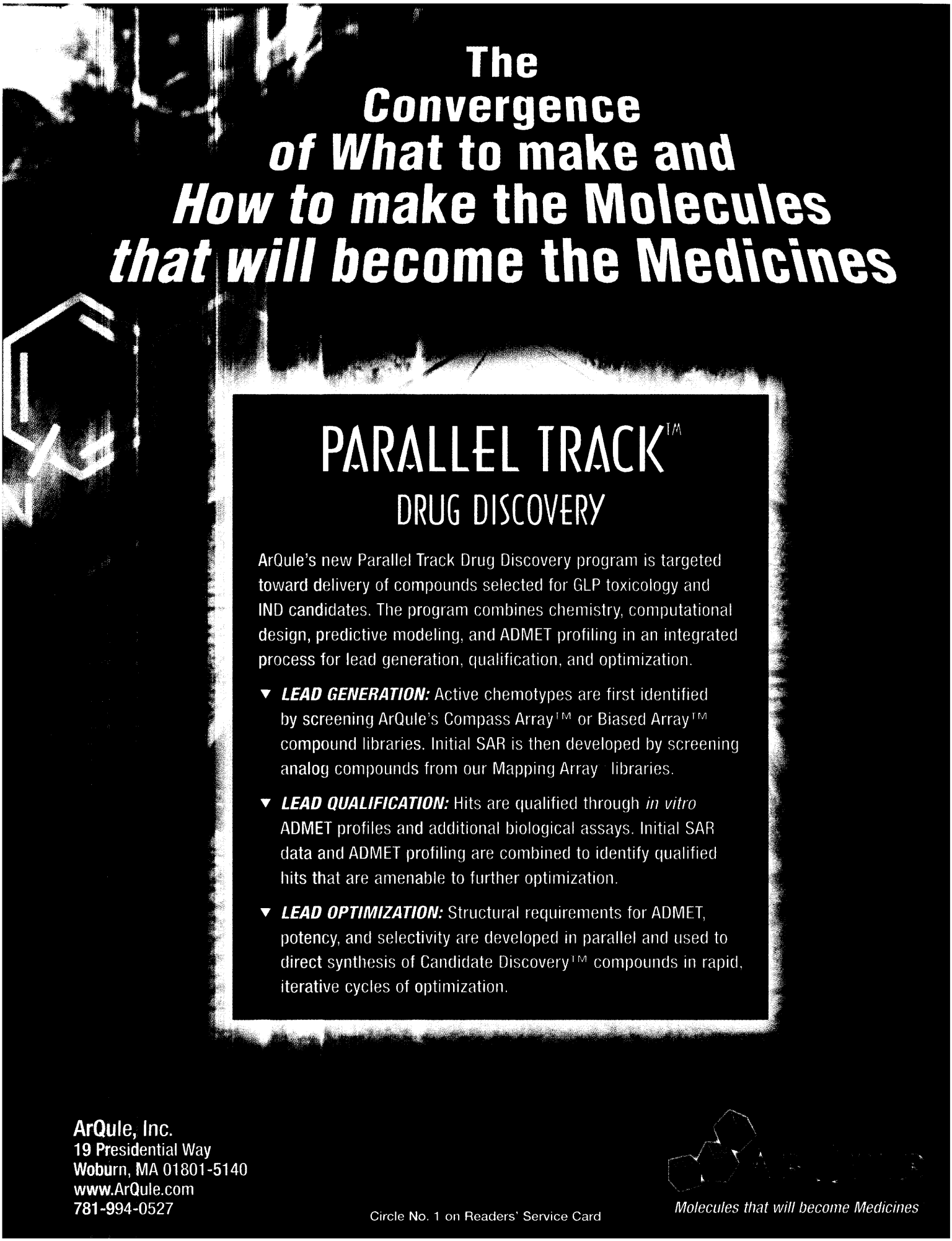
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Sequencher is a bioinformatics tool known primarily for its ability to assemble sequence fragments from multiple raw sequence files into contiguous segments (called contigs). The program is a boon for sequencing projects. It lets users import sequences, identify and trim away contaminating vector sequences, and edit ambiguities in the alignments used to make a contig from the original sequence machine trace data. Program commands are usually self-explanatory, requiring little time for the novice to get familiar with the software.

The recently released version 4.1.2 of Sequencher incorporates several enhancements. Users can now choose between two modes for the placement of gaps within the sequence of a contig. The first mode allows only small gaps and is generally used when shotgun sequencing results are assembled. This version lets the user switch to a different mode, which allows the placement of larger gaps within sequence fragments. Larger gaps may result, for example, from aligning cDNA or expressed sequence tags (ESTs) with genomic DNA–containing introns.

The new version of Sequencher can import a few more file types than before, including common assembly format (CAF) files, which contains information on the confidence intervals of base identification in original automatic sequencer output. These data, together with traces from the automatic sequencer, allow one to determine whether discrepancies in base alignments occur in areas of high or low confidence and to adjust the manual editing process accordingly. Another new feature in Sequencher is support for comparative sequencing by aligning to a user-specified "reference sequence." It enables a user to identify a sequence as the standard to which all subsequent files are to be aligned.

Sequencher offers a free trial version disabled only in the save and print commands. Full functionality requires either use of a hardware key device or access via a key server. This makes the software portable from home to office but takes up sockets that might otherwise be in use for other external computer accessories.

Although the new tools add to the utility of Sequencher, the software interface retains simplicity and offers only basic visual display of sequence data, contigs, and alignments. Help functions, online help, and even the manual are not always useful, but the technical support available by e-mail or phone is excellent. The convenience and power Sequencher offers for DNA sequence analysis makes the work of biologists and bioinformaticists easier in the light of the ever-increasing amount of genetic information. Sequencher's comparative sequencing in Reference Sequence was developed in collaboration with the Armed Forces DNA Identification Laboratory and ViroLogic, Inc.

—Andreas Madlung

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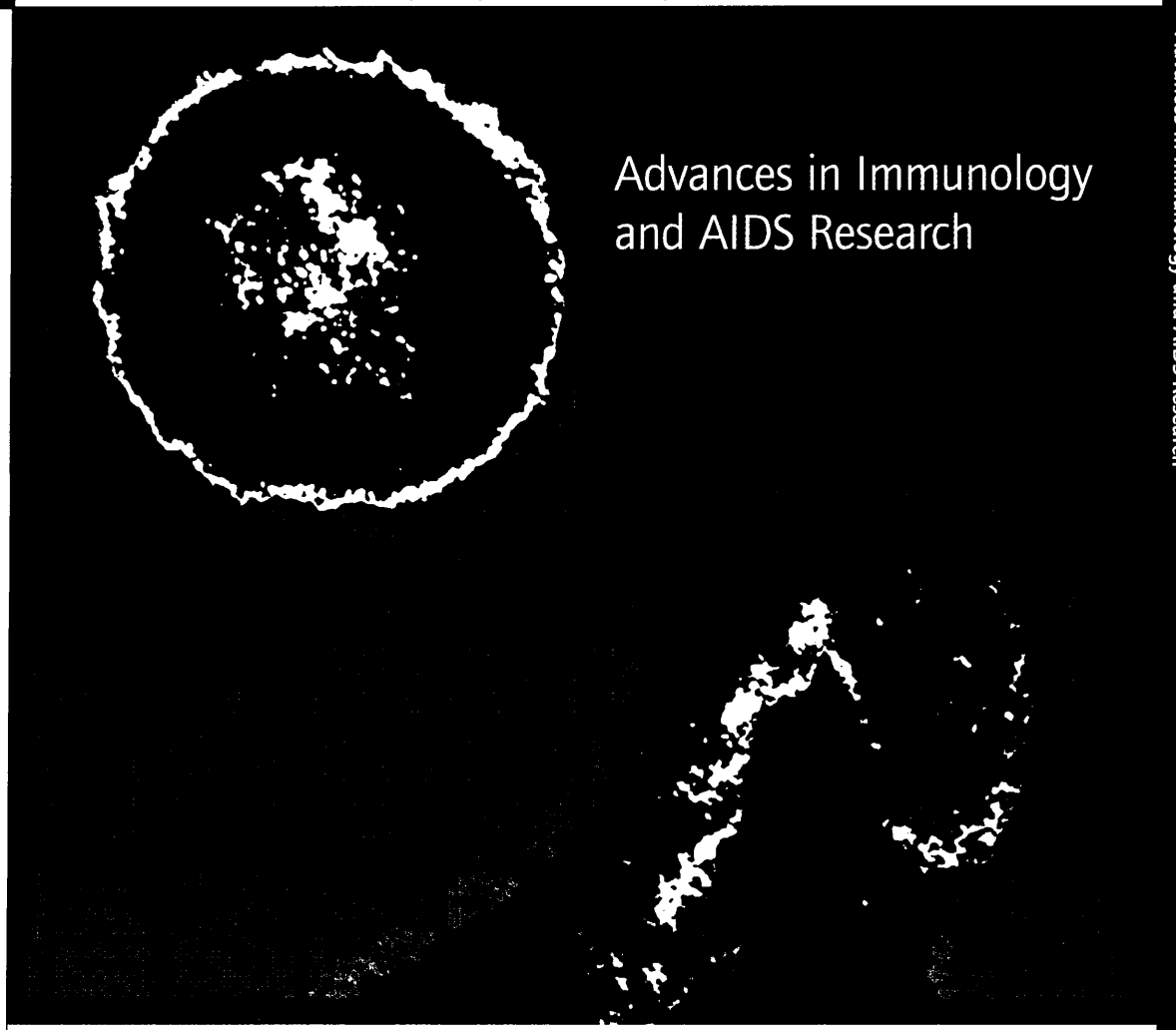

Advances in Immunology and AIDS Research

The HIV virus responsible for AIDS provides a tough challenge to researchers who want to understand it and minimize its effects. New tools and technologies have brought scientific teams in sight of the ultimate goal of developing an effective vaccine against HIV.

BY PETER GWYNNE AND GARY HEEBNER

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Attacking the Ultimate Invader/Evader

Just over a month ago, the medical world marked the 20th anniversary of the report that first identified the strange and apparently fatal disease that we now know as AIDS (for acquired immunodeficiency syndrome). During the 1980s the worldwide scientific and medical community struggled to understand the nature of the disease, to track down the human immunodeficiency virus (HIV) responsible for it, and to develop rudimentary treatments – an effort that continued throughout the 1990s.

In the meantime, AIDS has continued to destroy lives. The **Joint United Nations Programme on HIV/AIDS** (UNAIDS) estimates that 36.1 million individuals around the world were living with HIV infections or full-blown AIDS at the end of last year. In 2000 alone HIV/AIDS caused the deaths of approximately 3 million individuals, making a cumulative death toll of 21.8 million by year's end. UNAIDS' figures also indicate that roughly one in every 100 adults between the ages of 15 and 49 is now infected with HIV. More than 80 percent of all adult HIV infections have resulted from heterosexual intercourse.

Throughout the past decade the scientific and medical communities have sought better understanding of the HIV virus in hopes of developing more effective therapies, possibly including vaccines for individuals not exposed to the virus and for AIDS patients. Policy makers realize that they have a long road to travel before they begin to think about having this disease in check. "You not only have the effect of the virus infecting the cell," says Anthony Fauci, director of the **National Institute of Allergy and Infectious Diseases** (NIAID). "The HIV envelope itself is an extraordinary entity in its ability to have an aberrant effect on the immune system. In addition to being a disease of immune deficiency, it is a disease of aberrant immune system activations. These effects are really quite profound. Unfortunately for the

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human species HIV/AIDS is proving to be an extraordinary experiment of nature with regard to its effects on the immune system."

Marie Chow, professor of microbiology and immunology at the **University of Arkansas**, expands that thought. "Certainly other viruses have had some effects on immune systems before, but we never saw anything as devastating as the HIV," she explains. That devastation is amplified by HIV's ability to destroy the immune system. "The virus has been very difficult to pin down. HIV is making a precision surgical hit, knocking out the cells that direct and regulate the immune response," Chow continues. "AIDS victims succumb to diseases caused by other fungal, parasitic, bacterial, and viral infections owing to the loss of T cell function from the underlying HIV infection. On the one hand we're still learning so much about the immune system and how it works. But at the same time we can't defer research on HIV therapeutics and vaccine development until we understand how to help the immune system combat infections. It is really guerilla warfare at several levels, developing treatments and therapies for the variety of different infections seen in AIDS patients that are symptoms of the HIV infection itself."

Multidisciplinary approaches, involving collaborations between basic researchers and clinicians and among research scientists with different skills, have become mandatory for that effort and for treating the conditions that the virus causes. "HIV has forced us to deal with this disease on multiple fronts with individuals who have different backgrounds," says Chow.

STEADY PROGRESS

Researchers and clinicians working in multidisciplinary teams have made steady progress in countering the virus. For example, the research effort that isolated the HIV virus and then sequenced and cloned its various genes to express its proteins led about a decade ago to protease inhibitors. "This class of drugs has been shown to be extraordinarily efficient when used with other drugs," says Fauci. "To me this is a classical example of the translation from basic research to clinical benefit."

Drug cocktails containing protease inhibitors have significantly extended the lives of many patients. And the search for other effective forms of chemical therapy continues. "What we would like to see from a new class of drugs is the same impact as protease inhibitors," says Richard Colonno, vice president of infectious disease discovery at pharmaceutical company **Bristol-Myers Squibb**. "We're seeing similar inhibition levels with the new class of entry inhibitors. New drugs will give patients an expanded set of options for combining drugs and avoiding long-term toxicity."

Behavioral concepts have also proved valuable for individual patients. For example, interrupted therapy permits individual patients to take occasional breaks from their drug regimens, giving them some relief from the often devastating side effects that those regimens cause. A team at the **Lifespan/Tufts/Brown Center for AIDS Research** (CFAR) is refining a project that pays neighbors to deliver AIDS treatments to patients who have difficulty reaching a hospital or doctor's office for therapy. "So far we've achieved results in terms of reducing viral loads far better than before," says Charles Carpenter, committee chair of CFAR and professor of medicine at **Brown University**. "We're also looking at nutrition. In women the body-mass index correlates positively with the length of time before the patient gets serious symptoms after being infected."

All those approaches lack one essential element. While they slow down the progress of HIV infection or full-blown AIDS, they do not result in a reconstitution of HIV-specific immunity. So the search is on for a vaccine – or perhaps several vaccines – that will confer at least some immunity to the virus. Vaccines can be used in an attempt to prevent initial infection or to slow progression of disease if a person becomes infected despite having been vaccinated. In addition, vaccine trials have been initiated in people who are already infected in an attempt to boost HIV-specific immunity.

To date approximately 30 vaccines against HIV have been tested, most in phase 1 or phase 2 trials to determine their safety and immunogenicity. Only one vaccine candidate, made by **VaxGen, Inc.**, has gone on to phase 3 efficacy trials, which will probably not be completed for some time. Development of an HIV vaccine has become a very high priority in AIDS research. The **National Institutes of Health** expects to spend $282 million on research into vaccines this year, one-eighth of its entire AIDS budget. Several pharmaceutical companies have also entered the arena.

Within the past few months the effort has started to show definite promise. "Vaccines provide another example of how in-the-trenches basic research is showing us light at the end of

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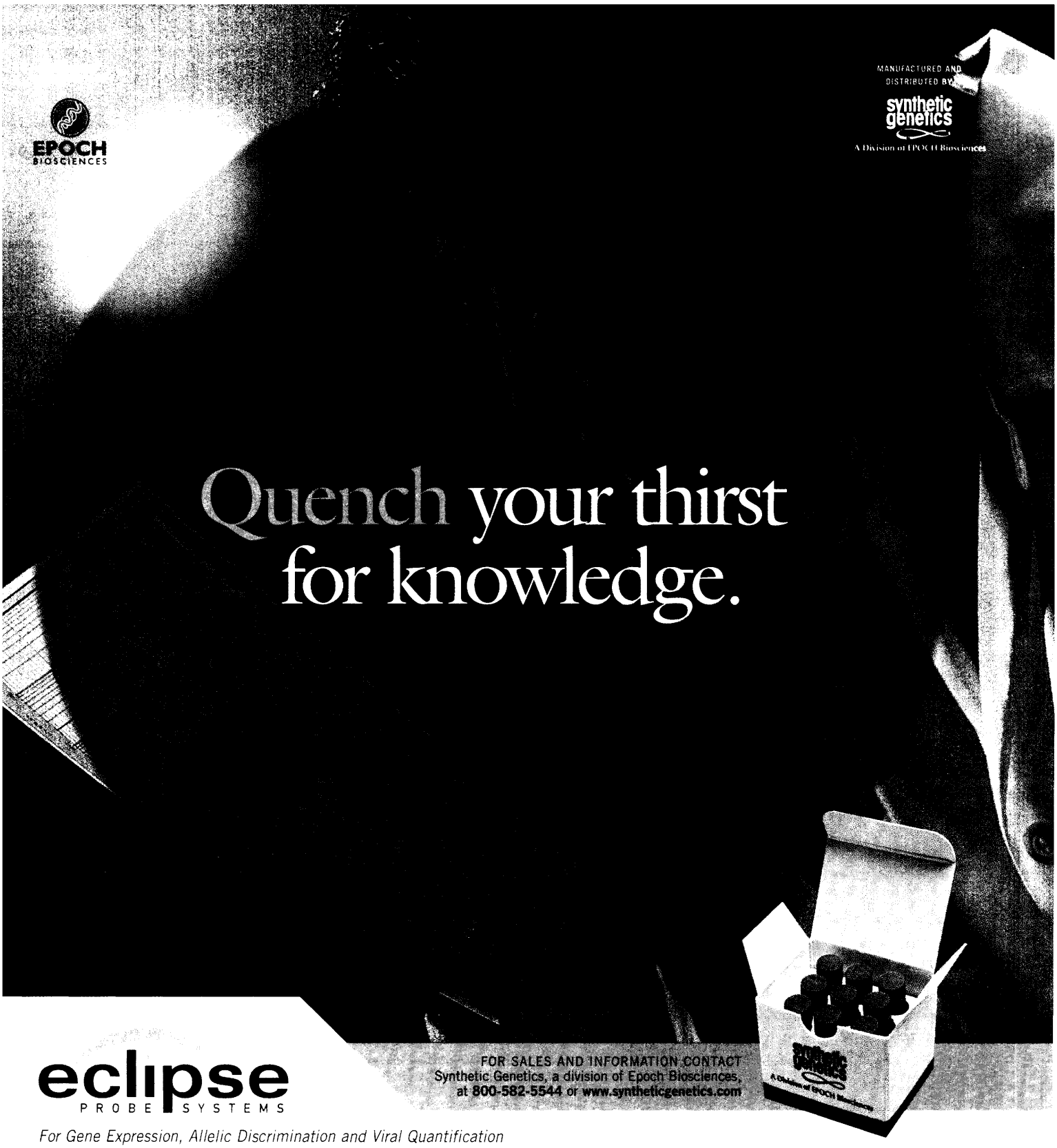

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a tunnel that was very dark for a long time," says Fauci. "Right now we feel certainly more optimistic than we felt a year ago about the possibility of developing an HIV vaccine."

The research has application beyond AIDS. "The natural experiment of HIV is really teaching us more about the human immune system than many decades of animal research," says Fauci. "HIV has, in a grossly horrific way, given us clues to how the immune system works," echoes Chow.

THE IMMUNE REACTION

The immune system consists of a series of mechanisms that work together to protect the host from any number of foreign invaders. Together, these systems protect the body against potentially deadly attackers. Thus whenever a pathogen invades the body it elicits an almost immediate response from the innate immune system. This produces a rather unspecific defense against any pathogen. This defense includes barriers such as skin, the cilia in mucous membranes that sweep away airborne invaders, and tears, secretions, and saliva whose enzymes can destroy bacteria and other pathogens.

When this first line of defense fails to prevent an invader from entering the human body, a more specific set of responses can be evoked. The adaptive immune system mounts a specific response against a foreign molecule or antigen. It involves both B cells and T cells.

B cells originate in the bone marrow and circulate in the bloodstream. They are white blood cells that produce antibodies whose purpose is to interact with foreign particles or antigens; an antigen is a molecule that can elicit the production of antibodies (Abs) to a specific antigen (Ag). Antibodies generally recognize only one antigenic determinant, in a process known as the lock and key phenomenon. T cells, meanwhile, form in the thymus. The two main varieties are helper T cells that help other immune cells in their functions and cytotoxic T cells that kill damaged or foreign cells in the body.

When a foreign particle or organism enters the body, the immune system goes from alert status to active duty. Both B cells and T cells respond to the threat and eliminate the foreign substance from the host's body. If the invader is located in the bloodstream or outside the individual cells of the body, the B cells take charge. They bind to the foreign particle, an action that prompts another series of events which ends with the elimination of the Ab-Ag complex. If, on the other hand, the pathogen enters a cell, as viruses do, the body responds by activating cytotoxic T cells. These cells circulate in the bloodstream and lymph system and eliminate the foreign body by killing the host cell that is infected with the foreign agent.

HOW HIV WREAKS HAVOC

HIV is a kind of retrovirus, a term that refers to the ability to copy its RNA genome into DNA rather than taking the reverse direction. The core of HIV contains several proteins including reverse transcriptase which converts the viral RNA into DNA that can then be integrated into the host's genome.

Interestingly, these viral enzymes have allowed molecular biologists to produce complementary DNA from the messenger RNA taken from a living cell. This has become a very important tool in studying the families of proteins expressed in a cell, the field now referred to as proteomics. Several suppliers, among them **Ambion, Promega, New England Biolabs,** and **Roche,** provide this type of molecular biology enzyme to help researchers in their efforts to produce high quality copies of cDNA. RT-PCR, the reverse transcriptase polymerase chain reaction, is based on this unique enzyme's ability to copy RNA into its counterpart DNA.

