry/Molecular Biology will be hired at 60 percent time for one year to carry out molecular biological and biochemical studies of HIV transcriptional regulation. Qualifications: Ph.D. in biochemistry or molecular biology. Considerable postdoctoral experience and demonstrated knowledge in biochemistry of transcriptional regulation and viral gene expression. Salary range: $51,500–$67,400. Send résumé, description of research experience, and bibliography by December 26, 1999, to: **Dr. Qiang Zhou, Department of Molecular and Cell Biology, University of California, 229 Stanley Hall, #3206, Berkeley, CA 94720-3206.** *The University of California is an Equal Opportunity/Affirmative Action Employer.*

POSTDOCTORAL POSITIONS IN AIRWAY CELL PHYSIOLOGY AND DISEASE
Department of Physiology
University of Massachusetts Medical School

Two postdoctoral positions (NIH funding) are available for two years, to study 1) the role of intercellular Ca^{2+} signaling between airway epithelial and smooth muscle cells in asthma and 2) the regulation and dysfunction of airway mucociliary activity in cystic fibrosis. Experience in microscopy, Ca^{2+} imaging, electrophysiology, tissue culture, and molecular biology desirable. Details at: **website: http://www.ummed.edu/dept/sanderson.lab**. Send curriculum vitae and statement of interests to: **Dr. Michael J. Sanderson, Department of Physiology, University of Massachusetts Medical School, 55 Lake Avenue North, Worcester, MA, 01655.**

POSTDOCTORAL POSITION available for study of molecular biology of pain and analgesia. NIH-funded laboratory investigating receptor mechanisms underlying neural plasticity associated with chronic pain and gender differences in analgesia. Qualified applicants will have a Ph.D. with fewer than three years postdoctoral experience and published experience with quantitative protein and mRNA analysis. Provide curriculum vitae and three references to: **Dr. James Eisenach, Professor of Anesthesiology, Wake Forest University School of Medicine, Winston-Salem, NC 27157-1009. E-mail: eisenach@wfubmc.edu** *Equal Employment Opportunity/Affirmative Action Employer.*

FACULTY POSITION
PHYSICAL GEOLOGY
SEDIMENTARY GEOLOGY
PALEONTOLOGY

Hobart and William Smith Colleges, private coordinate liberal arts colleges in the Finger Lakes region of upstate New York, seek a colleague to join the Department of Geoscience for the 2000–2001 academic year. This new colleague will be responsible for teaching introductory physical/environmental geology as well as courses in the field of sedimentary geology, historical geology and/or paleontology, depending on the candidate's expertise and the department's needs. Departmental faculty assume leadership roles in the College's Environmental Studies Program. Faculty members in the Department are research-active and strongly encourage undergraduate research. The teaching load is five course-units (laboratories count 1/2 unit) over a two-semester academic year. The position is not tenure-track. The Colleges are located at the north end of Seneca Lake, largest of New York's Finger Lakes. Research by faculty and students on Seneca Lake, Lake Ontario, and other Finger Lakes accessible via the New York State Barge Canal System is possible with the College's well-equipped, 65-foot research vessel, the HWS EXPLORER. For further information see our **website: www.hws.edu/aca/depts/geo**. Applicants are to send a letter of application and curriculum vitae and arrange for three letters of recommendation to be sent (e-mail applications will not be considered). Review of applications will begin on February 1, 2000. All correspondence should be sent to:

William F. Ahrnsbrak, Chair
Geoscience Department
Hobart and William Smith Colleges
Geneva, NY 14456
Telephone: 315-781-3603
FAX: 315-781-3860
E-mail: ahrnsbrak@hws.edu

The Colleges actively seek applications from women, minorities and other underrepresented groups and do not discriminate on the grounds of race, color, religion, sex, marital status, national origin, age, disability, veteran's status, or sexual orientation.

FACULTY POSITION IN APPLIED PHYSICS
California Institute of Technology

The Applied Physics program at Caltech invites applications for a tenure-track position as **ASSISTANT PROFESSOR**. We are interested in highly qualified candidates who are committed to research and teaching in areas in which fundamental physical principles are applied to important technological problems. The initial term of appointment is normally for four years, and appointment is contingent upon completion of a Ph.D. Interested candidates should submit a résumé, publication list, and a less-than-five-page research prospectus via electronic submission. Please attach your résumé/prospectus subject file in an e-mail addressed to: **haa@daedalus.caltech.edu**—make the e-mail subject **"aphcit search"** and use your name as the résumé/prospectus file name. Submissions of Adobe *.pdf files is encouraged; however, Word 5.x, 6.x, 98 for Mac or Word 95, 6.x and 7.x for Windows will be accepted. Applications will be accepted through January 15, 2000. Applicants should also complete the registration form at the **website: http://www.cco.caltech.edu/~aphhome/register.html.** *Caltech is an Equal Opportunity/Affirmative Action Employer. Women, minorities, veterans and disabled persons are encouraged to apply.*

POSTDOCTORAL POSITION to study 1) molecular genetics of replication in the immunoglobulin heavy chain locus in relation to nuclear organization, gene expression and gene rearrangement during B cell development 2) replication of the genomes of human oncogenic viruses such as Epstein-Barr virus. Apply by mail and FAX copy to: **Dr. C. Schildkraut, Cell Biology, Albert Einstein College of Medicine, 1300 Morris Park Avenue, New York, NY 10461; FAX: 718-430-8574; e-mail: schildkr@aecom.yu.edu.** *Equal Opportunity Employer.*

MARINE SCIENTIST
ECOLOGICAL MODELER

The Dauphin Island Sea Lab (DISL), the marine research and teaching facility for 22 colleges and universities in the state of Alabama, is seeking a marine scientist with experience in mathematical and/or simulation modeling at the population and/or ecosystem level. Relevant experience could include, for example, research on dynamics of fish populations, metapopulation dynamics, nutrient and energy flux through marine and estuarine food webs, and larval transport processes. The ability to work collaboratively with a faculty of nine marine ecologists and oceanographers is essential, and opportunities exist to join ongoing projects. This position will likely be filled at the **ASSISTANT/ASSOCIATE PROFESSOR** level, with salary provided for 10 months per year. The successful applicant will be expected to develop an independent research program and must demonstrate strong potential for attracting extramural funding. Competitive research start-up funds will be available. Teaching responsibilities normally will include two courses per year at the undergraduate/graduate level. DISL faculty are expected to seek graduate faculty appointments at one (or more) of the DISL member universities. The DISL is a 36-acre campus 35 miles south of Mobile, Alabama, where teaching and research are supported by numerous research vessels (14′–65′), a newly renovated flowing seawater laboratory, a comprehensive library, and modern laboratory and analytical facilities. Applicants should send a curriculum vitae, a brief statement of teaching and research interests, two to three selected reprints, and the names and contact information (including e-mail addresses) of three references to: **Dr. James H. Cowan, Jr., Chair, Marine Scientist Search Committee, Dauphin Island Sea Lab, 101 Bienville Boulevard, Dauphin Island, AL 36528**. Further information is available at **website: http://www.disl.org**. Review of applications will begin 1 February, 2000, and continue until the position is filled. *The DISL is an Equal Opportunity Employment/Affirmative Action/Minorities/Females/Disabled Employer.*

POSTDOCTORAL POSITION available immediately in the Immunogenetics Laboratory, Department of Pathology, University of California, Los Angeles. The project involves the study of MHC class I signal transduction in human endothelial cells and smooth muscle cells. Specific areas of investigation include *in-vitro* and *in-vivo* characterization of class I mediated alterations in endothelium and smooth muscle intracellular signaling pathways. Candidates should have a recent Ph.D. degree in Biochemistry, Cell Biology, or a related discipline and skill in signal transduction and protein characterization. Send curriculum vitae, statement of research interests, and names of three references to: **Dr. Elaine Reed, Professor, Department of Pathology, UCLA School of Medicine, 950 Veteran Avenue, Los Angeles, CA 90095. E-mail: ereed@mednet.ucla.edu. Telephone: 310-825-7651. FAX: 310-206-3216.** *UCLA is an Equal Opportunity/Affirmative Action Employer.*