The general structure of the virus resembles that of other viruses. It has a membrane or viral envelope that it takes from the membrane of a human cell when a newly formed virus particle exits the host cell. This membrane surrounds a core of proteins and two single strands of RNA, each of which codes for the virus's nine genes. The viral envelope contains several proteins from the host cell as well as 72 copies of a complex HIV protein that protrudes from the surface of the viral envelope. Efforts to develop a vaccine for HIV have involved these envelope proteins.

Scientists have slowly elucidated the functions of the nine viral genes. Some contain information for making structural proteins while others code for regulatory proteins that control the ability of HIV to infect a cell, replicate its genome, and cause disease.

HIV wreaks its havoc by more than conventional viral action. One of the HIV envelope proteins, gp120, recognizes a receptor on helper T cells called CD4 and can physically bind to it. A normal membrane component of a helper T cell, the CD4 protein also acts as a specific receptor for HIV. The virus can also infect other cells such as macrophages and phagocytes. By interacting with CD4 on helper T cells, HIV specifically infects the very cells needed to activate both the B cell and the cytotoxic T cell responses. Without helper T cells, the body cannot produce antibodies effectively. Worse, cells that contain HIV can no longer be properly eliminated through the action of cytotoxic T cells. By blocking these critical defense mechanisms HIV can multiply and spread to other T cells, until the population of helper T cells diminishes.

FROM HIV TO AIDS

Researchers established fairly quickly that the CD4 receptor plays a key role in HIV infection. But they also realized that the process must also involve other receptors. Eventually research teams identified a second co-receptor that HIV commonly uses to enter cells. Known as CCR-5, this normally associates with body proteins known as chemokines that send chemical messages to cells, directing them to sites of inflammation. Another co-receptor for the virus is CXCR4. This normally associates with a chemokine or chemokines different from those associated with CCR-5.

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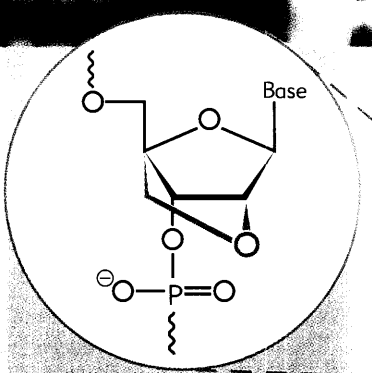

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Systems, and **Research Diagnostics**, specialize in providing products for chemokine research. That research has already shown that individuals who produce larger amounts of chemokines tend to be more resistant to HIV infection; the chemokines interfere with the virus's binding to the receptors. Furthermore, some individuals with mutations that alter the CCR-5 receptor appear to possess resistance to HIV infection.

The battle between the virus and the host's immune system continues for some time. The body responds to this assault by producing more T cells. Some of these will mature to become helper T cells that the virus ultimately infects, eliminating them from the struggle. In fact the battle may continue for several years before the human body finally succumbs to the virus. By this time the body seems to have lost its ability to produce any more T cells. Because of this loss of helper T cells, the body eventually loses all ability to fight off even the weakest of foreign organisms – organisms that would not normally pose any serious threat to the host. This acquired immunodeficient condition is referred to as AIDS.

Molecular biology has revealed another disturbing facet of the HIV virus: It can hide effectively in the genetic components of cells. "It's still somewhat of a mystery why the immune system is incapable of completely clearing the virus from the body, even in individuals doing well on treatment," says Fauci. "In every individual we look at, including those being adequately treated who have levels of the virus below detectability, it's inevitable that the virus can bounce back. That has been an extraordinary challenge."

The other major difficulty faced by HIV/AIDS researchers stems from the mercurial nature of HIV. "Like other viruses with RNA genomes, HIV readily mutates to generate new virus variants that contain subtle differences from the original virus but are now resistant to the drug's action. Yet once the HIV genes in their DNA forms are integrated, these variants are as stable as other cellular genes and the cell expresses the viral genes as if they were cellular genes," says Chow. "That presents a particular challenge if you're trying to develop an effective therapeutic agent. The acquired immune response is driven by the ability to differentiate between host and foreign [or viral gene] form. But because the HIV virus is so mutable, that's much more difficult. Basically mutations in the virus nullify what you're trying to develop."

ANTIBODIES WITH ATTITUDE

Life scientists have carried out intensive research on the HIV virus since the mid-1980s. Many laboratories worldwide have contributed to the clear understanding of the virus's structure and the mechanisms that make the virus so elusive to the natural immune system. Their work has relied on a series of research tools that range from specialized antibodies to robotic systems.

Antibodies have become familiar to generations of life scientists. The scientists use a relatively simple procedure to produce the basic variety: Inject an animal with antigenic material, allow for an immune response to develop, and then harvest the circulating antibodies present in the animal's blood. These polyclonal antibodies arise from a variety of B cells that produce different antibodies against different epitopes of the immunizing antigen.

Polyclonal antibodies are inexpensive to produce. Just as important, large quantities (up to 10 milligrams per milliliter) can be produced from the serum of an immunized animal. They also offer a realistic example of the immune response since polyclonal antibodies represent the entire antigen-specific antibody population in an animal. Polyclonal antibodies have the disadvantage of a limited supply, however; they can be harvested only from the animal used in the immunization.

Producing monoclonal antibodies involves a more complicated process. Scientists immunize an animal with an antigen as in the case of polyclonal antibodies. The difference occurs once the immune response develops. At that point the scientific team removes the animal's spleen. The cells in the spleen ultimately develop into mature, antibody-producing B cells that are, however, incapable of replicating and hence unable to be cultured *in vitro*. Scientists get around that problem by fusing the spleen cells with "immortal" myeloma cells that can replicate in culture for an extended period of time. The team then screens the resulting fused cells (hybridomas) with an ELISA assay to identify the cells that produce the antibody of interest. That cell is then isolated and cloned; it will produce large amounts of a single (monoclonal) antibody directed against the original antigen for virtually an indefinite period of time.

This hybridoma cell line can be frozen and stored for long periods of time, thereby providing the research team with a constant supply of a specific antibody. Polyclonal and monoclonal antibodies are available from several companies. They include **Alexis Corporation,** BD Biosciences, **Calbiochem-Novabiochem, Chemicon International, Sigma-Aldrich,** and **Zymed Laboratories**.

Antibodies tagged with labels such as fluorescein and other molecules that allow the antibodies to be visualized find widespread use in identifying and locating specific proteins in or on a cell. Antibody-based probes are ideal for identifying specific cell populations based on differences in their cell surface proteins or markers. These antibodies can also be used in histochemical applications, in which a cell is fixed in paraffin and sections of it stained with antibody for a specific molecule. To identify the tagged cells scientists rely on microscopy, fluorescent readers, or flow cytometers. **Molecular Probes** provides many of the fluorescent labels used with antibodies.

NO ANXIETY OVER SEPARATION

Antibodies find a role in another aspect of HIV/AIDS research: cell separation. Researchers can use the great diversity and specificity of antibodies to separate one type of cell from

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another. Typically they attach a specific antibody to a chromatography column; the antibody recognizes a particular antigen in the cells under investigation. By binding to those antigens the antibody pulls the targeted cells out of the mixture. T cells are often selected for and enriched using these antibodies. **Pierce Chemical** and R&D Systems, among other firms, offer a number of products for cell separation.

An alternative method of sorting cells involves covalently binding magnetic particles to antibodies specific to a particular cell of interest. A mixture of cells is then incubated in a solution with the magnetic antibodies. Next, the entire reaction mixture is exposed to a magnetic field, which retains the magnetic beads and separates out the cells of interest. Removing the magnet frees up the cells again. Several companies, including **Dynal**, **Miltenyi Biotech**, and **Polysciences**, have developed cell separation products based on magnetic particles. As an added advantage, some of the magnetic materials naturally degrade without adversely affecting cell function.

Flow cytometers developed by BD Biosciences and other companies, meanwhile, can measure differences in fluorescence with much greater accuracy than the human eye. Flow cytometry has faced limitations on its use in the past because of the difficulty of sorting and collecting enough cells for subsequent biochemical analysis. Now, however, the polymerase chain reaction permits scientists to use even a single cell as the starting material to amplify its DNA for biochemical analysis.

By using several antibodies tagged with different fluorescent labels, scientists can measure several variables in a cell population simultaneously. Cells can be identified and then sorted into different aliquots via the sorting capability of a flow cytometer. This multiparametric method eliminates several separate runs to measure more than one parameter. Companies such as BD Biosciences offer complete lines of antibodies for use with flow cytometry. "The flow cytometer is the ideal tool for AIDS researchers looking at subsets of T cells because it allows you to look at many cell types at the same time," explains Skip Maino, the company's scientific director for biological research and development.

In a related context, robotics can increase the productivity in many immunological and diagnostic procedures by fully automating an otherwise manual and labor intensive process. **Hamilton Company** has developed several systems for automating routine laboratory procedures. **Beckman Coulter** has designed a robotic system called Biomek® FX System for high- throughput screening (HTS). **TECAN** has developed the GENESIS workstation, a robotic system that can perform HTS assays including pipetting, plate washing, incubation, and plate reading. And **Tropix**, a division of **Applied Biosystems**, offers several HTS systems for both live-cell and biochemical assays. All these systems constantly drive toward increased sensitivity that enables scientists to detect smaller samples, to use smaller amounts of reagents, and – by demanding less input by individual team members – to increase laboratory productivity.

DELIVERING DIAGNOSES

The diagnosis of HIV infections has evolved over the past years from Ab-based ELISA assays to ultrasensitive assays based on the detection of viral RNA, DNA, or other specific molecules. The current molecular based assays can measure HIV circulating in a person's blood down to levels that were undetectable just a few years ago. Several of these diagnostic assays depend on RT-PCR to amplify the number of copies of HIV RNA to a detectable level for the assay.

Roche has developed an HIV test called Amplicor HIV-1 Monitor UltraSensitive Method. This test, approved by the **U.S. Food and Drug Administration** for clinical diagnostic use in 1999, can detect viral levels down to 50 copies per milliliter of plasma, a proportion previously undetectable. Other companies such as **Chiron Corporation** and **Organon Technika** have developed kits for measuring HIV in blood or plasma.

Ambion RNA Diagnostics focuses on products and services for the clinical investigator, including standards and controls for nucleic acid assays that monitor patient HIV viral loads. Many standards and controls for HIV clinical assays use naked RNA. "Naked RNA is easily degraded by ribonucleases and tends to hydrolyze over time," points out Ambion's Cindy WalkerPeach, director of diagnostic manufacturing. Last year the company launched a system, Armored RNA, based on protecting an RNA molecule from degradation by surrounding it with a phage coat protein complex. "Because the sequence mutation rate for the HIV is so high, it is important for researchers to have access to the myriad of potential sequences to study. This system allows the investigator to define any number of protected RNA sequences as potential targets for assay and vaccine development studies," says WalkerPeach. Roche Molecular Biochemicals, **Abbott Laboratories**, **Gen-Probe**, and others have licensed the technology.

Tests generally rely on blood samples. But **Calypte Biomedical Corporation** has taken a different approach. It has developed an FDA licensed urine test for the HIV antibody that has also shown promise in trials in Uganda. "We were able to identify people (who wouldn't have given blood) with HIV virus via a urine sample," explains Toby Gottfried, Calypte's director of research and development. "Our test may not be as accurate as a blood test, but it is a great alternative for patients who otherwise would not be tested at all." Scientists from **Johns Hopkins University** using the test in concert with educational advice have been able to make an impact on the epidemic in Uganda and have started a promising effort in Thailand. Another method of avoiding the necessity to take blood samples is an oral mucosa test for the HIV virus developed by **Orasure**.

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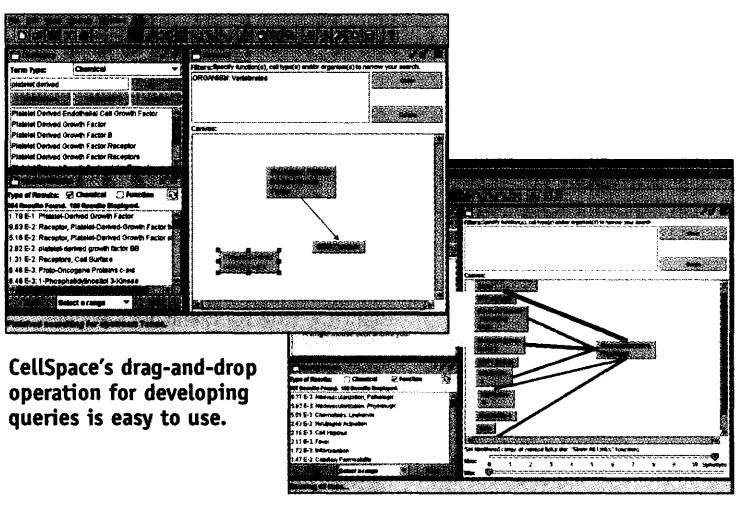

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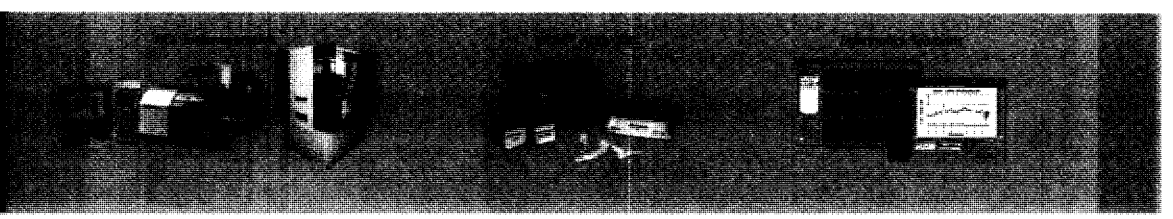

METHODS OF MONITORING

Several companies offer reagents and other products for the specific purpose of monitoring HIV and AIDS. "Our general products for the area are aimed at scientists who want to do viral culture work," says Jim Hengst of **Zeptometrix Corporation**. "We supply ELISA kits for the detection of HIV, simian immunodeficiency virus, and related viruses. We also provide interleukin 2 to help the viruses grow." Similarly **Cell Sciences, Inc.** markets ELISA kits to detect cytokines and chemokines. "And we can custom produce chemokines and other biologically active molecules that our customers can then modify," adds president Irwin Libeskind. "They can change the natural sequence into something that is in their scientific design for them to test."

Another small company, **BioErgonomics, Inc.**, has worked with AIDS researchers since its founding in 1993. "The first thing I did was fly to Washington to meet AIDS clinical trial groups," recalls Daniel Collins, the firm's cofounder, executive vice president, and chief scientific officer. The company actually grew out of the field of flow cytometry. "Most of our technology uses it as a platform," explains Collins. "That's useful because flow cytometry is an extremely sensitive instrument and it naturally multiplexes things. We have multiplex cytokine assays that are very rapid and sensitive, much better than ELISA assays, and capable of being done in a fraction of the time that other assays take. Based on a similar flow cytometry platform, BioE has developed an extremely sensitive assay that can simultaneously detect the HIV/AIDS virus and the presence of antibody against the virus. Unlike current ELISA assays, detection of the virus is done without interference by the antibody and detection of the antibody is done without interference by the virus. This allows very early detection of infection and actual monitoring of viral load."

That type of assay addresses a major aim of AIDS researchers: monitoring patients' progress. The initial approach involved counting the number of CD4 cells in patients' blood samples. "Right from the early stages we had CD4 as the benchmark for monitoring," says Amitabh Gaur, director of the custom technology team at BD Biosciences. "Our method of true count monitors the numbers for AIDS/HIV infections." The company has recently started to adapt work on cytokine flow cytometry by Louis Picker of the **University of Oregon** that permits researchers to characterize single antigen specific T cells. "We can show that an HIV antigen specific T cell is a CD4 rather than a CD8 or a particular type of memory T cell," explains Maino.

ISSUES OF SUSCEPTIBILITY

Beyond monitoring, researchers increasingly try to develop methods of measuring individual patients' susceptibility to HIV/AIDS and to specific treatments for the condition. Thus scientific teams have tried for several years to detect single nucleotide polymorphisms (SNPs). These natural genetic variations may be the basis for determining whether an individual is more likely to develop a particular disease. They may also be of great value in determining how a patient will respond to drug therapy. "Certain individuals are susceptible to AIDS and others not so, according to their genotype," points out Steve Hurt, director of receptor ligand biology at PerkinElmer Life Sciences. "We have introduced the first in a series of products for SNP detection – a nonradioactive kit based on detection of fluorescence polarization."

PerkinElmer is not alone. The **SNP Consortium,** formed by several companies worldwide, has the goal of promoting the identification of a large number of SNPs.

Applied Biosystems Group recently announced that it is in the final stages of clinical trials for a product that can tell physicians whether or not specific drugs would work with a particular HIV-infected patient. This could eliminate much of the trial and error associated with AIDS treatment. "Our ViroSeq HIV-1 genotyping system is designed to give an indication of the resistance of the HIV to the drugs that the patient is taking," says Eric Shulse, director of molecular diagnostics at Applied Biosystems. "Even with multiple drug cocktails a patient's HIV can become resistant to the drugs. Our test is used to give an indication of that resistance. It helps physicians to determine whether a patient is noncompliant on a particular drug treatment and to identify the drug to which the patient has become resistant."

Within the next month the company plans to submit tests of the system to the FDA. If it gains FDA approval, the test could reach the market next year. In fact, says Shulse, home brew versions of the test are already available today from large reference laboratories that have standardized on Applied Biosystems' technology.

TECHNOLOGIES FOR TREATMENT

Therapies for AIDS have progressed over the last several years as research teams have learned more about the mechanisms of HIV infection and AIDS. Many of the technologies used in developing therapeutics for AIDS and other important diseases will be addressed at the upcoming Drug Discovery Technology Conference in Boston, Massachusetts, on August 12 to 17, 2001 *(see accompanying item,* Getting Up to Date on Drug Discovery*)*.

The first drugs available to treat HIV infections were the nucleoside reverse transcriptase inhibitors or NRTIs. HIV undergoes reverse transcription when it converts its genetic material (RNA) into DNA so that it can integrate this genetic material into the host's DNA genome. NRTIs block this step, preventing HIV reproduction. The first company to offer these inhibitors was GlaxoWellcome (now **GlaxoSmithKline**) with its AZT drug.

Protease inhibitors came later. These drugs target the protease enzyme, which cuts long polypeptide chains into the smaller segments essential for viral reproduction. By preventing the formation of the smaller, active forms of polypeptides, the drug family prevents the virus from reproducing.

The pharmaceutical industry continues to pursue a new generation of protease inhibitors.

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"We have a protease inhibitor in phase 3 trials that can be taken once a day and does not appear to elevate cholesterol levels as other protease inhibitors do," says Bristol-Myers Squibb's Colonno. "We're very hopeful that this will result in greater compliance and tolerance over the long term." Why does this therapy keep patients' cholesterol levels low? "We're working on that," says Colonno. "It's a very big plus."

Other treatments use cytokines, the body's own chemical messengers, to increase the immune system's response to HIV. Different cytokines transmit different messages to immune cells. Some, for example, can activate a cell to multiply while others can send a cell into the form of death known as apoptosis. One of the best known cytokines for AIDS treatment is interleukin 2 (IL-2, or Aldesleukin) produced by Chiron Corporation.

Further in the future, pharmaceutical firms see the possibility of treatment via gene therapy. **Cell Genesys**, in fact, has already developed an AIDS gene therapy protocol. The treatment first involves collecting CD4 and CD8 cells from an HIV-infected individual. The cells are then genetically modified to recognize and kill HIV-infected cells. Next they are cultured to increase the number of affector cells, and finally they are reinfused back into the same patient. As Cell Genesys conceives its strategy, physicians would use gene therapy in conjunction with antiviral drugs.

THE PROMISE OF VACCINES

The most promising new approach to AIDS therapy focuses on the traditional approach to protection against infectious diseases. "Everyone's eye is on the vaccine question," says Calypte's Gottfried.

Researchers developing vaccines for HIV have less lofty ambitions than their colleagues dealing with other infectious diseases. They recognize that the ultimate target of preventing infection by HIV is almost certainly beyond their skill in the next few years. Instead, they aim to develop a vaccine, or better yet several vaccines, that will slow down the rate at which the HIV virus spreads in patients. "The field has deviated a little from the initial goal of developing a vaccine that causes sterilizing immunity toward one focused on the issues of adequate suppression of the virus," explains William Blattner, head of the Institute of Human Virology, Epidemiology and Prevention Division at the **University of Maryland Biotechnology Institute**. The institute works on both preventative and therapeutic vaccines.

The most advanced vaccine candidate, VaxGen's AIDSVAX, consists of the gp120 envelope protein. Produced in mammalian cells, this is designed to prevent infection in individuals who have not been exposed to the virus. The vaccine is undergoing phase 3 efficacy trials in the United States and Thailand.

Immune Response Corporation takes a different approach. It has designed its Remune product in collaboration with **Agouron Pharmaceuticals** (a Pfizer company) as a therapeutic vaccine to enhance the immune systems of individuals already infected with the virus. "Remune is depleted of the gp120 envelope protein of the virus, so that, in a way, we're trying to focus the immune system on the more conserved parts of HIV-1," says Ron Moss, vice president of medical and scientific affairs. "We've observed in our clinical trials that we can stimulate T helper cell responses in some patients. We're at the point where we're trying to see whether the T helper responses correlate with clinical disease progression and whether these additional immune responses decrease the failure rate of patients on antiviral drug therapy." BD Biosciences and others provide reagents and assay services to monitor the functional T cell response following vaccinations with candidate vaccines.

Other organizations are carrying out development that should eventually find use in treating AIDS. **AlleCure**, for example, is a relatively new biotechnology company that focuses on the development and commercialization of vaccines and other therapies designed to affect the immune system. "Our platform system allows us to precisely modulate the immune system and desensitize any individual against any allergen," says president and CEO Stephen McCormack. That platform could eventually find use in delivering vaccines to AIDS patients.

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FOCUS ON THE FUTURE

The devastating consequences of AIDS and other immune disorders have certainly made the public more aware of the importance of the study of the immune system and its role in medicine. The development of better and more specific drugs has also helped to control the progress of AIDS. The possibility of developing an effective vaccine against this virus brings the hope of limiting the spread of AIDS in the future.

Research on AIDS has provided fresh insights for scientists trying to understand other forms of illness. "CD4 assays, the development of exquisitely sensitive assays for the HIV virus in both plasma and tissue, new adjuvants, and new vectors for vaccines: All these technologies would probably have come along anyway, but the compelling need for the study of AIDS has made the process more rapid," says Fauci of NIAID. "It's going to be extremely beneficial for other diseases."

The main target of scientists in academic and industrial laboratories who are studying AIDS and many other immune-related disorders, however, is the hope of finding treatments and cures. Their understanding of the human immune system and how it relates to several diseases such as AIDS, lymphomas, and leukemia remains very limited. "HIV is one incredibly hard virus to study because it affects the physiology of the immune network," declares the University of Arkansas's Chow. "It calls for an interactive effort from a network of investigators from all the basic sciences. No single perspective or field will be able to make an adequate effort or progress."

Nevertheless, with continued efforts from researchers and the manufacturers who supply the tools to make such research possible, the scientific community will enhance progress in the war against the ultimate invader. "We're trying to accelerate the process," says Blattner of the Institute of Human Virology in Baltimore. "We're in the faces of the lab people and they're in our faces to make sure that these products move forward." ∎

Peter Gwynne is a freelance science writer based on Cape Cod, Massachusetts, U.S.A. Gary Heebner is president of Cell Associates, a scientific consulting firm in Chesterfield, Missouri, U.S.A.

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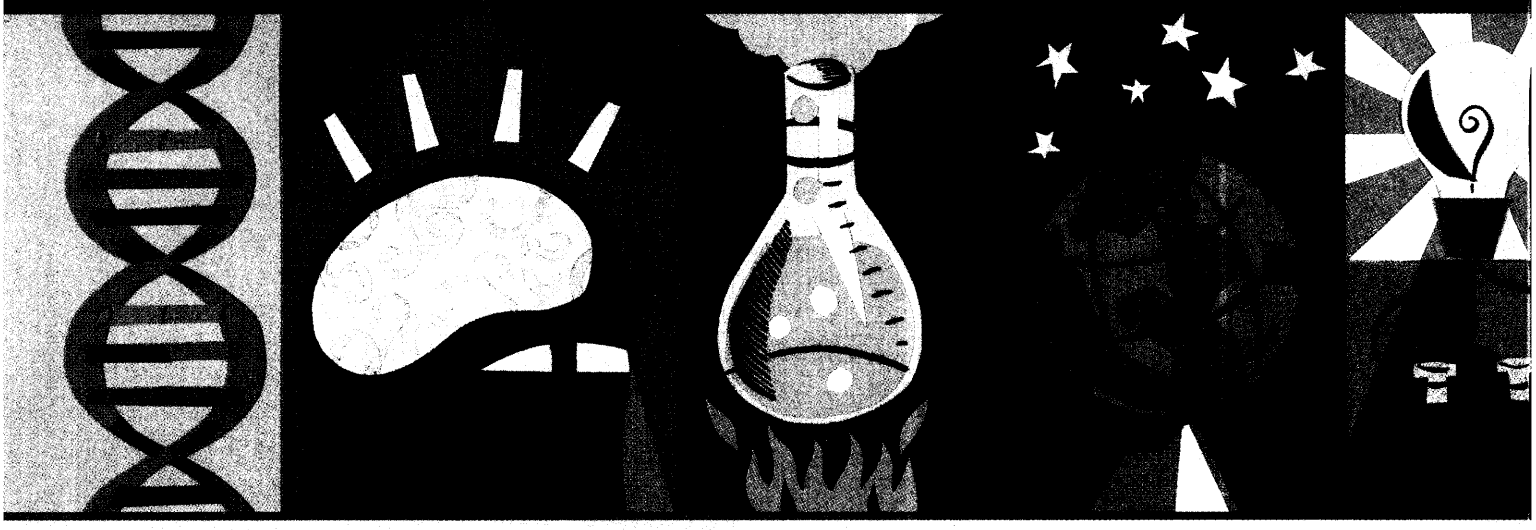

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Stimulating the Business of Life Science

Regional centers intended to stimulate the commercialization of life science research have blossomed throughout Europe. Different approaches to setting up Bio regions share the common goal of creating new companies and large numbers of jobs.

BY PETER GWYNNE

Bio-M AG * Copenhagen Capacity * Eastern Region Biotechnology Initiative * Karolinska Institute * Medicon Valley Capital * Rhein-Neckar-Dreieck BioRegio * Rhineland BioRegio * Scottish Enterprise

During the past five years, the concept of the biotechnology cluster has successfully crossed the Atlantic. Bio regions, as Europeans call them, have emerged in increasing numbers in the United Kingdom, Germany, Scandinavia, and other parts of the continent. These clusters differ in certain ways from the American institutions on which they are modeled: California's Silicon Valley, "Genetown" in Cambridge, Massachusetts, and North Carolina's Research Triangle Park. In particular, many have been created with government funding on a scale unimaginable in the New World. Nevertheless, the Europeans have maintained the underlying idea of incubating new biotechnology businesses in areas that contain universities and other research institutions with strong traditions and present-day achievements in life science research.

The Bio regions and the companies that they have incubated remain relatively immature when compared with their American counterparts. Few of the new firms have started to market products and even fewer have taken the step of going for an initial public offering (IPO). Nevertheless, the clusters have stimulated impressive growth in employment. For example, the number of jobs in the Munich BioRegio (the German term for Bio region) has exploded from 300 in 1997 to 2,800 today.

A former science editor of Newsweek, *Peter Gwynne writes about science and technology from his base on Cape Cod, Massachusetts, U.S.A.*

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Horst Domdey
BIO-M AG

Three factors provide a qualitative measure of the European Bio regions' success. They have created large numbers of jobs. Several regions now face a shortage of qualified personnel. And commercial funding has started to arrive from overseas.

Employment numbers are impressive. The Medicon Valley, a binational Bio region that spans the sound between greater Copenhagen, Denmark, and Sweden's Skåne region, has 34,000 employees in the life science industry, according to Birgitte Thygesen, business development director of Copenhagen Capacity, a local promotion organization. Members of ERBI Ltd., a biotechnology collaborative in Eastern England, employ about 10,000 individuals in work directly related to the biotechnology business. To the north, biotechnology firms under the aegis of Biotech Scotland have created about 4,500 jobs in biopharmacology in recent years.

In some cases those numbers fall short of what regions need. "We have problems finding technicians," says Horst Domdey, CEO of Bio-M AG, which supports the activities of the Munich BioRegio. "Finding good management is also difficult." Henrik Lawaetz of Danish V.C. firm Medicon Valley Capital agrees. "I think a bottleneck is finding competent people," he says. "We have many people to recruit locally from academe and established pharmas, but we need some influx from abroad."

In addition, venture capital companies from the United States and other parts of the world have started to pour money into European biotech start-ups. "There are enough opportunities here and that's what venture capitalists in the U.S. have detected," says Hartmut Thomas, CEO of Germany's Rhineland BioRegio. "They have come over here because the U.S. pond is overfished." Several overseas companies have put capital into the Medicon Valley. "Biofund from Finland has invested in several companies. So has a Norwegian fund," says Lawaetz, whose firm also invests heavily in the region. "Vertex Venture, with Singapore funds, has established its own office in Copenhagen. And Baker Tisch from New York has started to invest here."

J. Mark Treherne
EASTERN REGION BIOTECHNOLOGY INITIATIVE

COMPETITION FOR COMPETITIVENESS

Not surprisingly, given the variety of government philosophies across Europe, Bio regions in different countries have developed in different ways. Government money has played a crucial role in stimulating clusters across the continent, but individual Bio regions have taken different financial paths after the initial infusion of public funds. What all the successful clusters have in common is a strong source of ideas and scientists in local research universities, teaching hospitals, and nonprofit research organizations.

While the United Kingdom was the first European country to develop a significant biotechnology industry, the notion of biotech clusters stemmed largely from a German initiative. The federal government feared, with good reason, that the country would fall far behind the United States and the United Kingdom in commercial life science. "There were two venture capital companies in all of Germany, doing about one investment per year in biotechnology," recalls Domdey. "We were so far behind the U.S. and the U.K. that we needed a kick from the government," adds Ernst-Dieter Jarasch, manager of the Rhein-Neckar-Dreieck BioRegio.

In late 1995 the Ministry for Education and Research provided that kick by announcing a competition to stimulate an innovative biotechnology culture. The BioRegio contest offered three prizes of DM50 million ($22 million) for regions with the most inventive plans for encouraging commercial biotechnology. The plan worked remarkably well. The regional winners – Munich, Rhineland, and the Rhein-Neckar-Dreieck Triangle – and several also-rans went on to set up successful biotechnology clusters. By last year Germany had over 400 new biotechnology companies, more than any other European country. The sector was growing at an annual rate of 25 percent. "In four years," says Thomas, "Germany has become No. 1 in Europe for start-ups."

Henrik Lawaetz
MEDICON VALLEY CAPITAL

Beyond kick-starting a biotechnology industry, the competition notched two major achievements. It helped to create an entrepreneurial environment in a nation that had largely lacked it in the past. And it calmed public fears about genetic manipulation.

The numbers tell the tale of entrepreneurship. Having started from almost nothing in 1996, for example, the Munich BioRegio now has 55 venture capital companies, of which 30 invest in biotechnology. "Several support very early start-ups through seed financing," says Domdey. "Our projects could be funded [with public money] only if they acquired at least the same amount of private capital," adds Rhein-Neckar-Dreieck's Jarasch. "This has been the most important criterion in the overall success of the BioRegios. We didn't want projects so risky that industry would not invest in them on its own. You have to convince investors of the value of each project." Equally important, the BioRegios succeeded in convincing local scientists to take the first step toward commercializing their research. "That wasn't easy as there was an ivory tower attitude," Jarasch says, adding that the feeling has now changed.

So have public attitudes to the genetics industry. "We were very eagerly discussing the risks of genetic engineering until the mid-1990s," says Thomas of the Rhineland BioRegio (officially known as Landesinitiative Bio-Gen-Tec-NRW e.V.). "Then, all of a sudden, probably because of the BioRegio competition, politicians in federal and state governments gave strong support for biotechnology."

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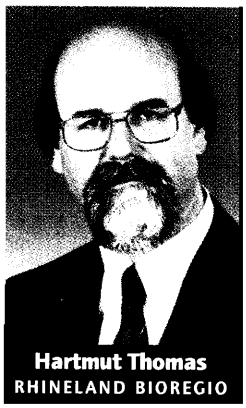


Hartmut Thomas
RHINELAND BIOREGIO

WINNING WAYS

The three winning BioRegios had one factor in common: a strong scientific infrastructure.

"The big asset in this region is the science in Heidelberg," says Jarasch. "We have the University of Heidelberg with its Center of Molecular Biology, the German Cancer Research Center, the European Molecular Biology Laboratory, and the Max Planck Institute for Medical Research. We also have pharmaceutical companies in the region, such as BASF and Boehringer Mannheim [now owned by Roche]." In fact the BioRegio recruited Ulrich Abshagen, a former staffer of Boehringer Mannheim, to head the region's biotechnology effort.

Similarly the Rhineland area built its BioRegio on a foundation of academic centers. "We have the densest population of universities with medical facilities in Germany," says Thomas. "We have a gene center in Cologne and a local biotechnology company Qiagen. And we have the infrastructure of the old chemistry and pharmaceutical industry located along the Rhine." Munich, meanwhile, based its entry to the BioRegio competition on two universities, three biologically oriented Max Planck institutes, and Martinsried, a local center of biomedical companies southwest of Munich.

Martinsried has blossomed since the end of the competition. "We have a critical mass," says Bio-M's Domdey. "The number of biotechnology companies has grown from 36 in 1996 to more than 110. In particular the number of companies devoted to diagnostics and therapeutics has grown considerably. In terms of jobs we had growth of between 60 percent and 70 percent last year." Bio-M supports that growth by maintaining a network of companies, academic institutions, law firms, and other local organizations. "We help companies to write research proposals and organize evaluation procedures," says Domdey.

In the Rhein-Neckar-Dreieck BioRegio, Abshagen has set up a private consulting company to promote the start-up of local biotechnology companies. The company, Heidelberg Innovation GmbH, carries out market research and helps to write business plans for start-up companies. It also runs a venture capital fund to provide money for new companies in their early capital phases. Four years ago that fund represented the only local source of seed capital. Now other venture capital companies have joined the line. "Since the BioRegio competition started, about 50 new companies have been set up here, half of which are research-driven, innovative firms in the core of the biotechnology business," says Jarasch. "These alone have created over 600 jobs for highly qualified people, and the biotechnology industry in our region now employs more than 1,600 people."

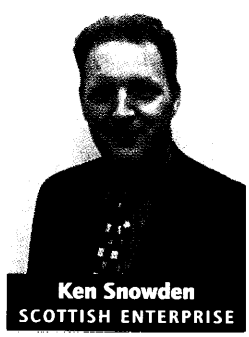
Ernst-Dieter Jarasch
RHEIN-NECKAR-DREIECK BIOREGIO

During the same period the Rhineland BioRegio has overseen about 100 biotechnology start-ups in the Cologne-Aachen-Düsseldorf area. "We call it the BioRiver," says Thomas. "We have a very complete spectrum of applications, including functional genomics with array technologies, high throughput screening technologies, and proteomics, intelligently combined with bioinformatics. We're about to establish platforms in functional genomics, proteomics, and bioinformatics in Bonn. The platforms will serve as backbones for collaboration with the pharmaceutical industry. We are working on similar platforms in Düsseldorf and Essen. And we are setting up a project on integrated functional genomics in Münster that will have applications in research on inflammatory and cardiovascular diseases and cancer."

THE U.K. EXPERIENCE

Britain's biotechnology industry grew up in the early 1990s around academic centers such as Cambridge, Oxford, and Edinburgh. However, clustering organizations did not emerge until later in the decade.

The ERBI (Eastern Region Biotechnology Initiative) has grown significantly since its founding in 1997. "We think it's one of the premier clusters in Europe," says J. Mark Treherne, ERBI's chairman and an executive at local company Cambridge Drug Discovery. "We range across the whole of Eastern England, including Cambridge, Norwich, and Hertford right down to the M25 motorway. We have about 180 members from GlaxoSmithKline to one-man bands. That's about half the membership of the U.K. Biotechnology Association." The membership includes local establishments of several American pharmas, including Amgen, Millennium, Genzyme, and Incyte.



Ken Snowden
SCOTTISH ENTERPRISE

Funds from the central government's Department of Trade and Industry helped the organization to start, but since then it has relied less on public monies than its German counterparts. "We have revenues from membership fees," says Treherne. "Another source of revenue is from conferences, which act as a showcase for the region." Yet more revenue helps both the organization and its members. "We get smaller members to club together to negotiate down the costs of consumables and capital equipment," Treherne explains. "We take a percentage of the transactions that we plow back to the membership." In a similar vein ERBI helps its members to identify and sign up with partners for research and technology projects. "That's particularly important for the smaller firms," says Treherne.

Scottish Enterprise, a government-backed organization, has helped to publicize Scottish biomedicine since the late 1980s. It has recently set up Biotech Scotland to promote the interests of commercial biotechnology and related sciences. "We're now in the middle of a four-year strategy developed with industry partners, academic partners, and the Scottish Executive [Scotland's new parliament, which has responsibility

CONTINUED ⇒

for domestic issues]," says Ken Snowden of Scottish Enterprise. "The strategy has the aim of doubling the size of Scottish biotechnology in the four years that started in 1999."

The new initiative includes commercial financing for biotechnology companies. "There's much more 'angel' finance and venture capital finance coming into biotechnology here," says Snowden. Overall the initiative has helped to create more than 350 companies, including 90 focused specifically on biopharmaceutical research and development.

The country already has a solid foundation based on medical research in Scottish universities. "We have 10 pharmaceutical products in clinical trials out of 45 in the U.K.," says Snowden. "Scotland also manufactures about 70 percent of the world's blood-typing reagents. And quite a lot of our companies are in informatics, developing tools to work on genome databases."

Birgitte Thygesen
COPENHAGEN CAPACITY

THE SCANDINAVIAN CONNECTION

The Medicon Valley started life in the early 1990s as an academic collaboration across the Øresund, the stretch of water between Copenhagen and the Swedish city of Lund. Universities and hospitals in the two cities collaborated to create the government-funded Medicon Valley Academy for academic exchanges. Then in 1996, shortly after authorities had announced plans to erect a road and rail bridge across the Øresund, the idea emerged of commercializing local research.

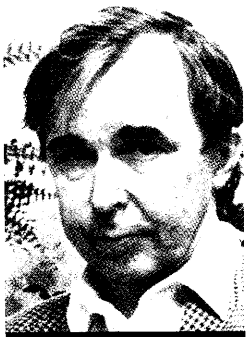
Funds from the European Union and Novo Nordisk, a local pharmaceutical company with a powerful international presence, helped to launch the effort. So did the growth of science parks on both sides of the sound. "The bridge encouraged a feeling of getting close," says Lawaetz of Medicon Valley Capital. "No other place in Europe has universities this close, but people didn't realize it because of the water and the different languages and cultures."

The bridge, which opened last year, has helped to create a critical mass of well-trained scientists. "We have a highly skilled labor force, particularly in biomedicine and biotechnology, as a result of university training on both sides of the sound," says Thygesen of Copenhagen Capacity. As a result, she adds, about 13 new companies set up shop in the region last year.

Local authorities have devised means of attracting top-flight scientists and managers from abroad. Thus both the Danish and Swedish sides offer foreigners some protection against Scandinavia's high taxes. "Foreign experts on three-year contracts can get tax reductions of 50 percent," says Lawaetz. That type of initiative has helped to attract several international biopharmaceutical and biotechnology companies to the region. In May, for example, Cambridge, Massachusetts, firm Biogen announced that it will build a pharmaceutical plant in the Medicon Valley.

AN INSTITUTIONAL BUSINESS

On Sweden's other coast an academic institution has set the stage for a revolutionary new type of BioRegio, based on a single institution. Stockholm's Karolinska Institute has a reputation for awarding Nobel prizes and carrying out medical research of an extremely high standard. Over the years institute scientists have developed a significant number of medical devices and drugs, including human growth hormone. But Karolinska received no revenue from those finds because Swedish law gives individual scientists complete control over the rights to their discoveries.



Hans Wigzell
KAROLINSKA INSTITUTE

Five years ago institute president Hans Wigzell decided to change that situation. He gained permission to found a holding company funded by 5 million krona ($470,000). The holding company spun off a fund with $50 million from conservative investors such as pension funds and medical associations to provide financial backing and other help for institute scientists who wish to commercialize their discoveries. "The fund has first dibs on ideas from the Karolinska Institute," says Wigzell. "We also allow start-up companies that want to be close to our scientists to become 'family members' who give us a share of their profits. It doesn't cost the institute anything, but we will get revenue from it."

The plan has worked well. "In the past 18 months we have had roughly one company coming up every two months," Wigzell says. During that period the number of biomedical companies in the Stockholm-Uppsala region has soared from 70 to about 180. Now Wigzell plans to transform a derelict part of the Swedish capital near the Karolinska Institute along with Karolinska Hospital, Royal Institute of Technology, and Stockholm University into a megacampus. "My vision is that within 10 years the Karolinska Institute will have an equal number of scientists on the company side and in the university," he says. "What we are trying to do is create a kind of virtual pharmaceutical company. I'm pretty proud of it."

A DARK CLOUD?

One potential dark cloud looms over the Bio regions: the worldwide financial downturn. But regional executives see little cause for anxiety, largely because Europe's biotechnology industry is still immature. "We're still in a very steep start-up phase. So it hasn't affected us very much," says Thomas of the Rhineland BioRegio. "Biotechnology hasn't been hit as badly as other technology stocks over here," echoes ERBI's Treherne. "Biotechnology companies have been more resilient and the private companies have been hardly affected at all."

Some growing companies may have to delay their IPOs. "But since there are many venture capital companies, biotechnology firms have good chances of extending their financing up to the IPO stage," says Lawaetz of Medicon Valley Capital.

Domdey of Bio-M sees a positive side of the situation. "Until two years ago most of the biotechnology companies focused on technology platforms," he says. "Now they are switching more and more to product development." That switch will almost certainly guarantee a flow of fresh revenues to Europe's Bio regions. ■

Bio-Gen-Tec-NRW

The state initiative Bio-Gen-Tec-NRW supports the responsible application of life sciences in North-Rhine-Westphalia, home of one-third of the German biotechnological companies. Bio-Gen-Tec-NRW advises and accompanies founders of businesses from the small and middle-sized biotechnological sector in finance and management questions as well as in international partnerships and alliances. Through objective and competent public relations work Bio-Gen-Tec-NRW informs about opportunities and risks of biotechnology and genetic engineering. For further information please contact:

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Further information about the position may be obtained from Michel Goedert, e-mail: mg@mrc-lmb.cam.ac.uk

Applications should include a full CV and the names and addresses of two professional referees who can be contacted prior to interview. Please quote reference NB/601/12 and e-mail: recruit@mrc-lmb.cam.ac.uk or alternatively, send to Kelly Andrews, Personnel Assistant, MRC Centre, Hills Road, Cambridge, CB2 2QH.