MARINE BIOLOGIST

Full-time, tenure-line **ASSISTANT PROFESSOR**; begins Fall Term 2000. Teach three undergraduate courses and associated laboratories annually, to include a freshman-level Evolution and Diversity of Life course and an advanced course in area of specialty. Initiate and maintain a research program involving undergraduates. Ph.D., expertise in marine biology, and commitment to undergraduate teaching and research required; postdoctoral experience preferred. Individuals with expertise in marine plants are especially encouraged to apply. Area of formal training can include, but is not limited to, morphology, ecology, evolution, conservation biology, physiology, or systematics. To apply, submit interest letter, curriculum vitae, statement of teaching philosophy, course descriptions and research interests, and three reference letters by December 15, 1999 (*extended closing date*) to: **Marine Biology Search, University of Puget Sound, P.O. Box 7297, Tacoma, WA 98407.** *An Equal Opportunity, Affirmative Action Educator/Employer.*

CALIFORNIA AIR RESOURCES BOARD
CHIEF, RESEARCH DIVISION
SACRAMENTO
$77,160-93,552 PLUS BENEFITS

The California Air Resources Board is seeking a highly qualified candidate to manage the staff and activities of the ARB Research Program. The mission of the Research Division is to provide sound scientific information for actions to protect people and the environment from the effects of air pollution. The Division oversees and sponsors air pollution research, recommends health standards, and provides technical and policy advice. The position manages a staff of 50 research staff members and a research budget of $13 million, $9 million of which is for extramural research.

QUALIFICATIONS

Equivalent to graduation from college with major work in engineering, mathematics, physical, biological, environmental sciences or related field; and

Broad extensive and varied experience in conducting or directing research in the engineering, physical, biological, or environmental sciences, at least four years involving supervision or consultation on major programs or complex projects in either a working or academic setting; and

Ability to work in a governmental agency, network with the scientific community, and communicate complicated scientific concepts in public forums. An advanced degree is also highly desirable.

HOW TO APPLY

1. File an application with the Air Resources Board, attention: **Kathy Hallett, P.O. Box 2815, Sacramento, CA 95812**
2. For more information, call (916) 323-4957 or E-mail **-khallett@arb.ca.gov**
3. For more information about ARB: **www.arb.ca.gov**

AN EQUAL OPPORTUNITY EMPLOYER - STATE OF CALIFORNIA

POPULATION ECOLOGIST
The University of Michigan
Assistant Professor

The Department of Biology solicits applications for a faculty position in the area of population ecology. We seek an individual whose primary research interests may include, but are not limited to, metapopulation dynamics, spatial processes, non-linear dynamics and/or analyses of structured populations. Individuals familiar with a variety of research techniques at both the theoretical and empirical levels and with a strong field component in their research will be preferred. A Ph.D. in an appropriate area is required and postdoctoral experience strongly encouraged. The successful candidate will join an active group of ecologists and evolutionary biologists interested in a variety of fundamental questions about Ecology, Evolution, and Organismal Biology. In addition to establishing a successful research program, the candidate must participate in the undergraduate and graduate teaching programs of the Department.

To apply, send a curriculum vitae, a letter summarizing teaching and research interests and future research plans, copies of publications, and arrange to have three letters of reference sent by January 10, 2000 directly to:

Chair, Population Ecologist Search Committee
Department of Biology
University of Michigan
Ann Arbor, MI 48109-1048

The starting date for the position is September 1, 2000.

The University of Michigan is an affirmative action, equal opportunity employer.

UNIVERSITY OF CALIFORNIA, SANTA CRUZ

Nominations and applications are invited for the position of

Dean
Jack Baskin School of Engineering

Situated on the edge of Silicon Valley, The Jack Baskin School of Engineering (http://www.cse.ucsc.edu) was established in 1997 to provide research programs and curricula in computer and communications related disciplines, as well as emerging technologies, and to enable the University of California to respond to the changing demands of society and the high-tech global marketplace. Over the next decade, the School of Engineering is poised to grow nearly three-fold from its current base of four academic programs (Comp. Sci., Comp. Eng., Applied Math., and Elec. Eng.), and 33 faculty.

The Dean will provide the intellectual, academic, and administrative leadership in the instructional and research mission of the School of Engineering and the planned growth of new programs. The successful candidate must possess an outstanding record of teaching and scholarly achievement appropriate for appointment as a full Professor in the UC system and demonstrated achievement in establishing successful partnerships with industry, government and other institutions of higher education.

For a detailed description, see **http://www2.ucsc.edu/ahr/soe.html.** Review of applications and nominations will start 2/1/2000. The position will remain open until filled.

UCSC is an EEO/AA employer.

UNIVERSITY OF CALIFORNIA, SANTA CRUZ

The University of California at Santa Cruz invites nominations and applications for the newly created position of

Vice Chancellor of Research (VCR)

As a member of the Chancellor's Cabinet, the VCR provides the executive leadership to maintain and strengthen the institution's research excellence and infrastructure. This position is an unprecedented opportunity for an individual with vision and creativity to build on existing excellence and expand UCSC's capacity for innovative, inter-disciplinary, and large-scale programs.

The Santa Cruz campus of the University of California has long been recognized as an outstanding research university with an uncommon commitment to undergraduate education. UCSC is the site of the newly established NSF Science and Technology Center in Adaptive Optics, and home to outstanding organized and multi-campus research units and centers of focused research activity. Over the past decade annual grants and contracts funding to the campus has increased 255% to its current level of $51 million. This growth is expected to continue due to planned increases in student enrollment, expansion of campus facilities and addition of faculty.

The successful candidate must possess a strong record of leadership in research and scholarship, as well as demonstrated experience in research administration, the development of collaborative research ventures, and the ability to work with state and federal agencies and other research sponsors. The VCR must have the academic credentials appropriate for appointment as a full Professor in the UC system.

For a detailed description and application guidelines, see **http://www2.ucsc.edu/ahr/vcr.html**. Review of applications will start 2/1/2000. The position will remain open until filled.

UCSC is an EEO/AA employer.

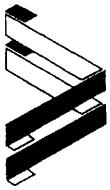
David and Lucile Packard Chair in Material Science

Howard University's College of Engineering, Architecture and Computer Sciences (CEACS) invites nominations and applications for the David and Lucile Packard Chair in Material Science. The Chair holder will have his or her appointment in one of the academic departments in the School of Engineering and Computer Sciences. The College of Engineering, Architecture and Computer Sciences has a strong multi-disciplinary research effort in material science and engineering with emphases in electronics, electro-optic materials and devices which resides in Howard's Materials Science Research Center of Excellence. The position requires an individual whose research and vision bridges theoretical, experimental, and computational aspects of materials science and engineering. The holder of the Packard Chair is expected to play a major role in facilitating communications across traditional disciplinary lines both within the College of Engineering, Architecture and Computer Sciences and University-wide to identify and develop new growth areas in material science research and lead initiatives in those areas.

The College of Engineering, Architecture and Computer Sciences offers ABET accredited programs leading to the bachelor's degree in chemical engineering, civil engineering, electrical engineering, and mechanical engineering. The College's program in systems and computer science offers a bachelor degree that is accredited by CSAB. All programs in the College of Engineering, Architecture and Computer Sciences offer graduate programs at the master's level and the Departments of Electrical and Mechanical Engineering offer the Doctor of Philosophy. Non-traditional interdisciplinary graduate programs in material science and atmospheric sciences are offered in the Howard University Graduate School. The holder of the David and Lucile Packard Chair will be expected to contribute to educational excellence in the College of Engineering, Architecture and Computer Sciences in both undergraduate and graduate programs.

Candidates for the Chair must hold a Doctorate in materials engineering, materials science, or a closely related engineering or science field. Credentials in research, education, and resource development should be suitable to warrant an appointment at the rank of full professor. Person selected will be expected to assume the Chair by August 2000.