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Functional Genomics Center Zurich

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BIOINFORMATICS EXPERT (Proteomics)

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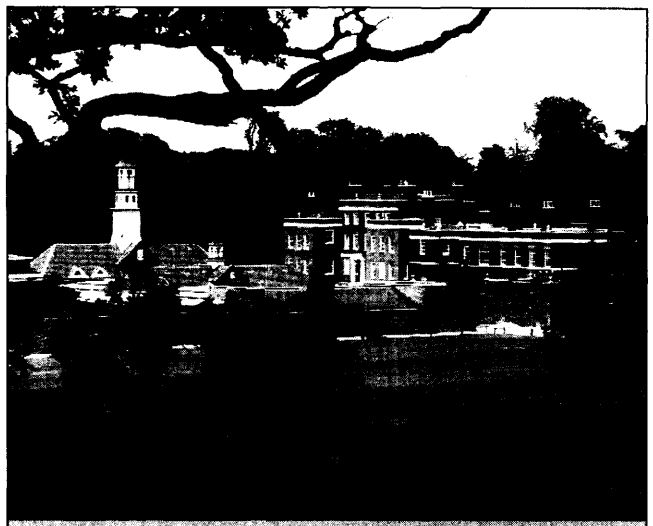

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E-mail: nicky.clarkson@hinxton.wellcome.ac.uk
Telephone: +44 (0)1223 495002
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Registration information: www.wellcome.ac.uk/hinxton/bioinformatics2001
Venue information: www.hinxton.wellcome.ac.uk

Speakers include:

Michael Ashburner, Janet Thornton, Michael Sternberg, Cyrus Chothia, Richard Ward, Manuel Peitsch, Barry Robson, Angel Ortiz, Michael Vieth, Jean Garnier, Harel Weinstein, Francois Iris, John Todd, Laura Walker, David Rubin, Michael Garrett

Topics:

• Virtual human biology • Computational genomics and proteomics protein interactions • Researching and simulating biomolecular interaction networks and bioinformatics aspects of intercellular integration • Environmental healthcare issues and bioinformatics • E-medicine, medical research and healthcare in an Internet world

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The position will involve working with managers and editors, in addition to researching and developing marketing opportunities for the Company's journals in the area of electronic publications. It will be based at the Company's premises in Cambridge, but is likely to involve overseas travel.

The successful applicant will probably have a PhD in biological science, a professional biological publishing background and excellent IT and communication skills.

The salary is negotiable from £40k, commensurate with experience, and will include a non-contributory pension scheme.

Please send letters of application, together with a full CV to:

Dr R J Skaer,
Company Secretary, The Company of Biologists Limited,
140 Cowley Road, Cambridge CB4 0DL, UK

Closing date: 31 August 2001

As a major Pharmaceutical Company well established at an international level, our success depends upon the dynamism of our research directed towards the discovery of novel drugs

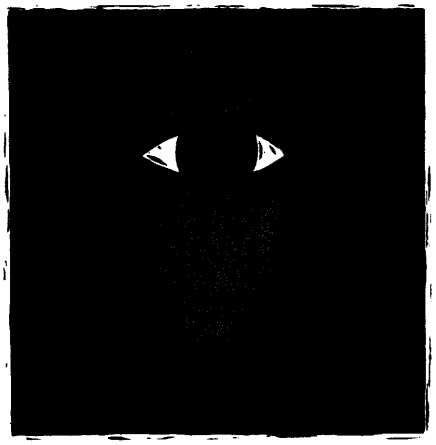
In our Research Center located in the Paris area, we seek to recruit a young scientist for a :

POST-DOCTORAL POSITION

The successful candidate will have a PhD and will be involved in studies in **Electrophysiology of vascular smooth muscle and endothelial cells** (interaction endothelium/ smooth muscle, patch clamp, microelectrode...).

The position is for 18 months.

Applications with curriculum vitae, photograph and handwritten letter are to be sent to **PUBLIVAL/6062** - 27 route des Gardes, 92190 MEUDON (FRANCE)



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As we grow, we have an urgent need for Scientists and Researchers in areas such as Molecular Informatics, Molecular and Cellular Biology, Computatonal Biology, Chemistry, Screening Technology and Protein Chemistry. Visit our website at www.pfizer.com for details and to apply for an opportunity to see the world of drug discovery as you never have before!

Research Associates

Pfizer has opportunities for Research Associates with a BS/MS in fields relevant to the position and 0-5 years experience.

Protein Chemistry
Req. #23Feb0103048

Molecular Biology
Req. #18Jun05637

Compound Management
Req. #06Jun0105457

Screening Technology
Req. #20Jun0105702
Req. #10May0104892

Biology
Req. #20Jun0105700

Clone Expression
Req. #07Jun0105508

Chemistry
Req. #20Jun0105698
This position is located in Groton, CT.

Research Scientists

Skilled professionals with a PhD and 1-10 years experience are sought in the areas below.

Molecular Biology
Req. #18Jun0105635

Screening Technology
Req. #07Jun0105493
Req. #20Jun0105701

Laboratory Automation/Screening Technology
Req. #07Jun0105494

Informatics

We have opportunities for professionals in Informatics. Most positions require a PhD and many years experience in relevant fields.

Director, Molecular Informatics
Req. #21May0105051

Research Applications Developer
Req. #01Jun0105331

Senior Statistician/Mathematician
Req. #01Jun0105334

Computational Biologist
Req. #21May0105052

Computational Chemist
Req. #21May0105050

Cheminformatics Scientist
Req. #21May0105049

As you contribute to our vision, you'll enjoy the Boston-Cambridge academic and scientific community, while savoring a quality of life unique to Boston and New England. **For consideration, please email your resume, indicating Req. #, to SCI@pfizerresumes.com. If necessary, you can mail your resume, indicating Req. #, for these jobs in Cambridge, MA, to Pfizer Resume Processing Center, 630 Boston Road M-104, Billerica, MA 01821, Attn: Softshoe Resumes.** An equal opportunity employer, Pfizer offers a workplace rich with diversity and potential.

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We currently have the following opportunities available for dedicated individuals in San Diego, California:

SCIENTIST I/II

This position requires an innovative and self-motivated scientist that will develop and put into practice high-throughput assays/technologies for ion channel drug discovery in a multidisciplinary environment. The ideal candidate must have a PhD and significant experience in 2 or more of the following areas: ion transport biophysics or biology, drug discovery, electrophysiology, cystic fibrosis, or optical detection methods. Excellent quantitative and communication abilities are necessary. Job #0123MM

SENIOR SCIENTIST

Your primary responsibilities will be to develop ion channel and transporter fluorescence-based assays for internal and external small molecule drug discovery projects. The position also includes the exploration and validation of targets and compounds with secondary assays. Electrophysiology and/or molecular biology experience, a PhD, 3-5 years of postdoctoral experience and excellent communication abilities are essential. Job #0192RN

RESEARCH ASSOCIATE I/II

You will assist assay development and screening of ion channel/transport targets. A BS or MS degree with 2+ years experience in some of the following areas: cell culture, molecular biology, electrophysiology, and high throughput screening methodologies. Expertise in standard computer analysis programs would also be useful. Job #0134KM

GROUP LEADER, DISCOVERY BIOLOGY

We seek an energetic, creative and effective person to lead drug discovery efforts in the area of ion channels and transporters. Using Aurora's world-leading proprietary assay technologies, you and your team will be responsible for the rapid identification and characterization of new small molecule leads for a variety of therapeutically relevant ion channel targets. A PhD and 5 years postdoctoral experience in a relevant scientific area are required. Demonstrated success in assay development and drug discovery for ion transport targets, knowledge of the relevance of ion channel targets in disease, and molecular pharmacology experience are required. Job #0178TG

In addition to competitive salary and benefits, we offer equity participation via an ISO and Stock Purchase Program. For more background on our company, visit our website at www.aurorabiosciences.com. Then email your resume and letter, referencing Job #, to hr@aurorabio.com. Or fax to (858) 404-6720. If unable to email or fax, please mail to Aurora Biosciences Corporation, Human Resources, 11010 Torreyana Rd., San Diego, CA 92121. EOE.

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The ideal candidates will possess:
- Ph.D. in biological sciences.
- Excellent written and verbal communication skills.
- Initiative and strong interpersonal skills.
- Ability for critical and analytical thinking.

All applicants must also submit a writing sample, preferably one where you are the sole author (collaborative samples also accepted in lieu of sole authorship).

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mayo

Director of Microarray and Genotyping Facilities
Mayo Medical School
Rochester, Minnesota USA

The Mayo Clinic (http://www.mayo.edu) in Rochester, Minnesota is seeking a permanent-track faculty member with research interests in the development of microarray and/or genotyping technology and its application to medical genomics. The successful candidate will also oversee the establishment and direction of a translational laboratory as Director of the Genotyping and Microarray Facility component of the Mayo Genomics Research Center. Significant institutional resources are available to pursue independent research while supervising the operation of a high quality, high throughput institutional genotyping and microarray resource that will be accessible to peer-reviewed projects from the Mayo research community.

Mayo Clinic is a non-profit, physician-led, clinical practice integrated with education and research in a unified multi-campus system. Rochester, Minnesota is approximately one hour from the Minneapolis/St. Paul metropolitan area. Rochester (http://www.rochestermn.com/) has excellent schools, a cosmopolitan cultural atmosphere, growing economy, clean environment, and has been consistently rated one of the best places to live in the USA by Money Magazine.

Applicants for this position should submit a cover letter expressing their interest and qualifications, their Curriculum Vitae, and three letters of recommendation before August 15, 2001 to:

Dr. Eric D. Wieben, Chair
Translational Genomics Search Committee
Guggenheim 15
Mayo Medical School
200 First St. S.W.
Rochester, MN 55905
email: pearson.debra@mayo.edu
Fax: (507) 284-9759

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DIRECTOR - Institute for Superconducting Radiofrequency Science and Technology

Jefferson Lab, Accelerator Division (Position #AR2145)

Thomas Jefferson National Accelerator Facility (Jefferson Lab), in Newport News, Virginia, USA, operates the Continuous Electron Beam Accelerator Facility (CEBAF) for nuclear and particle physics research. Superconducting radiofrequency (SRF) technology fundamentally enables the CEBAF accelerator, which provides 6 GeV, CW electron beams for experimental users from scientific institutions worldwide. SRF also drives Jefferson Lab's kilowatt-scale IR free-electron laser (FEL), which serves its own users as the world's most powerful tunable source of coherent, monochromatic light. Jefferson Lab has designed and is building an SRF linac and cryogenic plant for the Spallation Neutron Source, is poised to begin constructing a 12 GeV SRF upgrade of CEBAF, has begun a 10 kW IR and 1 kW UV FEL upgrade, has contributed substantially to planning the SRF portion of the envisioned Rare-Isotope Accelerator, and participates in the TESLA collaboration. The Southeastern Universities Research Association (SURA) manages Jefferson Lab for the U.S. Department of Energy.

To advance its primary core competency in SRF science and technology, Jefferson Lab has created a vertically integrated central professional research, development, and production center: the Institute for Superconducting Radiofrequency Science and Technology. This institute incorporates the associated disciplines of radiofrequency power and its control, research and development of novel cavities, surface science studies, cryogenics and cryomodule production capability, and electromagnetic and particle-beam-driven test facilities. Jefferson Lab's SRF Test Lab and FEL User Facility serve as the primary test facilities. The institute is charged not only with staying abreast of the state of the SRF art, but also with helping to define it. Simultaneously with cavity and cryomodule production capabilities, the institute is charged with taking bold steps in its R&D effort, pushing the SRF potential to its technological limits, and looking toward future breakthroughs. Concurrent with the programmatic goals of production and R&D, the institute is to establish its own information management architecture to ensure archiving of various SRF data and procedures, create a training and mentorship program in partnership with senior laboratory management and universities worldwide, participate in technology transfer and other SRF applications, and maintain its competitive status by establishing additional collaborations and partnerships with other organizations nationally and internationally.

The institute's director will report to the Laboratory Associate Director for Accelerators and will belong to a peer group of leaders/managers jointly owning and committing to tasks requiring SRF expertise in support of various laboratory projects, operations, programs, and facilities. Simultaneously, the director will lead a broad and diverse program in SRF physics and technology in support of particle accelerators and light sources for the global science and engineering community. The candidate must demonstrate significant experience and mature knowledge in an impressive combination of several of the following: SRF physics and technology, the physics and dynamics of particle beams, microwave electronics and control, RF power technology, surface science, cryogenics and low-temperature physics, and electromagnetic theory and design for RF cavities and linacs. Essential qualifications are demonstrated experience in leading/managing a team of scientists, engineers, and technicians in a diverse multidisciplinary setting, and a Ph.D. or equivalent in a relevant scientific or engineering field. Experience with education, training, and mentoring of students and professional staff is highly desirable.

For prompt consideration, please send resume and salary history to: **Jefferson Lab, Attn: Employment Administrator, 12000 Jefferson Ave., Newport News, VA 23606. Fax: 757-269-7559, E-mail: jobline@jlab.org.** Please specify position number and job title when applying. Deadline for application is Sept. 14, 2001 or until the position is filled. For more information on this position, contact Fred Dylla, Search Committee Chair (dylla@jlab.org) or Swapan Chattopadhyay, Associate Director for Accelerators (swapan@jlab.org). Further information and complete descriptions of this and other positions can be found by visiting our web site at http://www.jlab.org/jobline.html or by calling our jobline at 757-269-7359.

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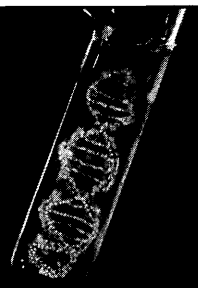

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SCIENTIST, STRUCTURAL INFORMATICS

Our Structural Informatics Group is looking for a PhD Scientist to support the biology, protein engineering and genomics teams by utilizing structural information of proteins which are of interest to Biogen. The ideal candidate will have a strong background in protein modeling/structural bioinformatics and expertise in knowledge-based homology modeling and protein structure prediction methods. Two to five years of postdoctoral or industrial experience preferred. Proficiency in UNIX and demonstrated scientific programming skills in C/C++, Java or Perl required.

Foster your initiative and creativity at Biogen. We have one of the strongest financial profiles in the industry and our compensation and benefits package, including equity participation, is unmatched. For consideration, please forward your resume to: Biogen, Inc., Attn: Human Resources, Source Code: RC-316-SCI, 14 Cambridge Center, Cambridge, MA 02142; email: resumes@biogen.com (Source Code ONLY must appear in the subject line). Biogen is an Equal Opportunity Employer. No phone calls, please.

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Worldwide opportunities within Discovery Research Biology.

GlaxoSmithKline's global Discovery Research Biology group is at the forefront of the pharmaceutical industry's efforts to derive the maximum therapeutic benefit from the Human Genome. Our vision is to marry genes and chemistry in order to develop a small molecule ligand for every potential drug target. In order to achieve this goal, we are systematically exploiting classes of target proteins that provide the greatest chance of drug discovery success. Additionally, to select the right targets the first time and thereby alleviate target associated risk pre-clinically, we are building capabilities to define and characterize as broadly as possible, the biological effects of our novel chemical entities. Our innovative and aggressive approach to science along with our commitment to invest over $4 billion each year in R&D, will make us an indisputable leader in our industry. GSK's effort to escalate the development of novel treatments for human disease and improve the success rate of drug discovery is dependent on the creativity, innovation and spirit of the staff who drive our research activities. To this end, we are looking for entrepreneurially-minded scientists who relish the challenge of unraveling the genome's secrets and applying that knowledge to the development of medicines for the treatment of human disease.

Our line functions are inter-dependent, where drug discovery through scientific excellence is achieved in matrix teams. These teams integrate all program activities to increase our understanding of ligand-induced changes in gene & protein expression within complex biological systems. Three core areas within Discovery Research Biology play critical roles in the execution of our strategy.

High Throughput Biology

Identifying the right targets for our drug discovery efforts is the major goal of HTB. This group will characterize the biological actions and therapeutic potential of novel ligands as well as elucidate the role of specific targets in human physiology. It is responsible for the design and construction of cellular models for testing novel target-selective chemical leads and will also employ a broad array of conventional and innovative *in vivo* models and technologies.

Systems Research

The vision of Systems Research (SR) is to pursue targets relevant to human disease within six protein systems consisting of nuclear receptors, G-protein coupled receptors (7TMs), kinases, proteases, ion channels, and integrins. A major goal of this group is to generate, validate and characterize the structure/activity relationships of chemical tools that enable the successful dissection of the physiology and pathophysiology linked with these target class proteins.

Gene Expression and Protein Biochemistry

This group (GEPB) is focussed on excellence in the generation and functional characterization of recombinant proteins, antibodies and cell lines for all stages of drug discovery and as therapeutic agents. Additional major functions of this group include developing molecular biology and biochemistry of key receptor and enzyme target classes, technological innovation in gene expression, fermentation strategies, and advancing modern approaches to protein biochemistry.

When you join us, you will find yourself in a vibrant environment that fosters creative, innovative thinking and action. This culture coupled with the resources at hand effectively offers unparalleled opportunities for ground-breaking impact on the drug discovery process. Filled with challenges and rewards, your work will play a pivotal role in the development and application of tools, technologies and procedures for turning biological science into the future drug pipeline of GSK.

Discovery Research Biology has worldwide opportunities for ***scientists experienced in drug discovery as well as those newly interested in joining our industry****. Openings exist at our US facilities located in suburban Philadelphia, PA and Research Triangle Park, NC, our Harlow and Stevenage facilities in the UK as well as our laboratories in Tsukuba, near Tokyo, Japan. Be on the lookout for future advertisements, or visit our website at www.gsk.com for more information regarding opportunities. You can apply online now by referring to Job Code: 01-1321 for US and Japan opportunities or Job Code: SUIDRB/500 for UK opportunities. Please note the Job Code is essential to search the Careers site. Principals only, no agencies please.*

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Platform Leaders (2 positions)

Responsible for managing and coordinating resources (equipment and personnel) for the Platform within the NA AS & AD Function for North America. Promote inter/intra function communication, develop personnel to meet personal, function, and project goals. Serve as an expert in current and emerging technologies directly impacting the platform objective of best-in field. Report directly to the functional head on matters impacting the functional group's ability to meet project milestones. Required: Ph.D. in immunology or micro/molecular biology with significant research experience (both industrial and academic experience), which includes 5 years industrial experience in product research and/or development and project management. 2-5 years experience in a diagnostic or test development laboratory. Direct experience in the development and validation of laboratory assays as well as GMPs and assay validation. 5-8 years management experience. Desired: experience in vaccine development, experimental design and interpretation of data as well as experience in presentation of result at both scientific meetings and in recognized publications. Experience with immunology, biochemical and microbiology/molecular biology analysis, biostatistics, statistics and matrix management. Direct interaction with Regulatory Agencies regarding assay development and validation. Experience in database management, LIMS or SAS would be a plus.

Laboratory Automation Engineer

Responsible for maintaining and providing technical support for scientific laboratory and serology equipment (plate readers, freezers, refrigerators, incubators, robotics, etc.). Provide laboratory equipment and software validation support in writing documents (validation plans, protocols, specifications, reports, SOPs, etc.) and executing protocols. Test, repair, calibrate and schedule to ensure that all equipment meets the guidelines stated in SOPs and are compliant with regulatory guidelines. Assure current facility equipment and systems are properly functioning and maintained and assume the lead responsibility in trouble shooting equipment/systems. The successful candidate will manage platform validation projects and collaborate with the IS and QA departments along with staff and scientists. Required: B.S in Engineering, Chemistry, Biology. Desired: 3-5 years validation, regulatory, compliance.

Research Scientists (3 positions)
Clinical Immunology (Virologist)
Analytical Immunology
Biochemistry

Key scientific responsibilities include the planning, supervision and execution of experiments leading to new serological assays including functional Ab assays to support major project milestones. Maintains collaborations with outside experts (e.g. CDC, FDA, Vaccine Centers, etc.) to establish assay concordance and validity. Works closely with Research, Quality Control, Regulatory, and Medical Affairs to develop clinical correlates of protection. Also, supports development of assays for cellular immunity and seroepidemiology. Serve as leader or member of Project Teams and subgroups. Background and experience with the development/optimizations of cell based neutralization and functional antibody assays, validation of cell based and functional antibody assays desired. Computer skills and cGMP/GLP training a plus. Required: Ph.D. or equivalent industrial experience, demonstrated capabilities in a specialized field in combination with the formal degree and experience in virology, immunology or biochemistry. Desired: Ph.D. with post-doctoral training and vaccine characterization experience.

Aventis Pasteur offers an excellent salary and benefits package, ongoing opportunities for continuing education and professional development, and satisfaction of working for a leading edge company with an exceptional record of success in the global marketplace.

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Send resumes via email to: arlyn.smith@aventis.com

(please include position title in subject line)

We are an equal opportunity employer, M/F/D/V committed to a smoke-free and drug-free environment.

Physician-Scientists Infectious Diseases

The Division of Infectious Diseases is seeking two Physician/Scientists for full-time academic positions at the Assistant or Associate Professor level. Primary responsibilities will be in research (75%) and patient care/teaching. Preference will be given to candidates with independent funding, whose research interests are broadly related to bacterial secretory systems, retrovirology, host cell responses to infectious agents, mechanisms for microbial pathogensis, antimicrobial resistance. or vector- borne diseases.

Candidates must be board-certified in Internal Medicine and board-eligible/certified in Infectious Diseases. Candidates will occupy state of the art office and laboratory space in the Center for Infectious Diseases in close proximity to other researchers working on microbial pathogenesis and other aspects of infection. Expanded startup funds will be provided by a grant from the Howard Hughes Medical Institution.

Please send letter of interest and CV to Dr. Benjamin J. Luft, Chairman, Dept. of Medicine, Stony Brook University/SUNY, Stony Brook, NY 11794-8160.

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UCSF **Post-Doctoral Position**

The Human Exposure Laboratory, in the Lung Biology Center at the University of California, San Francisco has a position for a Post-Doctoral scientist. The group investigates the effects of exposure to airborne toxins (gases, particles) on the pulmonary system in humans (healthy, allergic, asthmatic). Projects investigate the inflammatory process in the airways through the determination of cellular, biochemical, and gene expression responses. This position will allow the person to utilize airway cell, tissue, and fluid samples from multiple human exposure projects to independently investigate the mechanisms controlling airway inflammation. Specifically, they will investigate cytokine-cell interactions [at the gene (arrays), and protein levels], with the goal of delineating the mechanisms of the inflammatory cascade induced by inhaled toxins.

The successful applicant will have cell and molecular biology skills, and be able to integrate these skills into human exposure projects. Applicants should submit: Curriculum Vitae, statement of research interests and contact information for three referees.

Contact: Colin Solomon, Ph.D., Lung Biology Center, UCSF Box 0854, University of California, San Francisco, CA, 94143, USA. Ph: (415) 206-3106; Fax: (415) 206-4123. E-mail: soloc@itsa.ucsf.edu

UCSF is an Affirmative Action/Equal Opportunity Employer and committed to a diverse workforce.

SULTAN QABOOS UNIVERSITY
COLLEGE OF SCIENCE
Chair: Department of Earth Science

Sultan Qaboos University, the national University of Oman, is seeking an experienced geologist to lead its Earth Sciences Department into the new millennium. A new Virtual Reality Centre and an Earthquake Monitoring Unit are associated with the Department. The new Head will be expected to work closely with the directors of these centers and their staff to enhance the research potential of the Department and to graduate competent geoscientists at both undergraduate and postgraduate levels. Superb facilities, coupled with Oman's spectacular geology, make this a prestigious position with considerable potential. We are looking for an experienced individual with vision, a strong research record, experience in graduate supervision, knowledge of computer applications in geosciences and a commitment to participative, collegial management.

The University is located near the capital area and close to excellent international schools and unique natural recreational areas. Apart from a very attractive tax free base salary, Sultan Qaboos University offers free furnished accommodation, excellent recreational facilities on campus, subsidized schooling for up to two children, 60 days annual leave with return air tickets, end of service gratuity, free medical treatment in Government Hospitals in the Sultanate.

Enquiries can be addressed to the Dean of Science, Prof. Anton McLachlan, at antonmcl@squ.edu.om Applications should include a statement of interest, a detailed curriculum vitae and names and addresses of three referees. The position will remain open until filled but applications received before 15th September, 2001 will receive strongest consideration. The University reserves the right not to make an appointment.

Please send applications, quoting our Ref: ADV/SCI/03/01, to:

The Director, Personnel Affairs,
Sultan Qaboos University,
P.O.Box 50, Al-Khod - 123,
Sultanate of Oman
Email :personel@squ.edu.om OR
nair@squ.edu.om

MOUNT SINAI SCHOOL OF MEDICINE

Assistant/ Associate Professor

The Institute for Gene Therapy and Molecular Medicine of the Mount Sinai School of Medicine wishes to recruit an outstanding faculty member at the Tenure-Track Assistant/ Associate Professor level in the area of gene transfer and/or cell therapy involving bone marrow derived stem cells. Potential areas of interest include basic hematopoietic stem cell biology; use of stem cells for the treatment of autoimmune disease and immune deficiency, and for the induction of allogeneic tolerance; and models for engraftment across MHC barriers. Priority will be given to individuals using or developing appropriate animal models that can lead to future clinical translational studies. Applicants must have a Ph.D. and/or M.D. degree, and have relevant postdoctoral experience or a proven track record in the field. To be successful in developing an integrative research program, the candidate must be able to interact extensively with the existing faculty investigating basic and applied hematopoiesis.

We offer an exciting research environment with state-of-the-art core facilities, and generous start-up funds. Candidates should submit their CV, a statement of research interests and the names and addresses of three references to: **Hans-Willem Snoeck, M.D., Ph.D., Assistant Professor, Institute for Gene Therapy and Molecular Medicine, Mount Sinai School of Medicine, One Gustave L. Levy Place, Box 1496, New York, NY 10029. Telephone: (212) 659-8269. Fax: (212) 803-6740.** EOE.

NEW YORK MEDICAL COLLEGE
Chair of Microbiology and Immunology

New York Medical College, founded in 1860, is one of the nation's largest private health sciences universities with a strong academic tradition. Our faculty is committed to the quality education of our students and to excellence in research.

Situated in the picturesque Hudson Valley region of Westchester County, our Valhalla campus is just 30 minutes north of New York City.

The Department of Microbiology and Immunology participates extensively in undergraduate medical education as well as in Ph.D. and M.S. graduate programs. The College has embarked on a significant expansion to modernize its teaching and research facilities and as the head of the Department of Microbiology and Immunology, you will have a unique opportunity to build on its excellence and advance the Department.

This is an ideal opportunity for an effective leader with strong ongoing research program who is committed to excellence in teaching and research. Applications should include a c.v. and a narrative statement of research achievements and administrative philosophy.

Dr. Ernest Y.C. Lee
Chairperson, Search Committee
Department of Biochemistry
and Molecular Biology
NEW YORK MEDICAL COLLEGE
Valhalla, NY 10595

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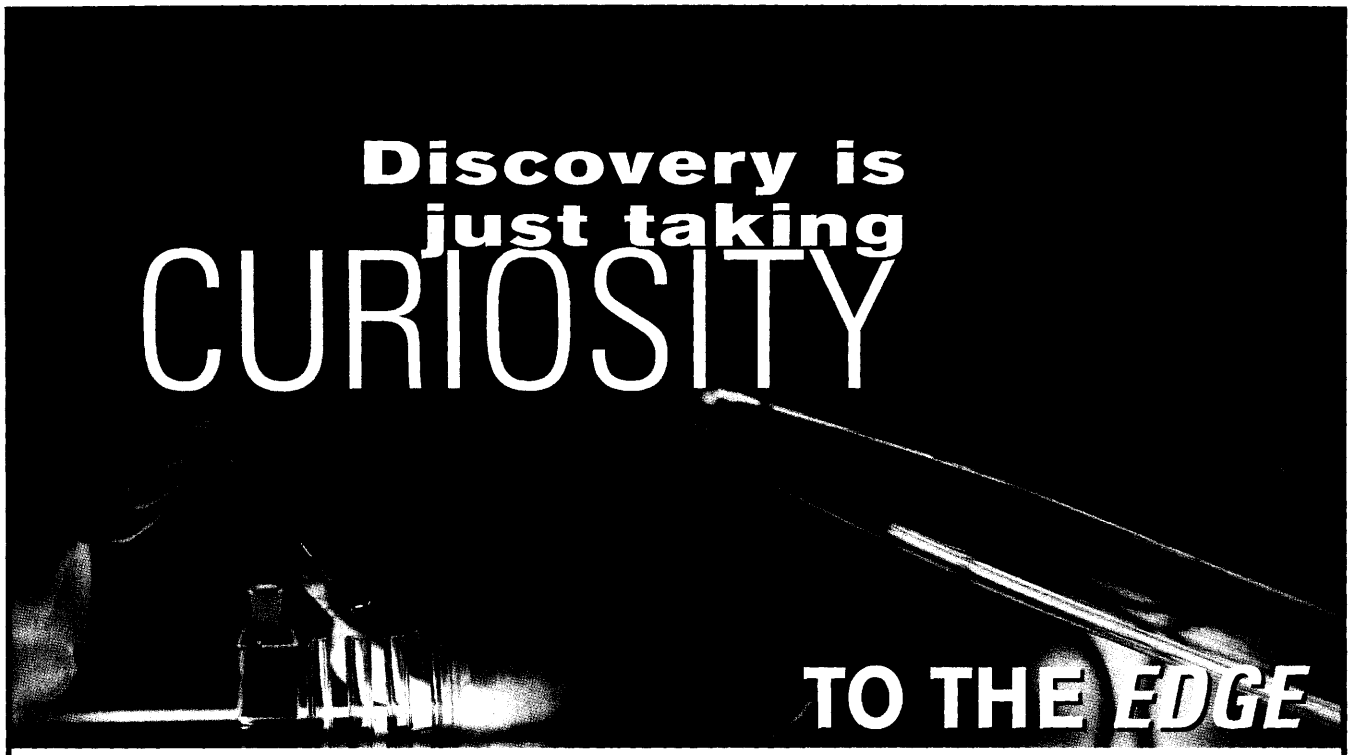

When curiosity is developed to its full potential, great discoveries are made. At Pharmacia Corporation, we invest $2+ billion a year in R&D with major activities focused in the areas of arthritis/inflammation, cancer, infectious diseases, cardiovascular and metabolic diseases, and disorders of the central nervous system. Exciting opportunities now exist for innovative, forward-thinking postdoctoral researchers to join our team.

The following opportunities are contract positions, engaged through Quantum Resources, a third-party employer. Selected candidates will work at the location sites indicated, under the supervision of Pharmacia scientists.

POSTDOCTORAL RESEARCH ASSOCIATES

CNS Drug Discovery Research - St. Louis, MO

This 2-year position for an NMR/MRI postdoctoral Research Associate represents an exciting opportunity to work with a world-class pharmaceutical team developing and applying state-of-the-art NMR/MRI methods to study neurodegenerative disorders, including Alzheimer's disease, as well as such psychiatric diseases as major depression and schizophrenia. Along with a PhD in Chemistry, Biology, or Physiology, candidates will need a related background, hands-on experience with *in vivo* NMR/MR spectroscopy, plus good computer skills. Experience in experimental design, image analysis, and the implementation, optimization and development of MR imaging/spectroscopy techniques is strongly desired. Opportunities exist for collaboration with the Biomedical Imaging Laboratory, located at the Mallinekrodt Institute of Radiology, Washington University, St. Louis, MO.

Biochemistry/RNA Modifications - Kalamazoo, MI

You will study RNA modification and the mechanisms for modifying RNA in fungal mutants. The ideal candidate will be skilled in RNA purification, RNA handling and chemical characterization of base modifications. Qualifications include a PhD in Chemistry, Biochemistry, Molecular Biology or related fields with experience in the biochemical characterization of nucleic acids. Other useful skills would include chemical analysis techniques (HPLC, TLC and MS) as well as molecular biology techniques, including gene manipulation and *in vitro* translation.

Protein Crystallography- Kalamazoo, MI

We seek a highly motivated individual to join our multidisciplinary Macromolecular Crystallography group focused on structure-based drug design of new antibacterials. Specifically, this will involve challenging structural studies of novel antibacterial targets and associated protein-inhibitor complexes. You will need a PhD in Biochemistry, Biophysics or related field with significant laboratory research experience in crystallographic structure determination. Laboratory experience in molecular biology and protein chemistry is highly desirable.

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Curious? Discover your potential with Pharmacia. For confidential consideration, please send your resume, indicating the position of your interest, to: **Beryl Galer, Quantum Resources, 8191 Moorsbridge Road, Suite G, Kalamazoo, MI 49024. Email: bgaler@quantum-res.com.** As an Equal Opportunity/Affirmative Action employer, Pharmacia Corporation values a diverse combination of ideas, perspectives and cultures.

PHARMACIA

St. Jude Children's Research Hospital

ALSAC • Danny Thomas, Founder

POSTDOCTORAL POSITIONS IN IMMUNOLOGY

Two NIH-funded post-doctoral positions are available for enthusiastic, hard-working individuals to work in one of the following areas:

1) ***Negative Regulation of T Cell Function.*** This study will focus on the molecular mechanism of LAG-3 function and subsequent signal transduction.

2) ***Establishing Tolerance as a Treatment for Diabetes.*** This study will evaluate a novel approach for inducing tolerance to GAD in the NOD mouse model.

You should have a PhD and/or MD, a solid understanding of basic immunology, and practical experience in molecular biology, biochemistry and/or cellular immunology. Information on our research can be found at www.stjude.org/departments/vignali.htm

St. Jude Children's Research Hospital has a highly interactive research environment and state-of-the-art facilities including core laboratories for proteomics, microarray analysis of gene expression, transgenic/knock-out technology, etc. The Immunology Department, chaired by Dr. Peter Doherty, consists of eight faculty and 50 support staff. Competitive stipends are available as well as a benefit package that includes professional developmental funds for journal subscriptions and travel.

Send a CV with the names of three references (postal and e-mail addresses, phone and fax numbers) and an outline of your past accomplishments and future career aspirations to **Dr. Dario Vignali, Department of Immunology, St. Jude Children's Research Hospital, 332 N. Lauderdale, Memphis, TN 38105. Tel: 901-495-2332. FAX: 901-495-3107. E-mail: dario.vignali@stjude.org**

www.stjude.org

GLOBAL OPPORTUNITIES

IRRI

HEAD, GENETIC RESOURCES CENTER

International Rice Research Institute (IRRI)
DAPO Box 7777, Metro Manila, Philippines

IRRI is seeking a genetic resources specialist to head its Genetic Resources Center (GRC), which manages the world's largest rice germplasm collection as well as a biofertilizer germplasm collection. Interested candidates should have a Ph D in botany, genetics, or crop science with a specialization relevant to the conservation of genetic resources (e.g., taxonomy, molecular or population genetics, seed physiology) and at least 7 years of experience in working with genetic resources. A complete position description and information about IRRI can be found at **www.cgiar.org/irri/irsjobs.htm** or contact the search committee chair, Dr. Graham McLaren at **g.mclaren@cgiar.org**. Please refer to code –IR01-GRC-Science.

FOUR DIRECTORSHIPS AVAILABLE

The Sidney Kimmel Cancer Center, located in the Torrey Pines area of San Diego, is hiring four directors to establish core facilities and services. Academic track appointments are negotiable for all positions. Competitive salary and benefits provided.

GENOMICS CORE DIRECTOR
Provide services via the glass microarray and Affymetrix array core facility, BioMek FX robot, and Real Time PCR machines. Will interface with Bioinformatics for preliminary data analysis requiring some software skills/ knowledge.

BIOINFORMATICS DIRECTOR
Supervise the bioinformatics component of the genomics and proteomics cores. Requires computer scientist with M.S. or Ph.D. and an interest in bioinformatics.

PROTEOMICS DIRECTOR
Set up and run growing facility, including new QTOF, MALDI, Nanospray mass specs, 2-D gel with image analysis. Requires experience in mass spectral analysis of proteins, microflow separations, automation, de novo sequencing and database searching.

ELECTRON MICROSCOPY/IMAGING DIRECTOR
Will set up and run new facility. Proven experience in transmission EM, including immunogold labeling of ultrathin cryosections. Also light and fluorescence microscopy helpful.

Send c.v., indicating which position is of interest, to:

Albert B. Deisseroth, M.D., Ph.D., CEO
Jan E. Schnitzer, M.D., Scientific Director
Human Resources-SC
10835 Altman Row
San Diego, CA 92121
Fax (858) 410-4222
humanresources@skcc.org

AA/EOE

POSTDOCTORAL POSITIONS

MOUNT SINAI SCHOOL OF MEDICINE

Mount Sinai School of Medicine currently has research positions available to study the biochemical and toxicological effects of cytochrome P4502E1 in cultured rat and human hepatocytes and in engineered HepG2 cell lines. Specific projects involve studies on signal transduction pathways, which play a role in CYP2E1-mediated oxidative stress and cytotoxicity, use of microarrays and differential display to evaluate the effects of CYP2E1 overexpression on hepatic gene expression, and the role of oxidative stress, molecular chaperones and the proteasome complex in regulating CYP2E1 turnover. Experience in the appropriate biochemical, molecular or protein turnover techniques required. Salary commensurate with experience.

Please forward CV and names of three references to: **Dr. Arthur I Cederbaum, Dept. of Biochemistry and Molecular Biology, Mt. Sinai School of Medicine, One Gustave L. Levy Place, Box 10-20, New York NY 10029. Fax: (212) 996-7214. E-mail: Arthur.Cederbaum@mssm.edu.** EOE.

STOWERS INSTITUTE®

FOR MEDICAL RESEARCH

Postdoctoral Positions

Situated on a 10-acre campus in the heart of Kansas City, the Stowers Institute for Medical Research conducts basic research on genes and proteins that control fundamental processes of cellular life.

The Stowers Institute takes great interest in postdoctoral training and provides a number of internal programs to enhance preparation for careers in laboratory research. Postdoctoral Research Associates have the opportunity to work in state-of-the-art laboratories using the most advanced technologies. They will interact with interdisciplinary research teams and receive competitive salaries and excellent benefits.

The following positions are now available.

- A Postdoctoral position is available immediately to study **molecular mechanisms regulating germline stem cells** in *Drosophila* as well as in the mouse using a combination of molecular, genetic, genomic and cell biological approaches (*Cell* 94:251-260, 1998; *Science* 290:328-330, 2000). Recent Ph.D.s with experience in genetics, development, molecular biology and/or biochemistry are particularly encouraged to apply. For informal inquiries about the above position, contact Dr. Ting Xie at **tgx@stowers-institute.org**.
- A Postdoctoral position is available immediately **to identify and characterize novel genes regulating neural crest cells during craniofacial development**. The successful candidate will have significant experience in molecular biology, particularly in making cDNA libraries. Experience in vertebrate development techniques would be an advantage. Recent publications include *Nature Cell Biology* 2:96-102, 2000 and *Nature Cell Biology* 2:103-109, 2000. For informal inquiries about the above position, contact Dr. Paul Trainor at **pat@stowers-institute.org**.
- Two to three postdoctoral positions are available immediately to study **meiotic chromosome pairing and segregation** in *Drosophila*. Interested candidates should have demonstrated proficiency and productivity in one of the following areas: *Drosophila* molecular genetics, analysis of motor proteins, or high-resolution optical cytology. Efforts will be focused on the structure/function analysis of proteins involved in SC structure and in chromosome movements during and following prometaphase. For informal inquiries about the above position, contact Dr. Scott Hawley at **rsh@stowers-institute.org**.
- A Postdoctoral position is available to study the **signaling pathways of apoptosis in mammalian systems**. Previous work has demonstrated that a novel mitochondrial protein, Smac, promotes caspase activation in the Apaf-1/Cytochrome c pathway by removing suppression by IAP (*Cell* 102:33-42, 2000; *Nature* 406:855-862, 2000; and *Nature*, 408:1008-1012, 2000). The project will utilize techniques of protein biochemistry and molecular biology to delineate the mechanism of function of Smac in normal and cancerous cells as well as to identify other novel biochemical pathways in apoptosis. Attention will be given to candidates with a strong background in protein biochemistry and molecular biology. For informal inquiries about the above positions, contact Dr. Chunying Du at **cdu@stowers-institute.org**.
- Postdoctoral positions are available immediately for technology development in **DNA microarray and proteomics.** A strong background and training in Molecular Biology is required. The successful candidate must have experience in high throughput and robotic technologies. Experience in data mining and analysis of microarray data is desirable. For informal inquiries about the above positions, contact Dr. Ranjan Perera at **per@stowers-institute.org**.

To apply, send CV, statement of research experience and interests, and names and contact information of 3 references, with cover letter, to: **Judy McNish, Human Resources, Stowers Institute for Medical Research, 1000 East 50th Street, Kansas City, MO 64110; or to jlm@stowers-institute.org. Please clearly indicate the position of interest to you**.

The Stowers Institute is an Equal Opportunity Employer.

DISCOVERY PARTNERS INTERNATIONAL, INC., is focused on providing the best platforms, services, and information available to augment the internal drug discovery efforts of pharmaceutical and biopharmaceutical companies in the postgenomic era. We are looking for candidates in the computational area who will join our team in applying our integrated discovery platform, which includes combinatorial and medicinal chemistry, structure- and ligand-based design, and high-throughput biological screening. DPI is headquartered in San Diego, California, and has operations in San Francisco, California, Tucson, Arizona, Fort Lee, New Jersey, and Basel, Switzerland.

Senior Chemoinformatician or **Computational Chemist (California).** We are seeking a senior chemoinformatician or computational chemist experienced in scientific applications and programming including database infrastructure development. This candidate will lead our efforts in the development and maintenance of the internal infrastructure used by our small-molecule design products. The candidate will participate in the planning, implementation, and design of software systems to serve the various efforts ongoing in DPI including high-throughput screening, μARCS development, combinatorial synthesis and design, and implementation of a corporate compound database. This senior candidate will have had extensive experience in the pharmaceutical industry and have supervised a group including software engineers. The candidate must also be proficient with commercial database products from MDL and Daylight, data stores such as Oracle and Access, SQL, C++, and object-oriented programming applied to pharmaceutical applications.

Computational Chemists (New Jersey and California). We are looking for computational chemists to join our team in applying structure- and ligand-based lead generation and optimization strategies. Previous experience in drug design or structural biology including docking techniques, pharmacophore mapping, and a knowledge of ligand protein interactions is necessary. Candidates possessing expertise in chemical informatics, QSAR derivation and application, and datamining techniques are also being sought. Excellent communication skills are expected, as you will interact closely with chemists and biologists in an interdisciplinary, team-based environment.

Computational Chemistry Software Engineer (New Jersey). We are seeking a structural biochemist with an extensive knowledge of C++ programming to work on the development of a next-generation docking program, which will model protein-ligand interactions for entire protein families. The successful candidate will have experience in the development of molecular modeling programs and a demonstrated knowledge of protein-ligand interactions.

Postdoctoral positions (New Jersey and California). We have postdoctoral positions available in applied computational chemistry. The candidates will carry out research in areas relating to protein-ligand interactions, protein surface characterization, and proteomics.