Nominations and applications should be sent to: **Dr. Lorraine N. Fleming, Chair, David and Lucile Packard Chair Search Committee, College of Engineering, Architecture and Computer Sciences, Howard University, 2300 Sixth Street NW, Washington, D.C. 20059**. Applicants should send a letter of interest along with a complete resume and the names, addresses and phone numbers of four references whom we may contact. For maximum consideration, apply by January 7, 2000. Thereafter applications will be accepted until the position is filled. Howard University is an Affirmative Action, Equal Opportunity Employer. Highly qualified candidates from academia, industry, and research laboratories are encouraged to apply.



THE UNIVERSITY OF MANCHESTER
SCHOOL OF BIOLOGICAL SCIENCES

The School is one of the largest and most successful University Biological Sciences Departments in Europe and there is a strong culture of interdisciplinary interactions at all levels of research and teaching. As part of our continuing recruitment programme, we intend to make a further 12 'tenure track' appointments. If appointed, you will join 30 staff recruited in the last 3 years, more than half of whom came to us from outside the UK.

CHAIR IN PHYSIOLOGICAL SCIENCES

(Ref: 863/99)

Preference will be given to applicants who can integrate molecular, cellular and physiological studies, preferably in one of the areas listed in the box on the right. We are looking for someone with leadership qualities and an excellent research record.

For more information please contact Professor Arthur Weston. E-mail: arthur.weston@man.ac.uk

LECTURESHIPS/SENIOR LECTURESHIPS IN PHYSIOLOGY, PHARMACOLOGY AND NEUROSCIENCE

(Ref: 864/99)

We are particularly interested in the following fields:

- Cell death and survival
- Channels and transporters
- Neuroendocrinology and neuroimmunology
- Receptors and signalling

For more information please contact Professor Nancy Rothwell. E-mail: nancy.rothwell@man.ac.uk

LECTURESHIPS/SENIOR LECTURESHIPS IN BIOLOGICAL SCIENCES

(Ref: 864/99)

We are seeking applicants in any area of biomedical/biological sciences but are particularly interested in:

- Developmental biology
- Functional neuroanatomy
- Genetics
- Host responses to infection
- Microbial pathogenicity
- Tissue engineering

For more information please contact Professor Mike Grant. E-mail: michael.grant@man.ac.uk

LECTURESHIPS FOR BIOLOGISTS IN THE EARLY STAGE OF THEIR CAREERS

(Ref: 864/99)

We encourage applications from biologists researching any aspects of the subject who have up to about six years' post-doctoral experience or who hold individual Fellowships or Career Development Awards.

For more information please contact Professor Mike Grant. E-mail: michael.grant@man.ac.uk

The Lecturer and Senior Lecturer salary ranges and the Professorial minimum are currently £17,238 - £30,065, £31,563 to £35,670 and £36,401 respectively.

Information on the School and details of how to apply can be found on http://www.biomed.man.ac.uk

Application forms and further particulars are available from the Office of the Director of Personnel, The University of Manchester, Oxford Road, Manchester M13 9PL. Tel: +44(0)161 275 2028; E-mail: personnel@man.ac.uk

Closing date: 1 February 2000. Please quote appropriate reference number.

NEURODEGENERATIVE DISEASE RESEARCH FACULTY POSITION

UNIVERSITY OF WISCONSIN-MADISON

The University of Wisconsin-Madison's Waisman Center is currently constructing a $23 million building to accommodate an expansion of its research programs in innovative gene and cell-based therapies for neurodegenerative diseases, scheduled for completion in July 2000. This expansion will support the recruitment of up to four new physicians and basic scientists over the next two years in concert with the Department of Neurology or related departments of the UW-Medical School. As part of this new initiative, we invite applications for the first of these tenure-track faculty positions at the Associate Professor or Professor level, to start after July 1, 2000.

For this initial recruitment, we anticipate that the individual will provide leadership to a new program in the discovery and early development of innovative gene and cell-based therapies for neurodegenerative diseases, such as Parkinson's and Alzheimer's diseases. This individual will join a growing biomedical research community in neuroscience research at UW-Madison, and will guide program development, including participation in the recruitment of additional faculty. The incumbent will occupy state-of-the-art laboratory research and office space in the Waisman Center's new addition. This new building offers new research laboratories as well as highly-specialized support facilities including a cleanroom manufacturing facility for the production of biopharmaceuticals for Phase I and II human clinical trials, and a functional imaging center with both PET and fMRI scanning technologies. The Waisman Center is the largest interdisciplinary research center in the Graduate School of the UW-Madison and conducts research in areas related to human development in the biological and behavioral sciences.

The academic appointment will be in the Department of Neurology or related departments of the UW-Madison's Medical School. Appropriate background may be M.D., Ph.D., or M.D./Ph.D., with responsibilities including research, teaching in undergraduate, graduate and professional programs, and other activities commensurate with background and experience. The successful candidate should have a strong, externally funded research program in molecular biology and/or molecular and cellular pathogenesis of neurodegenerative disease, with an interest in developing experimental biological therapeutics, and strong publications record. The research focus of this position will imbue strong elements of translational research in a very multi-disciplinary program.

Submit curriculum vitae, a summary of research program goals, and three references by January 15, 2000 to:

Thomas Sutula, Co-Chair, Search Committee
Rm H6/570 Clinical Sciences Center
600 Highland Ave
Madison, WI, 53792 (sutula@neurology.wisc.edu)

or

Terrence R. Dolan, Co-chair, Search Committee
Rm. 827 Waisman Center
1500 Highland Ave
Madison WI 53705 (dolan@waisman.wisc.edu)

Note: Unless confidentiality is requested in writing, information regarding the names of applicants must be released upon request. Finalists cannot be guaranteed confidentiality. UW-Madison is an equal opportunity / affirmative action employer.

GLOBAL OPPORTUNITIES

AMS Science and Industry

ANSTO is seeking a scientist of international reputation to be appointed as Leader of the Accelerator Mass Spectrometry (AMS) Group in the Physics Division.

The successful applicant should have demonstrated:

- International reputation in a relevant area of scientific research
- Knowledge of accelerator mass spectrometry and its applications
- Leadership ability to inspire scientists and support staff to be creative and output oriented
- Facilitation and negotiation skills
- Capacity to manage teams of people involved in providing research and services.

ANSTO operates the ANTARES AMS facility, providing ultrasensitive analysis of the long-lived radioisotopes carbon-14, beryllium-10, aluminium-26, chlorine-36 and iodine-129 for Australian and International researchers. A facility dedicated to the analyses of uranium-236 and other rare actinide isotopes has just become operational. More than a thousand radiocarbon samples are analysed every year, many related to the research program of 36 Australian universities, coordinated by the Australian Institute of Nuclear Science and Engineering.

The AMS Group aims to cooperate with the International Atomic Energy Agency and the Australian Safeguards Office in nuclear safeguards. AMS isotopes are also measured, in cooperation with other ANSTO Divisions, in support of national research programs, such as investigations of global climate change and environmental pathway analysis. To this extent experience in application of carbon-14 analyses would be welcomed.

A key focus of the role will be to create research alliances with industry, academia and other research institutions, both in Australia and overseas to expand the effective use of AMS.

The position may be offered on a permanent or term basis.

Applications close 14 January 2000.

Selection criteria and further details can be obtained by accessing our Home Page on http://www.ansto.gov.au or by contacting Mrs Cherylie Thorn on +61 2 9717 9039 or by e-mail cxt@ansto.gov.au

Applications based on the selection criteria, giving the names of at least three referees should be forwarded to Mrs Cherylie Thorn, Physics Division, ANSTO, PMB 1, Menai, NSW 2234 Australia.

http://www.ansto.gov.au

Nuclear Science and Technology...benefiting all Australians

ANSTO is an Equal Opportunity Employer. **We provide a smoke-free working environment.**

ansto
Australian Nuclear Science & Technology Organisation

DIRECTOR, MRC INSTITUTE FOR ENVIRONMENT AND HEALTH

MRC Medical Research Council

***We invite applications from scientists of exceptional ability and international standing to lead the* MRC Institute for Environment and Health.**

The Institute was established in Leicester in 1993 and fulfils a valuable advisory role to Government Departments, publishing policy-influencing reviews on a wide range of topics such as air pollution, endocrine disrupters, food and diet, human exposure and risk assessment. The new Director will strengthen the Institute's position in environment and health research in the UK and internationally.