Please reply to: **Computational Chemistry Search Committee, Discovery Partners International, 9640 Towne Centre Drive, San Diego, CA 92121. E-mail: info@structuralproteomics.com.**

Faculty Positions
Brain Imaging and Analysis Center
Duke University Medical Center

The Brain Imaging and Analysis Center (BIAC) at Duke University Medical Center is seeking exceptional candidates for two tenure-track faculty positions. The BIAC focuses upon basic and clinical research in human brain function using magnetic resonance imaging and spectroscopy. Candidates in the areas of MR physics and biophysics, image and signal processing, and cognitive and clinical neuroscience are particularly welcome to apply. A demonstrated capability or exceptional promise for developing a first-rank, independent, extramurally funded research program is required. New faculty will hold primary appointments at the appropriate rank in medical school departments such as Radiology, Psychiatry, Neurobiology, or Biostatistics and Bioinformatics.

Major equipment at the BIAC includes two research-dedicated GE MRI NVi systems operating at 1.5 and 4.0 Tesla. The BIAC is closely affiliated with Duke University's Center for Cognitive Neuroscience, Center for Advanced Magnetic Resonance Development, and Center for In-Vivo Microscopy. Interested candidates should submit a statement of research interests, c.v., representative publications, and three letters of recommendation to: **Professor Gregory McCarthy, Director, Brain Imaging and Analysis Center, Box 3918, Duke University Medical Center, Durham, NC 27710 (for courier use 163 Bell Building, DUMC, tel. 919-681-9337).** This search will remain open until both positions have been filled; however, applications prior to September 15, 2001 will be guaranteed consideration.

Duke University is an Equal Opportunity - Affirmative Action Employer.

Postdoctoral Position
Mayo Clinic Rochester
Rochester, MN

A postdoctoral fellowship position is available immediately in the laboratory of Dr. Richard Vile, a faculty member within the Molecular Medicine Program. The position involves the construction of targeted vector systems to express a highly potent class of cytotoxic and immunostimulatory genes known as the Fusogenic Membrane Glycoproteins (*Cancer Res.* **60:**1492, 2000; **60:**6396, 2000; *Gene Ther.* **19:**1656, 2000).

Expertise in any or all of molecular biology, virology, immunology and cell biology would be required. Salary will be determined by the successful candidate's experience. There is also an attractive benefit package. Mayo Foundation is a non-profit physician-led clinical practice integrated with education and research in a unified multi-campus system.

Application including a CV, summary of past accomplishments, and the names of three referees should be sent to:

Dr. Richard G. Vile, PhD
Mayo Clinic Rochester
Molecular Medicine Program
Guggenheim 18
200 First St SW
Rochester, MN 55905
Email: vile.richard@mayo.edu
http://www.mayo.edu/research/mmp/

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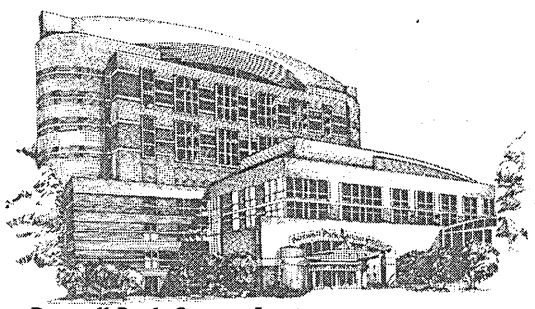

Roswell Park Cancer Institute
4th Annual Symposium on Oncological Sciences

November 5-6, 2001

Hilleboe Auditorium
Roswell Park Cancer Institute

Modeling Tumor Expression Profiles for Intervention

Faculty Includes:
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ROSWELL PARK CANCER INSTITUTE

Contact:
Enrico Mihich, MD
Roswell Park Cancer Institute
Elm & Carlton Sts.
Buffalo, NY 14263
Tel: 716-845-3314
FAX: 716-845-3351
E-mail: ann.toscani@roswellpark.org

Voted one of the "Best Places To Work" - *Philadelphia* Magazine, February 2001

DIVISION CHIEF FOR DEVELOPMENTAL BIOLOGY

The Department of Pathology and Laboratory Medicine at The Children's Hospital of Philadelphia invites applications for a faculty position at the rank of full Professor in the tenure track of the University of Pennsylvania School of Medicine, available July 2002. The candidate should be a senior-level M.D., Ph.D., or M.D./Ph.D. developmental biologist with expertise in mouse genetics and/or developmental biology.

The successful individual will be charged with the mission of building a new division of Developmental Biology within the institution. Individuals should have an independent track record in this area and have shown the ability to participate in the training of both graduate and medical students. The environment within The Children's Hospital of Philadelphia and the University of Pennsylvania for both collaborative basic and clinical research is outstanding.

Curriculum vitae, a statement describing previous experience, and the names of three references should be submitted by November 30, 2001 to: **Scott Baldwin or Jeff Golden, Chairs for Developmental Biology Search Committee, The Children's Hospital of Philadelphia, 5135 Main, 34th Street and Civic Center Boulevard, Philadelphia, PA 19104-4399**

The Children's Hospital of Philadelphia and the University of Pennsylvania is proud to be an equal/affirmative action employer. Women and minority candidates are strongly encouraged to apply.

The Children's Hospital *of* Philadelphia
A pediatric healthcare network

CHIEF SCIENTIST

The **Jet Propulsion Laboratory (JPL)**, an operating division of the California Institute of Technology, is a leading research and development center for NASA. JPL employs over 5000 and is responsible for missions that explore the frontiers of the solar system and perform Earth observations. JPL seeks a Chief Scientist for the Solar System Exploration Directorate.

Duties include developing scientific exploration strategies, interfacing with the science community and directing mission planning. To qualify, you must be an expert in solar system exploration with extensive, independent solar system science research experience. A broad understanding of NASA solar system strategic plans/issues and the scientific profession in general is essential. Prefer candidates with a PhD in Physical Science (ideally in a Planetary Science area) and 10 years of work experience, or an equivalent combination of education and experience. Proven success with the scientific proposal process and the scientific community in general is also desired. Knowledge of JPL Institutional requirements, policies and management practices is ideal.

For immediate consideration, please mail/fax your resume and position of interest to: **Jet Propulsion Laboratory, Dept. GDD/CS, 4800 Oak Grove Drive, MS-T1720-C, Pasadena, CA 91109**; Fax: **(818) 393-4591**; E-mail (ASCII text only, no attachments): **jobs@jpl.nasa.gov**. EOE.

JPL
Jet Propulsion Laboratory
California Institute of Technology

www.jpl.nasa.gov

GLOBAL OPPORTUNITIES

研究員募集

創造的研究をポリシーとするHIHがBiotechnology, Life Scienceの分野で働く研究員を求めています。
あなたの発想が活かせる日本では唯一ユニークな研究所です。

Foreign applicants with a good command of English are also welcome, as Japanese skills are no absolute prerequisite for research activities at our institute.

業務内容
1. 人工生命の創作
2. ヒトモノクローナル抗体のタンパク質工学
3. 癌細胞抗原のネットワーク解析
4. ラン藻細胞を用いた有用物質の生産
5. ガンワクチンの開発
6. 抗老化因子の探索
7. ストレス・癌・免疫機構の解明
8. 脳神経系と記憶

募集要項
・資格：年令35才位迄、博士号取得者
・専攻：基礎医学・基礎生物学・生物化学・生物物理学・数理生物学
・給与：当所規定により優遇
・勤務：午前8時50分～午後5時40分/日祝・完全週休2日制
・応募方法：自己紹介書（写真添付）、推薦者一名の手紙および主な研究歴、研究論文2通（第一著者のもの）送付（コピー可）
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不採用の場合、送付書類は、返送いたしません。

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Neurogen Corporation, a biotechnology company, has an immediate opening in its Branford, Connecticut office for a Senior Scientist I and a Research Associate I.

SENIOR SCIENTIST I (REFERENCE CODE SS)

Performs multi-step organic synthesis using modern analytical methods, especially NMR and mass spectrometry. Also performs research in organic/synthetic chemistry, and conceives, critically evaluates, conducts and communicates research relating to synthetic/medical chemistry.

Qualified applicants must posses a Ph. D. in Synthetic Organic Chemistry or a related field and relevant work experience, including multi-step organic synthesis and modern analytical methods, especially NMR and mass spectrometry.

RESEARCH ASSOCIATE I (REFERENCE CODE RR)

Assists in the performance of the Company's research and development activities. Performs the synthesis of gram quantities of fragments and prepares solutions for fragments for High-Speed Synthesis library production. Performs synthesis, isolation and characterization of novel chemical entities as potential drug candidates.

Qualified applicants must posses a Master's degree in Chemistry and relevant work experience carrying out multiple-step organic synthesis utilization of purification and analytical techniques; and demonstrated knowledge of heterocyclic chemistry and organometallic chemistry.

Resumes and/or cover letter must reflect each requirement above and specify reference code or it will be rejected.

Forward resume to **Suzanne Nolan, 35 Northeast Industrial Road, Branford, CT 06405.**

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City of Hope

The Beckman Fellows Program

Senior-Level Postdoctoral Research Fellowships
The Beckman Research Institute at
The City of Hope National Medical Center

The Beckman Fellows program, established by The Arnold and Mabel Beckman Foundation, was initiated in 2000 to support postdoctoral research at the very highest level. This prestigious program is designed to attract postdoctoral candidates with remarkable achievements and provide them with the support and resources required to develop into the next generation of outstanding investigators.

To accomplish these goals, the Beckman Research Institute at the City of Hope National Medical Center is conducting a nationwide search to identify such promising individuals. Two fellows will be selected. Each will be provided a **salary of $55,000/yr.** and a **research allowance of $52,000/yr.** for supplies, equipment, travel and/or technical support. Each fellow will select a faculty mentor to serve as a primary sponsor and will be expected to develop a cutting-edge, multi-disciplinary, collaborative research program. Fellowships are renewable for 3 years.

Eligibility Requirements

1. US citizen or permanent resident.
2. Completion of PhD prior to appointment.
3. No more than three years of postdoctoral experience.

Application Process

Fellows will be selected based on their previous achievements, letters of recommendation (3) and their proposal for a novel and multi-disciplinary biomedical research program. Interested candidates must complete their application by **September 15, 2001.** For more details about City of Hope and for an application form, please visit the City of Hope Beckman Fellows web-site:

Beckman Fellows web page:
http://beckmanfellows.coh.org

Arthur D. Riggs, Ph.D.
c/o Academic Personnel Office
City of Hope National Medical Center
1500 East Duarte Road
Needleman Building, Room 214
Duarte, CA 91010

Phone: 626-301-8352
Fax: 626-930-5366
E-mail: ariggs@coh.org

City of Hope is an Equal Opportunity/Affirmative Action Employer. Women, minorities, veterans and disabled persons are encouraged to apply.

DIRECTOR - Center for Advanced Studies of Accelerators

Jefferson Lab, Accelerator Division (Position #AR2141)

Thomas Jefferson National Accelerator Facility (Jefferson Lab) in Newport News, Virginia, USA, is an internationally recognized laboratory engaged in fundamental scientific research in nuclear and particle physics based on the Continuous Electron Beam Accelerator Facility (CEBAF) operated for the US Department of Energy under the management of Southeastern Universities Research Association (SURA). In addition to operating CEBAF, the laboratory also operates a Free Electron Laser (FEL) facility. As a result of its core strength and competency in RF superconductivity, the laboratory is a major partner in many national and international projects such as the SNS, CEBAF 12 GeV Upgrade, RIA and TESLA.

In order to further enhance and promote Jefferson Lab's primary core competency in accelerator physics and technology, the laboratory has created an integrated center of excellence in accelerator science and technology, the Center for Advanced Studies of Accelerators (CASA), reporting directly to the laboratory Associate Director for Accelerators. The center will incorporate all related disciplines in particle and photon beams. In partnership with other departments and divisions in the laboratory, the Center has the charter of not only supporting ongoing activities at the laboratory, but also to boldly promote future options in subatomic physics based upon particle and light beams.

We are currently seeking qualified candidates for the position of the Director of CASA at an appropriate level of seniority commensurate with experience. The incumbent in this position will be responsible for leading and building the Center as a world leader in accelerator and beam physics. The Director will be an advocate of Jefferson Lab to the outside community. The Center is responsible for providing accelerator physics guidance and support to the operation of CEBAF and the commissioning and future operations of the High Average Power IRFEL. Additionally, the Center will support design activities for upgrading CEBAF to 12 GeV, for significantly extending the FEL power and wavelength range and for initiating development of new facilities for nuclear/particle physics and synchrotron radiation sciences based on emerging technologies including the recirculating energy recovered linac technology, recently pioneered by Jefferson Lab.

The incumbent will have demonstrated strengths in both scientific and management roles, including: an ability to promote new initiatives, a record of significant accomplishments, and an ability to develop staff. The successful candidate must possess broad knowledge of accelerator physics and technology, with expertise in at least one area. Individuals having experience with, and understanding of, both theoretical and experimental accelerator physics are preferred. Minimum qualifications include a PhD or equivalent in Physics or a closely related field, and significant experience beyond the PhD, including leading multiple-person efforts in a laboratory/university environment. He/She must have excellent communication skills with all levels of laboratory staff and have good knowledge of worldwide work in accelerator physics.

For prompt consideration, please send resume and salary history by August 31, 2001 to: **Jefferson Lab, Attn: Employment Administrator, 12000 Jefferson Ave., Newport News, VA 23606. Fax: 757-269-7559, E-mail: jobline@jlab.org.** Please specify position number and job title when applying. For more information on this position, contact Lia Merminga, Search Committee Chair (merminga@jlab.org) or Swapan Chattopadhyay, Associate Director for Accelerators (swapan@jlab.org).

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Jefferson Lab

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At **Wyeth,** a division of Fortune 500 American Home Products Corporation, we have set ourselves apart from the others in the pharmaceutical industry by discovering and developing exceptional pharmaceutical, vaccine and nutritional products. Our strong name becomes even stronger when linked to our outstanding over the counter products such as Advil®, Robitussin®, Dimetapp®, ChapStick®, Anbesol® and more. Our superior research, manufacturing, sales and marketing are the result of the effort of our employees united in a shared vision - leading the way for a healthier world. We currently have openings at our **Princeton, NJ** facility.

Postdoctoral Fellow, Neuroscience

* PhD with 0-3 years of experience
* Characterization of novel molecular targets involved in neuronal apoptosis
* Dissection of pathways required for neuronal differentiation of mesenchymal stem cells
* Well versed in molecular and cell biology, immunological techniques and microscopy
* Experience in gene chip technology a plus

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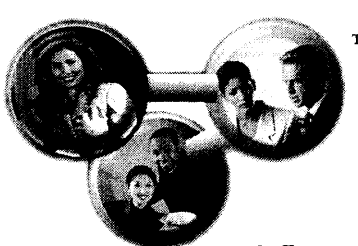

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POSITIONS OPEN

FACULTY POSITION INFECTIOUS DISEASES

The Division of Infectious Diseases, Department of Medicine, University of Pittsburgh, is seeking a candidate to assume **DIRECTORSHIP** of a molecular epidemiology and antibiotic resistance laboratory that focuses on community-acquired (e.g., *Streptococcus pneumoniae*) and nosocomial bacterial pathogens (e.g., vancomycin-resistant *Enterococcus* and extended-spectrum beta lactamase-producing *Klebsiella*). The laboratory performs pulsed field gel electrophoresis and is moving into newer methods such as DNA sequence-based typing. A new antibiotic resistance program will concentrate on resistance mechanisms of nosocomial pathogens, especially characterization of Gram negative bacillus beta lactamases. Candidates should have a Doctoral degree (M.D. or Ph.D.) and sufficient experience in the field on molecular microbiology to eventually establish a funded research program. The successful candidate will be expected to provide leadership in overseeing existing molecular work and also bring new technologies into the laboratory.

Interested candidates should forward their résumés and the names of three references by either e-mail (preferably) or FAX to: **Lee H. Harrison, M.D., University of Pittsburgh, 521 Parran Hall, 130 DeSoto Street, Pittsburgh, PA 15261. E-mail: lharriso@edc.gsph.pitt.edu; FAX: 1-412-624-2256.** *The University of Pittsburgh is an Affirmative Action/Equal Opportunity Employer.*

FACULTY POSITIONS IN CARDIOVASCULAR RESEARCH
Stanford University School of Medicine

A tenure-track faculty position at the **ASSISTANT** or **ASSOCIATE PROFESSOR** level is available in the Division of Cardiovascular Medicine at Stanford University for an individual holding an M.D. or M.D./Ph.D. degrees. The individuals recruited into this position will be expected to develop a superlative research program investigating the genetic, molecular, and cellular basis of cardiovascular development, function, or disease. Scientific interest should be in molecules within fundamental signaling pathways that regulate cell growth, differentiation, physiological adaptation, and aging in the cardiovascular system. The successful applicant will take advantage of a growing genetics and genomics infrastructure in the Donald W. Reynolds Cardiovascular Clinical Research Center and the rich research environment of Stanford and San Francisco Bay area. Send curriculum vitae to: **Marcia Gibbs, Faculty Affairs, Cardiovascular Medicine, Stanford University School of Medicine, Falk CVRC 275, 300 Pasteur Drive, Stanford, CA 94305-5406. E-mail: utlbillet@cvmed.stanford.edu.** *Stanford University is committed to increasing representation of women and minority groups on its faculty and particularly encourages applications from such candidates.*

SCIENCE FUNDRAISING MANAGER

Conservation International, a dynamic international organization, seeks a Science Fundraising Manager to help raise approximately $5 million annually from foundation, government, and other sources for the Center for Applied Biodiversity Science (CABS). CABS science/technology is the basis for conservation action. Develop funding strategies and manage proposal/report process and donor relations; some travel required. Fast-paced office. Excellent management, communication, and writing skills; knowledge of international environmental and science/technology issues and funders; five to seven years of related experience, preferably in a university setting. Competitive salary and excellent benefits. Send résumé and writing sample to **e-mail: hr@conservation.org.** Please include Science Fundraising Manager in your subject line or mail to: **Conservation International, HR/Science Fundraising Manager, 1919 M Street N.W., Sixth Floor, Washington, DC 20036. FAX: 202-912-1042. Website: http://www.conservation.org.** No telephone calls, please. *Equal Opportunity Employer.*

POSITIONS OPEN

CHAIRPERSON DEPARTMENT OF HUMAN GENETICS

Virginia Commonwealth University (VCU) is seeking an outstanding Scientist/leader to become the Chairperson of its Department of Human Genetics in the School of Medicine on the Medical College of Virginia campus. A newly endowed Chair in Human Genetics will support this position, and the Chairperson will have substantial resources available for further strengthening the Department. The Department has a long history of excellence in research, education, and the provision of clinical genetic services. The faculty has been highly successful in obtaining research funding for projects in many areas including disease gene discovery, genetics of complex traits, statistical genetics/genetic epidemiology, cancer genetics, gene regulation, clinical genetics, molecular cytogenetics, determining gene function, bioinformatics, functional genomics, and biochemical genetics. These research projects deal with a wide variety of phenotypes and disorders including cancer, deafness, behavioral and psychiatric conditions, blood diseases, epilepsy, chromosomal imbalances, and craniofacial disorders. The Department of Human Genetics has strong and active collaborative research and educational associations with many other VCU Departments including Psychiatry, Pediatrics, Pathology, the Massey Cancer Center, and Microbiology and Immunology. The Department provides excellent training leading to the Ph.D. and to the Master's degree in genetic counseling and in a basic and clinical genetics postdoctoral program. The faculty has teaching responsibilities in the Schools of Medicine and Dentistry and throughout the university. The Department is an integral part of the academic health center and is the principal provider of clinical genetic and cytogenetic services to the 1.7 million citizens in the Central Virginia area. VCU is home to one of the largest twin registries in the world, the Mid-Atlantic Twin Registry, and to the Virginia Institute of Psychiatric and Behavioral Genetics.

The successful candidate must hold an M.D., a Ph.D., or both and have the breadth of interest, leadership ability, administrative skills, and vision to chart the course of the Department in the 21st century. It is expected that the successful applicant will currently hold the academic rank of **FULL PROFESSOR** or its equivalent and will have an established, competitive research program, preferably in an area complementary to ongoing research in the Department.

Interested applicants should contact: **David S. Wilkinson, M.D., Ph.D., Chairman, Human Genetics Search Committee, c/o Larry Vetter, Department of Pathology, P.O. Box 980662, Richmond, VA 23298-0662.** Applications should include complete curriculum vitae, a brief summary of the candidate's professional background, a vision statement for the future role of academic departments of human genetics, and three letters of reference.

Virginia Commonwealth University is an Equal Opportunity/Affirmative Action Employer. Women, minorities, and persons with disabilities are encouraged to apply.

FACULTY POSITION

The Department of Cell Biology and Neuroscience at the University of South Carolina School of Medicine invites applications for a tenure-track position at the level of **ASSISTANT** or **ASSOCIATE PROFESSOR** beginning as early as September 1, 2001. Candidates must have at least two years of postdoctoral experience and the capacity to maintain an active research program in some area of mammalian reproductive biology fundable at the national level. Responsibilities will eventually include teaching in a team-taught histology course to medical students and participation in graduate education. Submit a statement of career and research interests, curriculum vitae, and names and contact information for three potential references to: **Clarke F. Millette, Ph.D., Search Committee Chair, Department of Cell Biology and Neuroscience, University of South Carolina, School of Medicine, Columbia, SC 29208.** *The University of South Carolina is an Equal Opportunity/Affirmative Action Employer.*

POSITIONS OPEN

TENURE-TRACK/TENURED FACULTY POSITIONS
Virology and Medical Microbiology

The Department of Microbiology and Immunology, Finch University of Health Sciences/The Chicago Medical School, is seeking two **ASSOCIATE PROFESSORS** with strong publication records and current extramural research funding in the fields of virology and medical microbiology emphasizing molecular pathogenesis and immunology, teaching medical and graduate students and directing training of Doctoral and/or Postdoctoral research trainees. The Department has established strength in the areas of molecular biology, immunology, and host-parasitic relationships. Excellent laboratory space and facilities, substantial start-up funds, and a competitive salary will be provided.