The Director will be pro-active in identifying new research priorities in the field and will be expected to organise an integrated programme of research ranging from basic science through to epidemiological studies. The scope of research undertaken at the Institute is expected to focus on 3-4 areas, although these might encompass such diverse issues as environmental chemicals and pathogens, gene-environment interactions, urban status and variations in human susceptibility. It is envisaged that the Director will also establish a network of national or international experts to expand the Institute's expertise and cover a wider range of environment and health issues.

The Director should be an outstanding scientist with the vision and breadth of understanding to identify key issues in environment and health, as well as the leadership skills necessary to organise in-house and collaborative research on a wide range of issues. The candidate should also have experience or aptitude to manage several research programmes, possibly outside of his/her own field, as well as the substantial review programme that the Institute currently undertakes. Previous experience in research related to environment and health and plans to continue as an active scientist in your preferred field are essential. You should also show a strong commitment to improving methods for environmental health research, to working interactively with other research groups and funding partners, and to communicating effectively your findings nationally and internationally. Previous experience of working with Government departments and medical practitioners is desirable.

For further information and to discuss your interest in strict confidence, please contact

Dr Kevin Young, Euromedica plc. 7 Heron Quays, Docklands, London E14 4JB. UK
Telephone 44-(0)171 536 7950. Fax 44-(0)171 538 8362. E-mail: kevinyoung@euromedica.com

MICROBIAL DIVERSITY
JUNE 11 – JULY 27, 2000

MARINE BIOLOGICAL LABORATORY

An intensive six-and-a-half-week course for graduate or postdoctoral students, as well as established investigators, who want to become competent in microbiological techniques for working with a broad range of microbes, and in approaches for recognizing both possible affinities of as yet uncultivated bacteria, and for understanding putative phylogenetic relationships. Limited to 20 students.

The course emphasizes that the great strength of microbiology lies in the diversity of microbial types that can be exploited for basic research in a wide range of scientific disciplines. Students will isolate and cultivate characteristic microbial types from various marine, fresh water, animal, and plant habitats and initiate research projects with selected isolates.

This course is supported in part by grants from the Office of Naval Research, the U.S. Department of Energy, and the Foundation for Microbiology.

Directors: Caroline Harwood, University of Iowa, and Alfred Spormann, Stanford University

Application Deadline: March 1, 2000

Tuition: $3,900 *Scholarship assistance available*

Contact: Carol Hamel, Admissions Coordinator
Marine Biological Laboratory
7 MBL Street / Woods Hole, MA 02543
(508) 289-7401 / admissions@mbl.edu

VISIT COURSES.MBL.EDU

The MBL is an EEO/Affirmative Action Institution

Edit a leader

Editor Current Biology

Elsevier Science London is a young, progressive and rapidly expanding division of the Reed Elsevier Group. Developing a variety of print and online information for the global life sciences market, including Current Opinions, Trends journals and BioMedNet, we provide a valuable resource for the world's scientific community.

ELSEVIER SCIENCE LONDON

Current Biology is one of our leading publications - a pioneering presence in the life sciences field, with an impressive record of publishing ground-breaking research and comment, both in print and online. To continue in this mould, we need a proven editor with the character and experience to take on this senior role.

As the Editor, you'll have overall control of Current Biology's content and should be an experienced leader, with the ability to motivate a dedicated editorial team. You'll also need the drive to take advantage of leading edge technology and add to the journal's online presence.

As well as extensive editorial experience, you'll need a passion for, and thorough knowledge of, life sciences - particularly biomedical research. With excellent contacts throughout the international scientific community, you'll have the presence to represent the journal globally and liaise with some of the world's leading scientists. Equally important will be the vision and energy you bring to strengthening Current Biology's reputation in an increasingly competitive market.

Based at our busy new offices in central London, you'll enjoy extensive global travel, as well as a competitive salary and benefits package.

To apply, please send your full CV stating your current salary details, to Karren Probyn, Elsevier Science London, 84 Theobald's Road, London WC1X 8RR. For informal enquiries, please email: karren.probyn@epress.co.uk

Closing date for applications is 17th December 1999.

www.current-biology.com

BIOLOGICAL FIELD STATION MANAGER. Grinnell College invites applications for the position of Manager of its biological field station, the Conard Environmental Research Area. Candidates should possess an appropriate master's degree, experience in restoration ecology, and a strong commitment to undergraduate liberal arts education. The Research Area, located in central Iowa 11 miles west of Grinnell, includes an on-site laboratory and a variety of natural areas, including mature upland forest, floodplain forest, restored savanna, and reconstructed tallgrass prairie. It is used extensively for undergraduate education and for student and faculty research. The new position of Manager coincides with the creation of the Center for Prairie Studies, a major effort by the College to promote multidisciplinary education, research, and public understanding of the North American Prairie. The Manager will help develop and conduct management and restoration projects, supervise a technician and student interns, and facilitate use of the field station by students, faculty, researchers, and other visitors. He or she will work closely with a Station Director in the Biology Department regarding biological education and research but will also report to the faculty Director of the Center for Prairie Studies. Founded in 1846, Grinnell College enrolls about 1,300 undergraduate students from every U.S. state (and the District of Columbia) and 40 other countries. The College's primary mission is to provide students with a broad, deep, and life-enhancing education. Additional information can be found at the College's **website: <www.grinnell.edu>**. To apply, send a letter of application, undergraduate and graduate transcripts, a curriculum vitae, and three letters of recommendation to: **Center for Prairie Studies, Professor Jonathan Andelson, Harry Hopkins House, 1131 Park Street, Grinnell College, Grinnell, IA 50112**. Direct questions to **e-mail: andelson@grinnell.edu**. Applications must be received by 3 January 2000 to be given full consideration. *Grinnell College is an Equal Opportunity/Affirmative Action Employer committed to employing a highly qualified staff which reflects the diversity of the nation. No applicant shall be discriminated against on the basis of race, national or ethnic origin, age, gender, sexual orientation, marital status, religion, creed, or disability.*

STAFF SCIENTIST POSITION
TITLE 42
Salivary Gland Development and Regeneration

Applications are invited for a Staff Scientist to conduct investigations into the molecular mechanisms involved in salivary gland development, differentiation, and regeneration at the National Institute of Dental and Craniofacial Research, National Institutes of Health, Bethesda, Maryland. The Staff Scientist position is a renewable, time-limited appointment, but is not tenured and does not have independent resources allocated for independent research projects. The applicant will have demonstrated ability to utilize cellular, biochemical, and molecular approaches to investigate salivary gland biology. The candidate will be expected to collaborate in developing a program to investigate the molecular details of the effects of the extracellular matrix and growth factors on salivary gland development, differentiation, and regeneration. Candidates must have a D.D.S., M.D., and/or a Ph.D. or the equivalent degree, as well as postdoctoral research experience working on the biochemistry and cell biology of salivary glands. Preference will be given to candidates demonstrating a strong, peer-reviewed publication record in these areas of research. The candidate will work under the supervision of a tenured investigator. Salary ranges from $58,027 to $75,433. If you wish to apply for this position, please submit a curriculum vitae and bibliography, a one-to-two page summary of research interests, and three current letters of recommendation from former preceptors or supervisors to the following address: **NIDCR Personnel Office, 31 Center Drive, MSC 2290, Building 31, Room 2C39, Bethesda, MD 20892-2290. Telephone: 301-496-6971**. Applications will be accepted until December 26, 1999. *NIH is an Equal Opportunity Employer.*

POSITIONS OPEN

Akkadix Corporation is a rapidly growing, agricultural biotechnology company focused on the discovery of novel strategies for crop improvement. We are seeking a prominent molecular geneticist to serve as **PROGRAM LEADER OF SIGNAL TRANSDUCTION**. This program is one of three internal research programs and is expected to grow significantly. It utilizes molecular genetics and functional genomics to manipulate signaling pathways that regulate plant growth, development, and responses to environmental signals. The successful candidate will have a proven track record in academia or industry in establishing and/or leading an internationally recognized and productive research program in some aspect of signal transduction. Evidence of productivity should include publications and/or patents. Akkadix offers a competitive package of compensation, health benefits, and 401K plan. We are located only minutes from the Pacific Ocean near the Scripps Research Institute, Salk Institute, and the University of California at San Diego. **Website: http://www.akkadix.com**. Applicants should send a cover letter indicating interest in position AKK046 and a curriculum vitae describing research experience, and names of three references to: **Akkadix Corporation, Attn: Human Resources, 11099 North Torrey Pines Road, Suite 200, La Jolla, CA 92037. FAX: 858-625-0158.**

MATERIALS SCIENCE/BIOMATERIALS
Brown University

The Division of Engineering at Brown University announces the opening of a tenure-track position in materials science in the area of biomaterials. The appointment may be made at the **ASSISTANT** or **ASSOCIATE PROFESSOR** level, depending on the qualifications of the candidate selected. Candidates for the associate rank should have substantial research experience beyond their doctoral dissertation. The appointment is expected to begin on September 1, 2000. The appointee will be expected to establish a strong research program in the field of biomaterials. Candidates in all areas of biomaterials are encouraged to apply. Research topics of particular interest include interfacial phenomena, functionalized and self-organized systems, bio-sensors, and tissue engineering. The appointee will also be expected to teach undergraduate and graduate courses in materials science and biomaterials, as well as contribute to the undergraduate core curriculum of the Division of Engineering. In addition, this person will be expected to make significant contributions to the development of the new Biomedical Engineering Initiative at Brown. Qualifications include a Ph.D. or equivalent degree, a background in materials science, and demonstrated research accomplishments in the field of biomaterials. Applicants should have the ability to make clear and effective presentations. Interested persons should send a complete résumé, including the names of at least three references to:

Professor Clyde L. Briant
Search Committee Chair
Division of Engineering
Box D, Brown University
Providence, RI 02912

To ensure full consideration, applicants should respond by January 15, 2000. *Brown University is an Equal Opportunity/Affirmative Action Employer. Women and members of minority groups are strongly encouraged to apply.*

POSITIONS OPEN

SUPERVISORY RESEARCH ENTOMOLOGIST/AGRONOMIST/SOIL SCIENTIST (RESEARCH LEADER), GS-14/15. The U.S. Department of Agriculture, Research, Education, and Economics, Agricultural Research Service, is recruiting a Research Leader for the Northern Grain Insects Research Laboratory at Brookings, South Dakota. The incumbent will be responsible for all aspects of the Laboratory management including: research on environmentally and economically sustainable cropping/pest management systems for corn, soybeans, and small grains; interaction with USDA administrators and cooperators in universities and industry. The incumbent will also maintain a personal research program in his/her area of specialty. The incumbent will supervise a staff of seven scientists and 18 support personnel, and several seasonal aids/technicians. U.S. citizenship is required. A Ph.D. is preferred. Salary is commensurate with experience ($67,298–$102,907 per annum). Comprehensive benefits package includes paid sick and annual leave, life and health insurance, and a savings and investment plan (401K-type) are available in addition to the federal retirement plan. For information on the research program and/or position contact: **Dr. Will Blackburn** at **Telephone: 970-229-5557** or via **e-mail: blackbuw@npa.ars.usda.gov**. A full copy of the vacancy announcement (#ARS-X0W-0047) is available on the Agricultural Research Service **website: www.ars.usda.gov**. Applications must be postmarked by the closing date. *USDA, ARS is an Equal Opportunity Provider and Employer.*

STAFF SCIENTIST: RESEARCH
Shriners Hospitals for
Children–Tampa

The Center for Research in Skeletal Development and Pediatric Orthopaedics has an opening for a research position at the **ASSISTANT, ASSOCIATE** or **SENIOR INVESTIGATOR** level. Rank and salary will be commensurate with accomplishments. This position carries with it generous laboratory space and start-up funds for equipment, supplies, and personnel. The Center is part of the Shriners Hospitals for Children–Tampa, and is located adjacent to the campus of the University of South Florida. A courtesy faculty appointment in a basic science department in the University's College of Medicine is available. The Center's **website** is: **<www.med.usf.edu/COM/SHC/>**. Applicants must have a Ph.D. or M.D., postdoctoral experience, excellent communication skills, and will maintain an independent research program. Individuals with expertise in molecular genetics, molecular biology, biochemistry, cell biology, developmental biology, vascular biology, or biomechanics and with research interests in the processes or genes involved in the growth, morphogenesis, or regeneration of musculoskeletal tissues are invited to apply. Applicants should submit a one-page statement of their research plans, a copy of their curriculum vitae, and contact information for four references to: **John R. Hassell, Ph.D., Director of Research and Search Committee Chair, Shriners Hospitals for Children, 12502 North Pine Drive, Tampa, FL 33612**. To ensure full consideration, applications must be received by February 1, 2000. *Equal Opportunity Employer. Alcohol/Drug-Free Workplace.*

BIOLOGY: ASSISTANT PROFESSOR, August 2000, **INVERTEBRATE ZOOLOGIST** to teach Invertebrate Zoology and Animal Biology courses. Ph.D. and strong commitment to undergraduate teaching and research required. Priority deadline January 24, 2000. Send inquiry to: **Chair, Department of Biology, University of Wisconsin–Eau Claire, Eau Claire, WI 54702-4004. E-mail: GLENNALE@UWEC.EDU. Telephone: 715-836-4166. FAX: 715-836-5089**. More information: **website: www.uwec.edu/Academic/Biology/biology.html.** *Equal Opportunity/Affirmative Action Employer.*

POSITIONS OPEN

COGNITIVE NEUROSCIENCE

The Department of Psychology at the University of Wisconsin-Milwaukee anticipates a tenure-track opening (pending budgetary approval) in Cognitive Neuroscience at the **ASSISTANT PROFESSOR** level for the fall of 2000. Candidates should have a background in experimental psychology and neuroscience, and significant postdoctoral research experience. Outstanding individuals with interests that complement existing efforts focused on the neurobiology of memory and human brain imaging are particularly encouraged to apply. Send a curriculum vitae, a statement of research interests, and three letters of recommendation before January 15, 2000, to: **Cognitive Neuroscience Search Committee, Department of Psychology, University of Wisconsin-Milwaukee, P.O. Box 413, Milwaukee, WI 53201**. The names of those applicants who have not requested that their identities be withheld and the names of all finalists will be released upon request. *The University of Wisconsin-Milwaukee is an Equal Opportunity Institution committed to diversity.*

RESEARCH ASSOCIATE

Research Associate position immediately available for an individual with expertise in small animal (mouse and rat) models of myocardial injury. The position will focus on the analysis of pro-inflammatory and muscle-specific gene expression in myocardium following injury and their correlation with myocardial remodeling. Experience with molecular techniques is an absolute necessity as are good interpersonal and writing skills. Academic appointment and salary will be commensurate with experience. Reply with curriculum vitae and supporting letters to: **Carlin S. Long, M.D., Chief, Cardiology Section, Denver Health Medical Center, 777 Bannock Street, Box 0960, Denver, CO 80204. FAX: 303-436-7739** or **e-mail: clong@dhha.org.**

DIRECTOR, SCIENTIFIC AFFAIRS AND MEDICAL COMMUNICATIONS

A highly visible position where the successful candidate will drive challenging activities in various therapeutic areas related to: project communications (CD-ROM, WWW, publications, presentations); participation in sales and speaker training and promotional efforts; symposia activities at national medical meetings; participate in speaker training meetings; related market, sales, and market research efforts; participation in development of pulmonary, allergy, or urology selected reviews. Requirements for this dynamic position include an M.D., or Ph.D. degree, scientific publications, several years' clinical or experimental research experience, and an outgoing personality. Position involves 10–30 percent travel. Interested candidates should mail, FAX, or e-mail résumé and cover letter to: **Human Resources Administrator, JC92, Sepracor, Inc., 111 Locke Drive, Marlborough, MA 01752. FAX: 508-357-7498. Website: www.resumes@sepracor.com.** *Equal Opportunity/Affirmative Action Employer.*