Applicants should send curriculum vitae, a summary of research accomplishments and future research plans, and names of three references to: **Yoon B. Kim, M.D., Ph.D., Professor and Chairman, Department of Microbiology and Immunology, Finch University of Health Sciences/The Chicago Medical School, 3333 Green Bay Road, North Chicago, IL 60064.** *Finch University of Health Sciences/The Chicago Medical School is an Equal Opportunity Employer.*

FACULTY POSITION VIROLOGY
Boston University School of Medicine

The Department of Microbiology (**website: http://www.bumc.bu.edu/microbiology**) is seeking applicants for a faculty position in virology. Applications in any area will be considered, but applicants specializing in viral pathogenesis or viral-host cell interactions are especially encouraged to apply. We are seeking candidates with strong research records and a commitment to develop independent, innovative research programs and who have interest in graduate and medical education. Applications at any faculty rank will be considered, but preference will be given to candidates at the **ASSISTANT** or **ASSOCIATE PROFESSOR** level. Interested individuals should submit applications by September 15, 2001, including curriculum vitae, a summary of research accomplishments and future research plans, and three persons who can provide letters of recommendation to: **Virology Search Committee, Department of Microbiology, Boston University School of Medicine, 715 Albany Street, Boston, MA 02118-2394.**

Boston University School of Medicine is an Equal Opportunity/Affirmative Action Employer.

The Department of Pathology and CIMER (Center for Integrative Metabolic and Endocrine Research), a research enterprise being formed within Wayne State University School of Medicine and dedicated to using state-of-the-art techniques in functional genomics, proteomics, imaging, and genetic animal models to discover new drug targets in the area of metabolic diseases, are seeking highly collaborative individuals (M.D. or Ph.D.) with demonstrated research success in the area of metabolic diseases for tenured/tenure-track and nontenured faculty positions at the rank of **ASSISTANT/ASSOCIATE PROFESSOR** that will work with other colleagues of the group. Applicants should contact: **Professor James Granneman, Wayne State University School of Medicine, 2343 Scott Hall, 540 East Canfield, Detroit, MI 48201. E-mail: jgranne@med.wayne.edu; Telephone: 313-577-5629.** *Wayne State University is an Equal Opportunity Employer.*

RESEARCH ASSISTANT needed by New York University Medical Center to perform neuroscientific research in psychiatry. B.S. in neuroscience and relevant work experience and training required. Send résumé to: **Dr. Eric Stone, NYU Medical Center, 550 First Avenue, New York, NY 10016.**

National Institute on Aging

A research fellow position is available immediately at NIA/NIH, to conduct research projects in 1) regulation of telomerase expression in human lymphocytes; and/or 2) characterization of gene expression and function in memory lymphocytes. Applicants must have a Doctoral Degree with a solid training in immunology and molecular biology or protein purification. Experience in transgenic and knockout mice techniques is favored. Salary ($34,000-$60,000) commensurate with qualifications and experience. Send CV, bibliography and three letters of reference to:

Dr. Nan-ping Weng
National Institute on Aging
National Institutes of Health
5600 Nathan Shock Drive, Box 21,
Baltimore, MD 21224
Voice:(410) 558-8341
Fax: (410) 558-8284
e-mail: wengn@grc.nia.nih.gov

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Biologist

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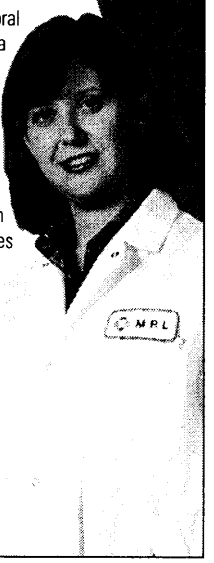
SENIOR RESEARCH BIOLOGIST

The successful candidate should have a Ph.D. and/or M.D. degree with postdoctoral experience in neuropharmacology, physiology, genetics or obesity research and a proven record of accomplishments and publications. Candidates are expected to initiate or participate in multidisciplinary research activities with responsibilities in target validation studies, identification of new leads and/or mechanistic studies of relevant receptors involved in the pathophysiology of obesity. Excellent interpersonal and communication skills are required.



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Send a cover letter, resume, and three references to: **Dr. Chris Taron.**

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STAFF DIRECTOR
Board on Children, Youth, and Families

The National Academies, located in Washington, DC, is seeking a Staff Director for the Board on Children, Youth, and Families.

This person will use behavioral, social, and health science to address policies, issues, and problems of children, youth, and families; advance scientific knowledge; promote exchanges among researchers and policymakers; and disseminate research to a broad range of decision-makers. The Board currently has an annual budget of $1.5 million, a staff of 10, and is conducting 8 workshops and major studies.

We require a Ph.D. and 5 years of experience or equivalent in child development, public health, developmental biology, or a related field. Must have demonstrated research, technical, and policy analysis capabilities; and highly effective communication, management, organizational, administrative, and fundraising skills. Recognition by senior practitioners in the field for substantial scientific and technical achievements is a plus.

We offer a competitive salary, an excellent benefits package, and a dynamic work environment. For consideration, please forward your resume with salary requirements, indicating the Job Code, to: The National Academies, GR 146, Job Code: (DS/551.170), 2101 Constitution Avenue, NW, Washington, DC 20418. Fax: (202) 334-1746. E-mail: ohrresum@nas.edu EOE, M/F/D/V.

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POSITIONS OPEN

LANDSCAPE ECOLOGIST AND AQUATIC ENVIRONMENTAL BIOLOGIST
Case Western Reserve University

As continuation of planned expansion of Department of Biology of Case Western Reserve University, the Department invites applications for an appointment of one or two Ecologists at the **ASSISTANT PROFESSOR** level. Candidates for these positions should have interests in landscape ecology or the environmental biology (e.g., physiology, behavior, or endocrinology) of aquatic organisms. Applicants will be expected to have both experimental and quantitative skills and have an interest in integrative biology. Successful candidates will also be expected to lead a strong, independent extramurally funded research program as well as develop and teach courses at the undergraduate and graduate level. See **website: http://www.cwru.edu/artsci/biol/biol.htm** for more information about the Department and its plans.

Applicants should send a letter that describes their research and teaching interests, current curriculum vitae, and have three letters of recommendation sent directly to: **Joseph F. Koonce, Chair; Department of Biology, Case Western Reserve University, Cleveland, OH 44106-7080**. To receive full consideration, applications should be submitted by September 30, 2001. The search will continue until the positions are filled. *In employment as in education, CWRU is committed to Affirmative Action and Equal Opportunity. Applications from women and minority candidates are especially welcome.*

FACULTY POSITION IN NEUROSCIENCE

The Division of Neuroscience at the Oregon Regional Primate Research Center/Oregon Health and Science University invites applications for a position of **ASSISTANT/ASSOCIATE SCIENTIST**. The position will include a joint appointment in a basic science department of the OHSU School of Medicine and faculty membership in the OHSU Neuroscience Graduate Program. Qualifications include a Ph.D. or equivalent degree, appropriate postdoctoral experience, and a strong publication record. Applicants who are applying molecular/genetic approaches to fundamental problems in neuroscience are particularly encouraged to apply. The successful candidate will be expected to establish and maintain an extramurally funded research program with international visibility. Please send curriculum vitae, a statement of research interest and long-range goals, and the names of three references to:

Dr. Sergio R. Ojeda
Division of Neuroscience
Oregon Regional Primate Research Center/
Oregon Health and Science University
505 N.W. 185th Avenue
Beaverton, OR 97006
Telephone: 503-690-5303
FAX: 503-690-5384
E-mail: ojedas@ohsu.edu
Website: http://www.ohsu.edu/orprc

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RESEARCH POSITIONS
Princeton University

The Physics Department at Princeton University wishes to make one or more research appointments in areas of theoretical physics with connections to biology. Depending on qualifications and experience of the applicant, appointment may be at either the **POSTDOCTORAL** or the **RESEARCH STAFF** level. Interested applicants should send a statement of research interests and curriculum vitae to: **Daniel Marlow, Chair, Physics Department, P.O. Box 708, Princeton University, Princeton, NJ 08544**. Applicants should also have three reference letters sent to the same address. For full consideration, applications should arrive no later than August 15, 2001. We are sorry that we cannot accept applications submitted by electronic mail. *Princeton University is an Affirmative Action/Equal Opportunity Employer and particularly welcomes applications from women and members of minority groups.*

POSITIONS OPEN

The Division of Genetics and Metabolism in the Department of Pediatrics and Institute of Human Genetics at the University of Minnesota are seeking candidates for up to two new tenure-track or tenured positions at the level of **ASSISTANT** or **ASSOCIATE PROFESSOR** of pediatrics. The Division of Genetics and Metabolism maintains an active clinical service of outpatient and inpatient consultations in genetics, dysmorphology, and inborn errors of metabolism with specialty clinics in genetic eye diseases, vascular anomalies, cardiovascular, pigmentation, and familial cancer. Candidates should have an M.D. or M.D./Ph.D. degree and must be Board certified/Board eligible in pediatrics and medical genetics. Experience with management of inborn errors of metabolism is preferred. Candidates will be expected to develop independent research programs that will lead to external funding. The ability to interact collaboratively within the Department and Institute of Human Genetics will be encouraged.

Grant funding for one of the positions requires that *the individual be a U.S. citizen or be able to secure permanent resident status*. Applications will be reviewed beginning November 2, 2001, and accepted until positions are filled. Please send curriculum vitae, statement of research interests, and three letters of recommendation to:

Susan Berry, M.D.
Department of Pediatrics
University of Minnesota
420 Delaware Street, S.E.
Box 75 Mayo
Minneapolis, MN 55455

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TWO RESEARCH ASSOCIATE POSITIONS

Available to study plasticity/recovery in the mammalian respiratory system after cervical spinal cord injury. First position requires experience in respiratory electrophysiology, although candidates with a background in regeneration/spinal cord injury or physiological techniques involving another system are also encouraged to apply. Second position requires experience with cellular/molecular techniques such as (but not limited to) Northern and Western blots, HPLC, and receptor *in situ* hybridization. Both positions will remain open until suitable candidates are found. They require a Ph.D., strong communication skills, and are guaranteed for five years. Salary is competitive. Send curriculum vitae, statement of research interests, and names of three references to: **H. G. Goshgarian, Department of Anatomy/Cell Biology, Wayne State University, 540 East Canfield, Detroit, MI 48201. E-mail: hgoshgar@med.wayne.edu**.

Wayne State University is an Equal Opportunity/Affirmative Action Employer.

The Department of Chemistry and Biochemistry jointly with the Institute for Cellular and Molecular Biology at The University of Texas at Austin is seeking to expand its faculty with the addition of two tenure-track **ASSISTANT PROFESSOR** positions starting September 1, 2002. One position is in areas related to nucleic acid or protein/nucleic acid crystallography. The second position will be in the general area of biochemistry. Visit **website: http://www.cm.utexas.edu** for more information on the Department. Exceptional senior level applicants will also be considered. Applications received after October 15, 2001, may not receive full consideration and early applications are encouraged. Candidates should forward curriculum vitae, short descriptions of research plans, a statement of teaching philosophy, and three letters of reference to: **Biochemistry Search Committee, Department of Chemistry and Biochemistry, The University of Texas at Austin, Austin, TX 78712**. *Equal Opportunity/Affirmative Action Employer.*

POSITIONS OPEN

FACULTY POSITION
Immunology or Microbiology of Respiratory Diseases
University of Arkansas for Medical Sciences

The Department of Microbiology and Immunology and the Department of Pediatrics of the University of Arkansas for Medical Sciences are seeking applicants for a 12-month, tenure-track position at the **ASSOCIATE PROFESSOR** or **FULL PROFESSOR** level with the primary appointment being in microbiology and immunology. The successful candidate is expected to have demonstrated a strong track record of extramural funding and publications in the area of the immunology and/or microbiology of respiratory disease in keeping with both departments' goal of building a center of excellence in respiratory disease. Ideally, the research emphasis should be on microbial or immunologic diseases of pediatric importance. Newly renovated laboratories are available in the Arkansas Children's Hospital Research Institute with competitive start-up funds and salary commensurate with the individual's experience. It is also anticipated that the successful candidate will take a leadership role in establishing collaborative research programs with other targeted areas of excellence in the Arkansas Children's Hospital Research Institute including asthma, birth defects, critical care, and nutrition. The individual is expected to participate in the teaching activities of the Department of Microbiology and Immunology in the graduate and medical school programs. Applicants should submit curriculum vitae, a concise statement of research interests and plans, and three letters of reference to: **Dr. Roger G. Rank, Department of Microbiology and Immunology, Slot 511, University of Arkansas for Medical Sciences, 4301 W. Markham, Little Rock, AR 72205**.

The University of Arkansas is an Equal Opportunity Employer.

ASSISTANT/ASSOCIATE PROFESSOR, Aquatic Sciences, School of Renewable Natural Resources, University of Arizona, Tucson. Successful candidate will also serve as the Assistant Unit Leader of the Arizona Cooperative Fish and Wildlife Research Unit at the University of Arizona. Energetic candidates early in their career with a background in population genetics or stream restoration and riparian ecology are especially encouraged to apply. We will also consider candidates with expertise in ecotoxicology, quantitative sciences or modeling, and fish/wildlife diseases or amphibian ecology. Applicants should have a strong publication record and demonstrated ability to work with management agencies and other Scientists to conduct research addressing critical ecological and management issues. Successful applicant will be required to teach one graduate course per year in area of expertise. Ability to obtain extramural research funding and a strong interest/ability to mentor graduate students is required. This position is supervised through the Biological Resources Division of the U.S. Geological Survey; see **website: http://www.usajobs.opm.gov** for full application instructions (announcement will be posted approximately 9 July 2001 and will remain open for 30 days) or contact: **Dr. Scott Bonar, 104 Biological Sciences East, University of Arizona, Tucson, AZ 85721. Telephone: 520-621-1959**. *Women and minorities are strongly encouraged to apply.*

RESEARCH FISHERY BIOLOGIST OR ECOLOGIST

The National Marine Fisheries Service is seeking applicants for a **PERMANENT POSITION** at our Santa Cruz laboratory, Santa Cruz, California, studying estuarine and ocean ecology of Pacific salmon. The incumbent serves as a Principal Investigator conducting research on the influences of environmental variables on salmon physiology and ecology to address endangered species and fishery management issues. *Applicants must be U.S. citizens,* have a Ph.D. or equivalent education and experience, and have a strong record of research and publication. Salary range: $56,411 to $73,330. To apply, see **website: http://www.usajobs.opm.gov** (Announcement W/NMF/SWC/010378.RJ) or **Telephone: 206-526-6407** for more information. Closes July 24, 2001. *Equal Opportunity Employer.*

mayo

MAYO CLINIC POSTDOCTORAL POSITIONS

NIH-funded postdoctoral positions are available immediately to work in the area of DNA damage-signaling pathways and cancer biology. The lab currently focuses on the biochemical and molecular aspects of breast/ovarian cancer and the roles of tumor suppressor genes p53, Chk2, BRCA1/BRCA2 and the DNA damage-signaling pathway in tumorigenesis. The approaches we are using range from mammalian cell culture, molecular biology to mouse and yeast genetics. A strong background in molecular and cellular biology is essential. We are seeking candidates who are self-motivated and career-oriented. The research environment at Mayo Clinic is excellent. Prospective applicants are encouraged to contact me by e-mail at **Chen.junjie@mayo.edu** or letter to:

Junjie Chen, Ph.D.
Department of Oncology
Guggenheim Building, Room 1342
Mayo Clinic
200 First Street, SW
Rochester, MN 55905
See also: http://www.mayo.edu/research/

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Over US$1 million is now available to support truly novel research projects aimed at understanding the molecular basis of ataxia-telangiectasia (A-T). A major objective of grant awards will be to unravel the functional role of the ATM protein, especially in the development and maintenance of the brain, in collaboration with other labs that have already developed reagents such as ATM knock-out mice, monoclonal antibodies and biochemical assays for ATM activity. Projects with potential for identifying downstream therapeutic targets are of particular interest.

Competitive awards will be given to researchers for one- and two-year projects to be funded up to a total direct cost of $75,000 per year. No administrative overhead or fixed costs are supported.

Scientific excellence, originality, investigator competence and direct relevance to Ataxia-Telangiectasia are the paramount criteria in award decisions. All applications will receive quick reviews and decisions will be communicated to applicants within 30 days after proposals are received. Grant periods can begin as early as 15 days after grants are awarded.

For proposal guidelines, contact the A-T Children's Project or visit our web site.

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FACULTY POSITIONS
CENTER FOR MOLECULAR MEDICINE
MAINE MEDICAL CENTER RESEARCH INSTITUTE

The recently established Center for Molecular Medicine is currently undergoing a vigorous expansion as a result of NIH funding for the establishment of a Center of Biomedical Research Excellence in Angiogenesis. The Center's major focus is on the molecular mechanisms of human disease including diseases of the cardiovascular system, bone and mineral metabolism, and cancer. Applications are invited at the assistant, associate and senior member levels. Individuals using modern cell, molecular and/or genetic (vertebrate or invertebrate) methods to elucidate molecular mechanisms of human disease are encouraged to apply. Center faculty will have access to excellent resources including generous start-up funds and space in a new state-of-the-art research building. The Center has excellent state-of -the-art core facilities for DNA and protein analysis, confocal microscopy and mouse genetics. In addition, the successful candidate will be encouraged to interact with existing clinical programs at the Maine Medical Center as well as participate in graduate education programs.

Successful candidates will be expected to establish an independent basic research program that will attract extramural funding and will complement existing research programs at the Center. Applicants for senior level positions must have an outstanding record of academic achievement and extramural funding. Areas of interest include protein trafficking pathways, tumor development, vascular remodeling, functional characterization of growth factor, cytokine and cell fate determinant signaling pathways, and the molecular genetics of human bone development, tissue/organ repair and neoplasia.

Rank and salary will be commensurate with qualifications and experience. The Portland area offers an environment rich in cultural and recreational opportunities. Applicants should send curriculum vitae, three letters of reference and a brief statement of research interests, to: ***Dr. Robert E. Friesel, Search Committee Chair, Maine Medical Center Research Institute, 81 Research Drive, Scarborough, ME 04074-7205.***

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ASSOCIATE DIRECTOR
CENTER FOR MOLECULAR MEDICINE
MAINE MEDICAL CENTER RESEARCH INSTITUTE

The Center for Molecular Medicine at Maine Medical Center Research Institute seeks an accomplished scientist to serve as Associate Director of the Center.

The recently established Center for Molecular Medicine is currently undergoing a vigorous expansion as a result NIH funding for the establishment of a Center of Biomedical Research Excellence in Angiogenesis. The Center is comprised of a group of highly motivated and interactive scientists engaged in research in the areas of cardiovascular disease, tissue remodeling and repair. Applicants for this position should hold a Ph.D. and/or M.D. degree. Preference will be given to individuals with an outstanding record of academic achievement and extramural funding. The Center is interested in candidates with research programs involving any aspect of contemporary biomedical research and individuals pursuing important biomedical problems not related to angiogenesis will be given special consideration. The Center provides administrative support and has state-of-the-art core facilities for DNA and protein analysis, confocal microscopy and mouse genetics. The successful candidate will be encouraged to interact with existing clinical programs at the Institute as well as participate in graduate education programs. The position carries a competitive salary and relocation package.

The Portland area offers an environment rich in cultural and recreational opportunities. Applicants should send curriculum vitae, three letters of reference and a brief statement of research interests, to: ***Dr. Robert E. Friesel, Search Committee Chair, Maine Medical Center Research Institute, 81 Research Drive, Scarborough, ME 04074-7205.***

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POSITIONS OPEN

ASSISTANT PROFESSOR/ PHYSIOLOGICAL WEED GENETICIST
Department of Vegetable Crops
University of California, Davis, California
VL #00-09

Assistant Professor and Assistant Physiological Weed Geneticist: a tenure-track position in the Agricultural Experiment Station and the College of Agricultural and Environmental Sciences. This academic position has 50% organized research and 50% instruction and research responsibilities. The appointee will be located in the Department of Vegetable Crops at UC Davis. Appointee will develop a strong research program investigating fundamental aspects of weed science, particularly areas related to molecular biology and genetics. The research should have ultimate application in understanding herbicide activity in plants, weed biology, taxonomy, competition, weed management, or gene flow from transgenic crops. Examples of potential research areas are weed systematics and ecological distribution of weed ecotypes, biotypes or populations, herbicide resistance, and the potential for gene flow between transgenic crops and weeds. Appointee should seek and acquire extramural funding. The appointee will teach at the undergraduate and/or graduate level in the area of herbicide activity and topics associated with weed molecular biology and genetics. The appointee will also guide graduate students. Applicants must hold a Ph.D. degree in weed science or related discipline with emphasis on molecular biology or genetics. Postdoctoral experience is highly desirable. Ability or the potential to conduct independent research in molecular weed genetics must be demonstrated. Applicants should have a desire to be an effective teacher. The position is open until filled. To ensure consideration, applications must be received by October 15, 2001. A curriculum vitae, statement of research and teaching interests with documentation, official transcripts if within five years of receiving degree, and names and addresses of at least three professional references should be sent to: **Joseph M. DiTomaso, Search Committee Chair, Weed Science Program, Robbins Hall, Department of Vegetable Crops, University of California, Davis, CA 95616-8746. Telephone: 530-754-8715; FAX: 530-752-4604; e-mail: ditomaso@vegmail.ucdavis.edu**.