CHAIR, DEPARTMENT OF PHYSICAL SCIENCES

Barry University, a comprehensive Catholic university, seeks senior faculty (chemistry Ph.D.) as Chair beginning August 2000. Applicants should have commitment to undergraduate teaching (general chemistry and advanced courses in area of expertise); outstanding accomplishments in research with undergraduates; strong leadership and administrative abilities; and be creative and capable of building excellence in chemistry and physics. Send curriculum vitae, unofficial transcripts, three letters of recommendation, and statement of teaching philosophy, research plans, and administrative experience by January 15, 2000, to: **Search Committee, Department of Physical Sciences, Barry University, 11300 NE 2nd Avenue, Miami Shores, FL 33161**. See **website: http://www.barry.edu/artsci/phy_sci/chem4.html.**

POSITIONS OPEN

NEXtran

AN AFFILIATE OF BAXTER HEALTHCARE CORPORATION

SCIENTISTS

NEXTRAN, an affiliate of Baxter Healthcare and an established leader in xenotransplantation research, has two Ph.D. positions available at our Princeton, New Jersey location.

IMMUNOLOGIST: We are looking for an innovative Immunologist (Ph.D. with postdoctoral experience preferred) interested in investigating the unique immunological challenges that are presented by xenotransplantation. The successful candidate will join an active team that supports our preclinical transplantation program and is focused on research to control the immune response induced during pig-to-primate xenografts. Candidates with general expertise in B-cell activation or with experience in primate immunology are preferred, but all candidates will be considered. Responsibilities will be commensurate with experience.

VIROLOGIST: Extensive experience working with retroviruses (Ph.D. plus postdoctoral experience preferred), with proficiency in basic molecular biology and tissue culture techniques are required for this position. Incumbent will join an established group that is characterizing porcine endogenous retroviruses at the molecular and functional level.

NEXTRAN offers an excellent working environment along with competitive compensation and benefits. Please submit your curriculum vitae indicating the position you are applying for and your salary requirements to:

The Human Resources Manager
NEXTRAN
303B College Road East
Princeton, NJ 08540

DIRECTOR
Office of Research Integrity

The Office of Public Health and Science, U.S. Department of Health and Human Services, invites applications for the position of Director, Office of Research Integrity (ORI). ORI has the primary responsibility for the implementation of policies and procedures regarding research integrity and research misconduct in the extramural and intramural biomedical and behavioral research community. Scientists and doctors of medicine with a research or research administration background in university, institute, government, or private research organizations are encouraged to apply. Individuals with other combinations of biomedical skills may possibly also qualify. Current salary range is $110,351 to $125,900, with additional pay possible for physicians. The vacancy announcement and required technical qualifications are avilable at **website: www.psc.gov/spo/ex0799.shtml** or **Telephone: 202-619-0146**. Closing date is December 22, 1999.

POSTDOCTORAL POSITIONS MOLECULAR MECHANISMS OF ALZHEIMER'S DISEASE

Positions are available immediately for recent Ph.D. or M.D./Ph.D. graduates interested in pursuing research into the molecular basis of autosomal-dominant forms of Alzheimer's disease. Research projects include: analysis of transgenic models, neurobiology of presenilin 1 (PS1), analysis of PS1 knockout mice, and trafficking and metabolism of amyloid precursor protein (APP) *in vitro* and *in vivo*. Preference will be given to candidates who have proven track records in cell biology, eukaryotic gene expression and mouse transgenesis. Individuals with these qualifications are requested to submit a curriculum vitae and three letters of reference to: **Sangram S. Sisodia, Ph.D., Professor and Chairman, Department of Neurobiology, Pharmacology and Physiology, The University of Chicago, 947 East 58th Street, Chicago, IL 60637 (e-mail: lherrera@drugs.bsd.uchicago.edu).** *The University of Chicago is an Affirmative Action/Equal Opportunity Employer.*

POSITIONS OPEN

MARINE/AQUATIC ORGANISMAL BIOLOGIST WITH EXPERTISE IN MOLECULAR BIOLOGY

The University of Texas at Austin, Department of Marine Science and Marine Science Institute invite applications for a marine/aquatic biologist who utilizes molecular biology techniques to hold a joint appointment as a tenure-track **ASSISTANT PROFESSOR** in the Department and as a Research Scientist at the Institute in Port Aransas. Areas of interest include, but are not limited to: aquaculture, conservation, ecology, fisheries, physiology, population biology, and toxicology. Candidates must have a Ph.D. degree. Preference will be given to candidates with a strong research record that demonstrates the application of modern molecular biology approaches. The successful candidate will be expected to develop an externally-funded research program and to contribute to graduate and undergraduate education through course instruction and student supervision. The position receives nine months of annual salary support from the State. For more information about the Institute and Department, please see our **website: www.utmsi.utexas.edu**. Applicants should send a curriculum vitae, a statement of research and teaching interests, and the names and addresses of five references to: **Search Committee Chair, The University of Texas Marine Science Institute, 750 Channel View Drive, Port Aransas, TX 78373-5015**. Review of applications will begin on January 10, 2000, and will continue until the position is filled. *The University of Texas at Austin is an Equal Opportunity/Affirmative Action Employer.*

THE UNIVERSITY OF MICHIGAN MEDICAL SCHOOL

The Department of Pathology at the University of Michigan has two postdoctoral positions available for molecular and genetic studies on the role of transcription factors in cell specification during development and the modulation of their activity by signaling molecules. The fruitfly, *Drosophila*, is our model organism, and neural specification is our primary research focus. Preference will be given to candidates with a strong background in molecular biology and/or experience in *Drosophila* genetics. Please forward your curriculum vitae and three letters of reference directed to:

Dervla Mellerick-Dressler, Ph.D.
Department of Pathology
8200 MSRBIII
1150 West Medical Center Drive
Ann Arbor, MI 48109-0646
E-mail: dervlam@umich.edu
Telephone: 734-936-8640

The University of Michigan is a nondiscriminatory, Affirmative Action Employer.

POSTDOCTORAL POSITION
Oregon Health Sciences University Portland, Oregon

Two postdoctoral positions are available to carry out x-ray crystallographic studies on multidrug recognition and binding (*Cell* **96**:353–362, 1999); protein-DNA interaction (*J. Mol. Biol.* **291**:347–361, 1999); or structure-based drug design (*EMBO J.* **17**: 3219–3232, 1998). The appropriate candidates must have significant training in macromolecular crystallography. Interested candidates should send their curriculum vitae and the names and addresses of three references to: **Dr. Richard G. Brennan, Department of Biochemistry and Molecular Biology, Oregon Health Sciences University, 3181 Southwest Sam Jackson Park Road, Portland, OR 97201-3098.** *Oregon Health Sciences University is an Equal Opportunity Employer.*

Hoechst Marion Roussel

Computational Chemist

Hoechst Marion Roussel,
the pharmaceutical company of Hoechst, discovers and develops novel therapies based on scientific innovations in fields such as genetic engineering and biotechnology and aims to bring those therapies to the global marketplaces in the form of branded prescription drugs.

We are seeking a
Computational Chemist

We are looking for a Computational Chemist to join our Molecular Modeling group. Members of this group work closely with synthetic, structural and biophysical chemists in lead generation and optimization.

We prefer highly skilled and motivated staff to fill positions at our research locations in Frankfurt, Germany.

Successful candidates will possess a PhD in Chemistry or a related discipline. The background must include experience in at least one of the following areas: structure-based design, ligand-based design and experimental design. Strong communication skills with the ability to work in multidisciplinary teams are essential.

We offer a creative scientific and international environment which will allow you to develop your skills very quickly. Our state-of-the-art facilities give you the opportunity to fill this challenging position and prepare you for future career.

In addition we offer a competitive salary an and attractive bonus package which will suit your qualification.

For prompt, confidential consideration, we invite you to send a resume along with letters of references to:

Hoechst Marion Roussel
Deutschland GmbH
Bewerberservice, Building K 607
D-65926 Frankfurt
Germany

Hoechst

Hoechst Marion Roussel
The Pharmaceutical Company of Hoechst

Serono Pharmaceutical Research Institute

THE ARES-SERONO GROUP

The Institute is an affiliate of The Ares-Serono Group which has its Executive Headquarters in Geneva and is a leading multinational engaged in research, development and marketing of products in the biotechnology field. The Institute is a state-of-the-art centre of scientific excellence. Its research is directed towards the identification of novel molecular mechanisms underlying disease and the discovery of new drugs.

A challenging and exciting opportunity exists for a

BIOCHEMICAL PHARMACOLOGIST

Applicants will have a Ph.D. in biochemistry, pharmacology or a related discipline. They will also have 2-3 years experience in the design, validation and implementation of enzyme assays for use in highthroughput screening campaigns.

The position requires a strong background in enzymology. As part of the Biochemical Pharmacology Group, the successful candidate will participate in the design and implementation of highthroughput assays, as well as the down stream enzymology of key targets in the CNS and immunology area. The successful candidate will work closely with a variety of cross functional project teams, providing key enzymology experience and insight.

Informal enquiries concerning the position can be directed by e-mail to dennis.church@serono.com, or by visiting our web site at www.spri.serono.com.

If you are interested, please send your curriculum vitae with a list of publications and the names of three referees to the Personnel Department of the Institute.

Serono Pharmaceutical Research Institute
Ares-Serono International S.A.

14, chemin des Aulx
1228 Plan-les-Ouates
Geneva /Switzerland

Telephone
+41 22 706 96 66

Telefax
+41 22 794 69 65

E-Mail
spri.jobs@serono.com

EUROPEAN OPPORTUNITIES

POSITIONS OPEN

POSTDOCTORAL POSITIONS
University of California San Francisco
Columbia University

Two postdoctoral positions are available to study (1) Wnt and Notch function in trophoblast invasion at UCSF, jointly sponsored by **Dr. Susan Fisher** and **Dr. Jan Kitajewski**, or (2) Notch function in angiogenesis at Columbia University, sponsored by **Dr. Jan Kitajewski**. Please indicate specific area of interest. Send or e-mail curriculum vitae, brief statement of experience and interests, and names of three references to both:

Susan Fisher, Ph.D.
Box 0512, HSW 604
University of California San Francisco
513 Parnassus Avenue
San Francisco, CA 94143-0512
E-mail: sfisher@cgl.ucsf.edu
FAX: 415-502-7338

Jan Kitajewski, Ph.D.
Department of Pathology and OB/GYN
Columbia University
630 West 168th Street
New York. NY 10032
E-mail: jkk9@columbia.edu
FAX: 212-305-3624

Columbia University and University of California San Francisco are both Affirmative Action/Equal Opportunity Employers.

POSTDOCTORAL POSITION
Massachusetts General Hospital
Harvard Medical School

Pathogenesis of *Shigella*. Available immediately. Experimental work focuses on pathogen-host interactions, bacterial-induced actin assembly, protein targeting, and characterization of host responses. Strong background in molecular or cellular biology, or biochemistry required. Mail or e-mail curriculum vitae and references to: **Marcia B. Goldberg, Associate Professor, HSPH, 655 Huntington Avenue, Building 1, Room 903, Boston, MA 02115. E-mail: mgoldberg@partners.org.** *Equal Opportunity/Affirmative Action Employer.*

POSTDOCTORAL POSITION, Harvard Medical School. Available immediately. Cell biologist to examine therapeutic efficacy of radiolabeled compounds in tumor-bearing animals. Candidate must be self-motivated, creative, independent, and willing to work in a multidisciplinary group. Experience in cell culture and animal models is required. Permanent U.S. work status required. Please send curriculum vitae indicating area of expertise, a career statement, and three letters of reference to: **Dr. A. I. Kassis, Harvard Medical School, Goldenson Building, 220 Longwood Avenue, Boston, MA 02115. E-mail: Amin_Kassis@hms.harvard.edu.**

POSTDOCTORAL POSITION is available to study the repair of DNA damage caused by eukaryotic topoisomerase I. Using genetics and cell biology in yeast and other eukaryotes, we are investigating pathways dependent on an enzyme that specifically unlinks covalent topoI-DNA complexes (*Science* **286**:552). Send curriculum vitae and names of three references to: **Dr. Howard A. Nash, Laboratory of Molecular Biology, Building 36, Room 1B08, The National Institute of Mental Health, National Institutes of Health, Bethesda, MD 20892-4034. E-mail: nash@codon.nih.gov.** *NIH is an Equal Opportunity Employer.*

POSITIONS OPEN

XENCOR

POSTDOCTORAL POSITIONS

Xencor is an exciting, well-financed, biotechnology company that uses breakthrough molecular design methods to develop biological macromolecules. The company consists of an excellent computational group and several biologists who have developed novel methods for improving the properties of commercially important proteins. We now seek individuals at the postdoctoral level with experience in either computational biology or molecular biology and biochemistry. Successful candidates will be highly motivated, able to work in a fast-paced environment, and keenly interested in drug discovery and new drug discovery technologies. Experience in bioinformatics, software development, protein modeling, or cell biology is a plus. With an emphasis on teamwork, creativity, and intellectual achievement (publishing and conference attendance are encouraged), Xencor is dedicated to providing a challenging and stimulating work environment, and a competitive salary and benefits package. Please submit your résumé by mail to: **Xencor, 2585 Nina Street, Pasadena, CA 91107** or via **e-mail: recruiting@xencor.com.**

POSTDOCTORAL FELLOWSHIPS IN CELLULAR AND MOLECULAR IMMUNOLOGY
National Cancer Institute

Immediate openings exist for full-time postdoctoral fellowships in the Tumor Immunology Section, Surgery Branch, National Cancer Institute, National Institutes of Health, Bethesda, Maryland, to study the immune response to tumors in humans. We seek candidates with experience in cellular or molecular immunology. A background in immunology is essential. Ongoing projects include the identification of new tumor-associated antigens, the study of immune tolerance to tumor-associated differentiation antigens, and the development of synthetic and recombinant anti-cancer vaccines. Another project aims to study immune responses in breast cancer and requires a background in culture of fresh human breast cancers. Send cover letter, résumé, and statement of research interests to:

Steven A. Rosenberg, M.D., Ph.D.
Chief of Surgery
National Cancer Institute
National Institutes of Health
Building 10, Room 2B42
Bethesda, MD 20892-1502
E-mail: SAR@nih.gov

Selections for these positions will be based solely on merit, with no discrimination for nonmerit reasons such as race, color, religion, gender, national origin, politics, marital status, physical or mental disability, age, sexual orientation, or membership or nonmembership in an employee organization. NIH is an Equal Opportunity Employer.

TWO POSTDOCTORAL POSITIONS

We are currently seeking two postdoctoral fellows to work in the area of biomineralization and protein-interfacial interactions. Our laboratory is currently funded by the National Science Foundation and the Army Research Office, Department of Defense. One position is in the area of computational chemistry (algorithm design and programming experience in Fortran/C required), the other, nuclear magnetic resonance (biomolecular structure determination and/or pulse sequence development experience required). Salaries are negotiable. Interested candidates should submit a copy of their curriculum vitae and have three letters of recommendation forwarded on their behalf to: **Professor John S. Evans, Division of Basic Sciences, New York University, Room 1007, 345 East 24th Street, New York, NY 10010. E-mail: jse@lennon.nyu.edu.** *New York University is an Equal Opportunity Employer.*

POSITIONS OPEN

POSTDOCTORAL POSITION
Harvard Medical School

A position is available starting no later than June 2000 to investigate DNA damage responses and telomere metabolism in normal and neoplastic cells. The successful applicant will be highly motivated, have experience in molecular and cell biology, a Ph.D. or M.D., and a desire to excel. Please submit a curriculum vitae and two references to: **Dr. David T. Weaver, Center for Blood Research, Harvard Medical School, 200 Longwood Avenue, Boston, MA 02115. E-mail: dweaver@cbr.med.harvard.edu.**

The Department of Cardiology at The Cleveland Clinic Foundation at Cleveland, Ohio seeks a full-time, **POSTDOCTORAL CLINICAL RESEARCHER** with strong background in the area of three-dimensional echocardiography research. Applicants must have more than two years of research experience in this field. Medical training (M.D. degree) and ability to work independently is essential. Compensation will be commensurate with experience. Applicants should submit a letter and curriculum vitae to: **Takahiro Shiota, M.D., Ph.D. E-mail: shiotat@ccf.org, FAX: 216-445-4419.**

GLOBAL OPPORTUNITIES

TENURE-TRACK POSITION
THE HEBREW UNIVERSITY
HADASSAH MEDICAL SCHOOL
JERUSALEM, ISRAEL

The Faculty of Medicine calls for applications for tenure-track positions that will be available starting October 2000. Ph.D. and/or M.D. degrees and postdoctoral training are required. Excellence in research and teaching experience will be of prime importance for decisions of the search committee. Candidates are expected to develop independent research and take part in teaching commitments in one of the following fields: Cell and Developmental Biology, Mammalian Genetics, Bioinformatics and Biomolecular Modeling, Parasitology, Virology, or Cardiovascular Physiology. Applications including curriculum vitae, list of publications, three to five selected reprints, a plan of research, and three letters of recommendation should arrive at the **Office of the Dean, POB 12272, 91120 Jerusalem, ISRAEL**, by April 30, 2000.

AWARDS

ALBERT LASKER MEDICAL RESEARCH AWARDS

Call for nominations for the year 2000 in the following three categories: **Basic Research; Clinical Research; Special Achievement in Medical Science. Website: www.laskerfoundation.org.** Call the Lasker Foundation at **Telephone: 212-286-0222** to receive a form. Or send your mailing address to **e-mail: nhunt@laskerfoundation.org.** Nominations forms are not electronic; they must be mailed. Deadline for nominations is February 1, 2000.

MEETINGS

WOMEN'S CAREER WORKSHOP

NIH-funded interdisciplinary workshop will explore strategies for developing the careers of women in science through professional societies and individually. December 9–10, 1999, Washington, D.C. Convention Center. Contact **Gloria Williams: Telephone: 301-562-2300 x 340; e-mail: gwilliams@kra.com.**

EUROPEAN OPPORTUNITIES

POSTDOCTORAL POSITION PLANT ECOLOGY

The Department of Environmental Assessment at the Swedish University of Agricultural Sciences is announcing a postdoctoral position in plant ecology. The successful candidate will work on the effects of atmospheric deposition on forest-floor vegetation using a long-term (about 20-year) data set compiled by the Department. Applicants should have a Ph.D. in terrestrial plant ecology or the equivalent. The full announcement, address for applications, and other information can be obtained from the Department's **website: http://www.ma.slu.se/nytt/PostDoc9911.html**, or from **Ulf Grandin (Telephone: +46 18 673104; FAX: +46 18 673156; e-mail: ulf.grandin@ma.slu.se).**

We offer a stipend equivalent to a competitive salary, hence only non-Swedish nationals need apply.

GLOBAL OPPORTUNITIES

THE HONG KONG UNIVERSITY OF SCIENCE AND TECHNOLOGY
Head of Department of Biochemistry

The University was opened in October 1991 with current enrollment at about 7000 (FTE) students. The School of Science, which enrolls about 23 percent of the University's students, comprises five departments: Biochemistry, Biology, Chemistry, Mathematics, and Physics. The Department of Biochemistry conducts comprehensive teaching and research programs in both the basic and applied aspects of biochemistry. The academic degrees offered by the Department are: B.Sc., M.Sc., M.Phil. and Ph.D. Major foci of the Department's research include molecular and cellular biochemistry, genetic engineering and protein structure, and plant and medicinal biochemistry. Currently, there are 15 regular and several visiting faculty members in the Department, teaching about 200 undergraduate students and 50 graduate students. A number of central service facilities and interdisciplinary research institutes/centers provide support for the Department's research programs; of particular relevance are the Animal Care Facility and Plant Growth Facility, together with the Biotechnology Research Institute and Molecular Neuroscience Center. For more information, please visit the School/Department **websites: http://www.ust.hk/**.

Applications/nominations are invited from well-qualified and accomplished scholars for the position. In addition to extensive teaching and research experience, the successful candidate must have demonstrable leadership qualities necessary to lead and manage the Department. Salary will be highly competitive with generous benefits. Applications/nominations together with a detailed curriculum vitae and the names and addresses/FAX numbers/e-mail addresses of three to five referees should be sent to: **Chair, Search Committee for Headship of Department of Biochemistry, c/o School of Science, The Hong Kong University of Science and Technology, Clearwater Bay, Kowloon, Hong Kong. FAX: 852-2358-1464; e-mail: DHSEARCH@UST.HK** before 15 March 2000. The search will continue until a suitable appointment is made.

MARKETPLACE

MARKETPLACE

MARKETPLACE

Circle No. 28 on Readers' Service Card

Circle No. 30 on Readers' Service Card

Circle No. 15 on Readers' Service Card

Circle No. 31 on Readers' Service Card

Circle No. 18 on Readers' Service Card

MARKETPLACE

Circle No. 8 on Readers' Service Card

Circle No. 4 on Readers' Service Card

Circle No. 2 on Readers' Service Card

Circle No. 40 on Readers' Service Card

Circle No. 19 on Readers' Service Card

MARKETPLACE

Circle No. 10 on Readers' Service Card

Circle No. 26 on Readers' Service Card

Circle No. 6 on Readers' Service Card

Circle No. 22 on Readers' Service Card

Circle No. 3 on Readers' Service Card

Faster... Sharper...

BioMax Film

To see 32p markers faster or sharper try KODAK BioMax MS Film and TransScreen Intensifying Screens.

- **Faster...** Reduce 4-day exposures to 1 day; overnight exposures to 4 hours, and detect 1-dpm bands in 1 day.
- **Sharper...** Twice the resolution with the same exposure time. Better sensitivity than you are used to.
- **More Sensitive...** More than 4 times the sensitivity of KODAK X-OMAT AR film with a generic screen and up to 9 times greater than competitive film and screen combinations.

Place your order TODAY:

WORLDWIDE DEALERS
Amersham Pharmacia Biotech
NEN Life Science Products
Sigma-Aldrich Research Co.

ASIA/PACIFIC DEALERS ONLY
Australia
Integrated Sciences Ltd.
China
Beijing Cold Spring
Biotechnology Co., Ltd.
T'A Cheng Pacific Ltd.
Japan
Cosmo Bio Co., Ltd.
Nishimoto Sangyo
Korea
LRS Labs
Singapore
Research Instruments Pte. Ltd.
Taiwan
Long Chain International

CANADA ONLY
Intersciences Inc.
Mandel Scientific
VWR Canlab

EUROPE ONLY
Integra BioSciences
Merck
France
Poly Labo
Israel
Tamar Ltd.
Scandinavia
KEBO Lab
United Kingdom
Anachem Ltd.

MEXICO ONLY
Cientificos S.A. de C.V.
Internacional de Equipos

SOUTH AMERICA ONLY
Argentina
Biodynamics S.A.
Brazil
Labtrade do Brasil

UNITED STATES ONLY
E G Baldwin
E M Parker
Fisher Scientific
Merry X-Ray
Picker International
VWR Scientific Products

FREE
T-Shirt Offer
(see our website for details)

Scientific Imaging Solutions Online:
www.kodak.com/go/scientific

Call Toll Free in the U.S. and Canada-(877) SIS-HELP
Worldwide Direct +1 (203) 786-5657

Circle No. 13 on Readers' Service Card