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UNIVERSITY OF TEXAS-HOUSTON MEDICAL SCHOOL
Department of Neurobiology and Anatomy

The Department of Neurobiology and Anatomy at the University of Texas-Houston Medical School seeks an experienced teacher for its courses in human anatomical sciences. The open position is a **NON-TENURE-TRACK FACULTY POSITION**. Candidates should have a Ph.D. or M.D. and will play an important role in curriculum development. Send curriculum vitae, a statement of teaching interests, and names of three references to: **Anatomy Search Committee, Department of Neurobiology and Anatomy, University of Texas-Houston Medical School, P.O. Box 20708, Houston, TX 77225**.

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POSTDOCTORAL POSITION
Columbia University

Biochemical position to study lipid signaling in mammalian and invertebrate neural systems. Experience in lipid metabolism especially related to lipoxygenase or neurobiology is desirable. Send curriculum vitae and references to: **Steven J. Feinmark, Ph.D., Center for Molecular Therapeutics, Department of Pharmacology, Columbia University, 630 West 168th Street, New York, NY 10032. E-mail: sjf1@columbia.edu; website: http://cpmcnet.columbia.edu/dept/cmt/participants/**.

Columbia University is an Affirmative Action/Equal Opportunity Employer.

POSITIONS OPEN

The G. V. (Sonny) Montgomery VA Medical Center in Jackson, Mississippi, is seeking a Board-certified **PHYSICIAN** to direct its Research and Development program. Candidates must have credentials to receive a faculty appointment at the University of Mississippi School of Medicine and have sufficient administrative, clinical, and academic experience in order to teach medical students and residents. This medical center is a 163-bed, acute care medical center with a 120-bed nursing home care unit, outpatient clinics, and a research and education facility. In addition to an attractive salary, we offer paid malpractice insurance, vacation/sick leave, health/life insurance coverage, and a retirement package including a tax-deferred savings plan. Applicants must be Board certified, proficient in spoken and written English, and subject to drug testing and a preemployment physical. Interested candidates should send or FAX curriculum vitae; references; documentation of Board certification; and a copy of an active, current, full, and unrestricted license to: **Chief of Staff (11), VA Medical Center, 1500 East Woodrow Wilson Drive, Jackson, MS 39216-5199. FAX: 601-364-1456; e-mail: Kent Kirchner@med.VA.gov. Closing date: September 28, 2001**. *Equal Opportunity Employer.*

PROGRAM LEADER
Tissue Engineering/Cell Biology

We are seeking candidates experienced in stem cell plasticity and/or tissue engineering including cellular biology and growth requirements. Areas of current interest include bone and cartilage, myocardial, neural, and endocrine cells. The candidate will coordinate cellular expansion using the automated AastromReplicell™cell production system for large-scale cell preparation and should be able to expand the application to multiple cell lineages. This position includes supervisory responsibilities for others in the research laboratory and will interact closely with company management, Engineers, Scientists, and outside thought leaders. Qualified applicants must have a Ph.D. in an appropriate science with five to seven years of experience in tissue engineering and mesenchymal cell biology. Please forward résumé to: **Aastrom Biosciences, Inc., P.O. Box 376, Ann Arbor, MI 48106, Attention: Human Resources. E-mail: mail@aastrom.com; FAX: 734-665-0485; website: http:// www.aastrom.com**. Aastrom is a leading developer of innovative human cell therapy products intended for use in the treatment of a variety of diseases. *Aastrom Biosciences is an Equal Opportunity Employer.*

RESEARCH ASSOCIATE POSITION

Research Associate position available in the Thomas H. Christopher Center for Parkinson's Disease Research at The Sun Health Research Institute. Expertise in molecular and cellular biology, *in situ* hybridization histochemistry, Western blotting, Northern blotting, gene cloning, plasmid transformation, isolation and purification of proteins, and different kinds of PCR required. This position requires a Ph.D. in a relevant field with less than five years of previous postdoctoral experience. Starting salary is $50,000 per year, and opportunities are excellent for transition to permanent status after a successful tenure. Applicants should send their curriculum vitae and the names of two references by e-mail or regular mail to: **Dr. Jeffrey N. Joyce, Parkinson's Research Center, Sun Health Research Institute, 10515 West Santa Fe Drive, Sun City, AZ 85351. E-mail: Jeff.Joyce@sunhealth.org; website: www.shri.org/**.

POSITIONS OPEN

DIRECTOR
CLINICAL RESEARCH CENTER

Meharry Medical College is seeking applications and nominations for the position of Director of the Clincal Research Center (CRC). Meharry Medical College is a leader in the education and training of underrepresented minority Physicians, Dentists, and Biomendical Scientists in the nation and is engaged in a vigorous effort to advance research excellence and productivity. Areas of research that have been targeted include cardiovascular disease, cancer, diabetes, neuroscience, toxicology, environmental health, and others. Candidates with research programs, a vision for collaborative research activities, and an outstanding record of achievement and leadership are encouraged to apply.

The successful candidate will provide scientific and administrative leadership and enhance the institution's capacity to excel in clinical research competitiveness through the acquisition of extramural research funding and support. The individual will be expected to formulate strategic planning initiatives in order to maximize the institution's efforts for the continued development of the research program. The M.D. degree is required for this position.

Applicants should submit a letter of interest describing their research focus and qualifications for the position and curriculum vitae that documents their professional accomplishments in research, health care, and administration to:

George C. Hill, Ph.D.
Vice President for Sponsored Research
Meharry Medical College
1005 D.B. Todd, Jr. Boulevard
Nashville, TN 37208-3599
Telephone: 615-327-6193
E-mail: gchill@mail.mmc.edu

ANALYTICAL CHEMIST
Ph.D. (or Equivalent)

Quest Diagnostics' Nichols Institute Diagnostics has an opening for a Ph.D. or equivalent Analytical Chemist. Nichols Institute Diagnostics develops and produces instrumentation for clinical laboratory testing. The candidate will be responsible for our systems integration function within the Research and Development group. The candidate will work with Engineers and Biochemists to develop and validate instrument hardware, software, and new reagent products. The candidate must have a strong background in instrumentation and computers. Experience should include a background in analytical chemistry, biochemistry, and surface analysis, and immunoassays. Experience in IVD design and development plus software validation would be helpful. Quest Diagnostics is the largest clinical laboratory system in the world. Quest, through its Nichols Institute Diagnostics Division, develops and markets IVD test system worldwide.

Nichols Institute/Quest Diagnostics Inc., 33051 Calle Aviador, San Juan Capistrano, CA 92675. Visit our **websites: http://www.QuestDiagnostics.com** or **http://www.NicholsDiag.com;** Please submit résumés to **e-mail: syseng@nicholsdiag.com**.

Lorus Therapeutics, Inc. is specialized in research and development of cancer therapeutics. We have immediate openings for **RESEARCH SCIENTISTS** with Ph.D. and extensive experience in the following areas: (1) molecular biology, immunology, or cancer biology; (2) PK/toxicology; (3) analytical chemistry; (4) GMP manufacturing. Please send curriculum vitae with three references to: **Dr. A. Young, Lorus Therapeutics, Inc., Sunnybrook and Women's College HSC, 2075 Bayview Avenue, Room S115, Toronto, Ontario M4N 3M5 Canada. FAX: 416-488-8099; e-mail: ahyoung@lorusthera.com**.

Inserm

French Institute
of Health and Medical Research

Inserm is the French institute devoted to biomedical research and health. 10,000 persons work in 300 Inserm laboratories. Inserm has a budget over 450 million euros. Inserm collaborates with 93 countries and 260 industrial partners.

With the aim of giving a strong support to young researchers and of strengthening scientific dynamics of basic biomedical research, clinical research and public health,

Inserm launches the Avenir program: the call for proposals concerns post-doctoral scientists and young researchers with a permanent position.

The program will allow awardees to obtain:
- a financial support of 60,000 euros per year for a 3 year period
- laboratory space of approximately 50 m2
- access to core technological facilities
- to host a foreign post-doctoral fellow

The Avenir program concerns young researchers with a permanent position or French and foreign post-doctoral fellows who have a creative research project.

Inserm intends to select 45 projects.

For complete information consult the web site of Inserm http://www.inserm.fr (" actualités ") or call 33 1 44 23 67 01 or send a mail to postel-vinay@tolbiac.inserm.fr

Sr Wildlife Scientist

(Washington, D.C)

Environmental Defense, a national non-profit organization, seeks a **Senior Wildlife Scientist** for its Wildlife Program.

Conceive, design, test, and promote creative new approaches to conserve biological diversity, advocate for laws, policies, conduct research, prepare reports and articles for popular and technical journals, and create and respond to media opportunities.

Ph.D. (or a Masters degree and several years of conservation experience) in ecology, conservation biology, or a related field, plus experience in practical conservation efforts; excellent communication skills, and willingness to travel.

For detailed information on this position, please visit our website at www.environmentaldefense.org.

Send cover letter, resume and salary requirements to:

Cheryl Pickard
Manager of Recruiting
Environmental Defense
1875 Connecticut Avenue, NW
Washington, DC 20009
Fax: 202-387-1030
www.environmentaldefense.org

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environmental defense

finding the ways that work

Health Scientist Administrator

The National Institute of Dental and Craniofacial Research seeks applicants for a Health Scientist Administrator in the area of Clinical Trials and Population-Based Research (vacancy #NIDCR-01-0017). Responsibilities include planning and directing a full array of programs utilizing grants, cooperative agreements and contract support for applied clinical research, with an emphasis on clinical trials.

Applicants should have a D.D.S., D.M.D., M.D. and/or Ph.D. in a discipline related to the position, and experience conducting independent research in the area of interest. Starting salary will be in the range of $74,697-114,244, commensurate with qualifications and experience. Physicians may be eligible for a Physician's Comparability Allowance up to $20,000/year.

The full text announcement is available at http://www.nidcr.nih.gov/opportunities/joblist.htm. Interested candidates may contact **Ms. Freeman, HRMB, NIDCR at (301) 496-6971 or Tammy.Freeman@nih.gov.** Applications will be accepted if postmarked, emailed, faxed or hand-carried by September 7, 2001.

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Plaza Ballroom

13 AUGUST 2001
10:00 am - 3:00 pm

Remember to bring multiple copies of your CV or resume with you to the Career Fair; a copy will be necessary to gain admission to the hall.

Admission is FREE.

For more information & a list of exhibitors, visit sciencecareers.org & click on Career Fairs or call 202-326-7018.

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Science is a proud sponsor of the upcoming **Drug Discovery Technology 2001 Meeting** in Boston, MA, 12–17 August 2001. For further information, go to www.drugdisc.com.

For information contact Daryl Anderson
phone 202-326-6543
fax 202-289-6742
e-mail ..... danderso@aaas.org

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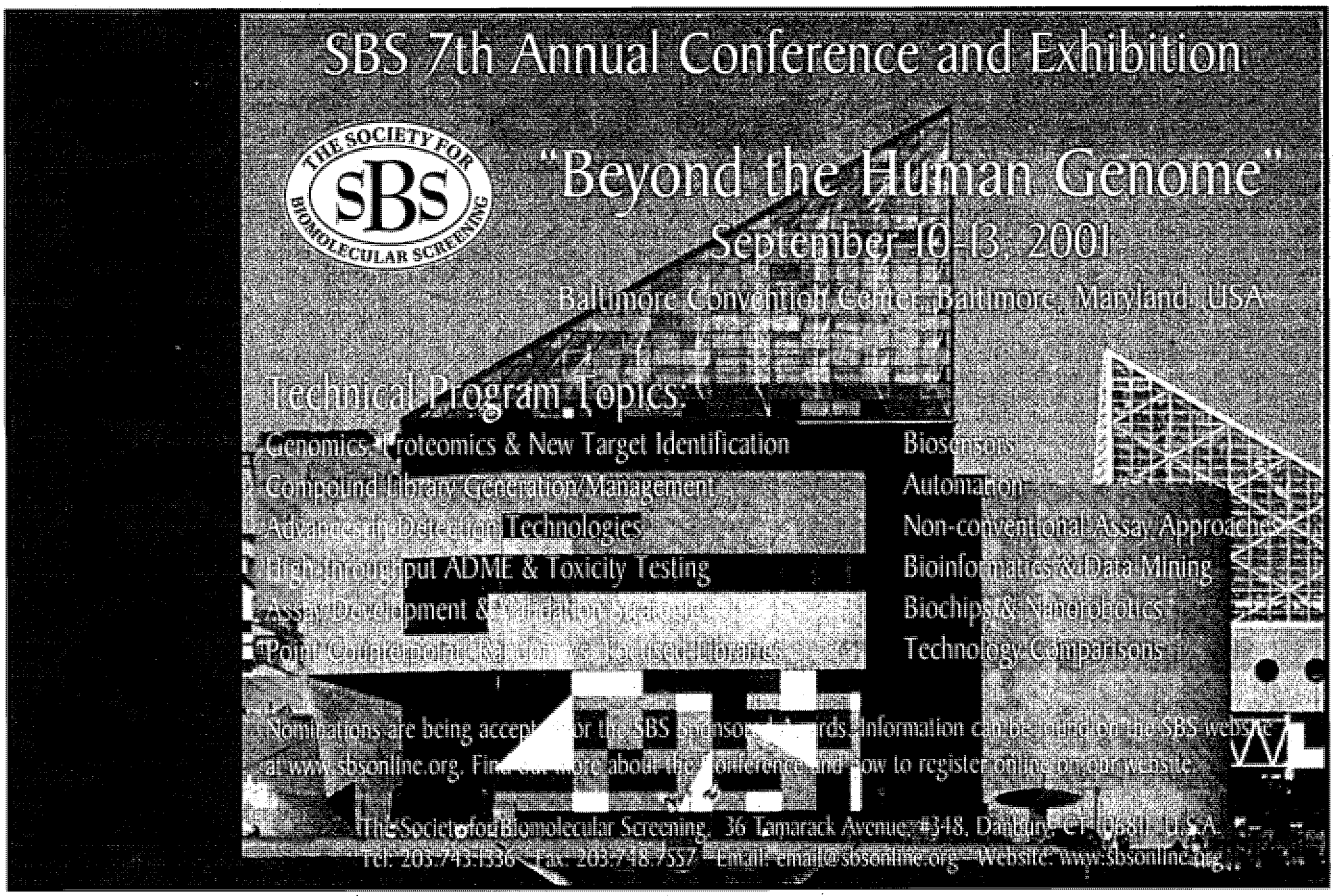

BURROUGHS WELLCOME FUND

Awards provide $400,000 over five years to scientists at the assistant professor level.

The application deadline for the 2002 award series is November 1, 2001.

Open to U.S. and Canadian biomedical scientists.

The Burroughs Wellcome Fund is an independent private foundation dedicated to advancing the medical sciences by supporting research and other scientific and educational activities.

P.O. Box 13901
21 T.W. Alexander Dr.
Research Triangle Park, NC 27709-3901
Telephone (919) 991-5100 Fax (919) 991-5160
Web site: www.bwfund.org

NEW PROGRAM!

INVESTIGATORS IN PATHOGENESIS OF INFECTIOUS DISEASE

These five-year awards provide $400,000 for accomplished investigators at the assistant professor level to study pathogenesis, with a focus on the intersection of human and pathogen biology. The program is intended to shed light on the overarching issues of how human hosts handle infectious challenge. Awards are intended to give recipients the freedom and flexibility to pursue new avenues of inquiry and higher-risk research projects that hold potential for advancing significantly the biochemical, pharmacological, immunological, molecular biological, and physiological understanding of how infectious agents and the human body interact.

BWF is particularly interested in work focused on the host, as well as host-pathogen studies originating in viral, bacterial, fungal, or parasite systems. Studies in this area may have their root in the pathogen, but the focus of the work should be on the effects on the host at the cellular and/or systemic levels. Research on under-studied infectious diseases, including pathogenic fungi, metazoan parasites, and emerging viral diseases, is especially of interest.

Applications must be submitted by degree-granting U.S. or Canadian institutions on behalf of individual candidates. Institutions may nominate up to two candidates for this award. **Application deadline: November 1, 2001.**

Visit our Web site at www.bwfund.org for complete program information.

POSITIONS OPEN

POSTDOCTORAL TRAINING IN THE MOLECULAR BASIS OF RHEUMATIC DISEASES

Research and training is available at Northwestern University Medical School through recently funded NIH (T32) training grant. The disease focus of investigation includes the study of rheumatoid arthritis, systemic lupus erythematosus, and juvenile dermatomyositis including experimental models. The topics of investigation include macrophage biology, apoptosis, the mechanisms of cytotoxic cell granule-mediated apoptosis signal transduction, angiogenesis and vascular biology, lymphocyte activation, CD40L regulation, and tolerogenic peptide therapy.

The six faculty members involved have international recognition and are currently funded by multiple NIH grants. Their work is on the cutting edge of translational research, defining molecular and cellular mechanisms that contribute to the pathogenesis of rheumatic diseases and developing novel therapies. *Candidates (Ph.D. or M.D.) must be U.S. citizens or lawful permanent residents at the time of appointment.* Applicants should send curriculum vitae, statement of research interests, and names and addresses of three references to: **Dr. Richard Pope, Northwestern University Medical School Division of Rheumatology, 303 East Chicago Avenue, Chicago, IL 60611. Telephone: 312-503-8003; FAX: 312-503-0994.** *Northwestern is an Affirmative Action/Equal Opportunity Employer.*

POSTDOCTORAL POSITIONS MICROBIAL IMMUNOLOGY

Two **POSTDOCTORAL FELLOW/RESEARCH ASSOCIATE POSITIONS** are available for cutting-edge research in the immune response to tuberculosis and *Chlamydia pneumoniae* using strategies such as real-time PCR, microarrays, and DNA vaccine constructs. One position is to evaluate the NK and CTL response to tuberculosis. The other is to develop CTL-based vaccines against *C. pneumoniae*. The latter project was rated in the top 1% of American Heart Association proposals. Experience in cellular immunology essential; experience in molecular biology desirable. The successful candidates will work with **Drs. Peter Barnes** and **Benjamin Wizel** at the University of Texas Health Center, where six NIH-funded Investigators are working on tuberculosis. Salary dependent on experience. Tyler is 100 miles east of Dallas, Texas, with low living expenses and excellent public schools. Send curriculum vitae and names of three references to: **Peter Barnes, M.D.** or **Benjamin Wizel, Ph.D., CPIDC, UT Health Center, 11937 U.S. Highway 271, Tyler, TX 75708-3154. FAX: 903-877-7989; e-mail: peter.barnes@uthct.edu** or **benjamin.wizel@uthct.edu**. *Equal Employment Opportunity/Affirmative Action Employer; Minorities/Females/Veterans/Disabled.*

POSTDOCTORAL POSITIONS are available immediately in the laboratory of **Xi Zhan**, Department of Experimental Pathology, to study the molecular mechanism of cell migration and tumor metastases. The candidates should have a Ph.D. degree or equivalent in molecular or cell biology and strong motivation in science and research. Experience in protein biochemistry, cytoskeleton, or signal transduction is desirable. Please send curriculum vitae and the names of three references to: **Holland Laboratory, American Red Cross, Attention: HR/HL–029, 15601 Crabbs Branch Way, Rockville, MD 20855. E-mail: MonicaH@usa.redcross.org**. *Equal Opportunity Employer; Minorities/Females/Disabled/Veterans.*

POSTDOCTORAL POSITIONS are available to study cytokine signal transduction and cytokine-inducible genes. Candidates with experience in molecular biology or knockout/transgenic animals should send their curriculum vitae to: **Dr. Yu-Chung Yang, Department of Pharmacology, Case Western Reserve University School of Medicine, 2109 Adelbert Road, W353, Cleveland, OH 44106-4965. E-mail: yxy36@po.cwru.edu.**

POSITIONS OPEN

USDA ARS

RESEARCH ENTOMOLOGIST

The U.S. Department of Agriculture (USDA) Agricultural Research Service (ARS), Bee Biology and Systematics Laboratory, Logan, Utah, is accepting applications for a permanent, full-time **RESEARCH ENTOMOLOGIST** to provide expertise that will contribute directly to the USDA Small Farms Initiative. The incumbent will be a team member primarily responsible for a broad area of research on the population dynamics and management of the alfalfa leafcutting bee (*Megachile rotundata*), a commercial-scale pollinator of alfalfa, canola, and other crops. Applicants must have a directly related Ph.D. or equivalent degree, plus professional research experience. Salary is commensurate with experience ($51,929 to $94,682). *United States citizenship is required.* Comprehensive benefits package includes paid annual and sick leave, life and health insurance, and a savings and investment plan, in addition to a federal retirement plan. Vacancy announcement containing information on basic and specialized experience and competencies can be obtained at **website: http://www.ars.usda.gov**. For information on the research program and/or position, contact: **Dr.W. P. Kemp; Telephone: 435-797-2525, or e-mail: wkemp@biology.usu.edu**. For information on application procedures contact: **John Watterson; Telephone: 435-797-3071**. Applications in response to this advertisement should be marked ARS–X1W–1310 and postmarked by September 14, 2001. *USDA is an Equal Opportunity Provider and Employer.*

RESEARCH PLANT PATHOLOGIST

The U.S. Department of Agriculture, Agricultural Research Service, Grain Legume Genetics and Physiology Research Unit, Pullman, Washington, is seeking a Research Plant Pathologist, GS–12/13. Salary range is $51,927 to $80,279 and is commensurate with experience. *Candidates must be U.S. citizens.* The incumbent will conduct basic and applied research on the nature, cause, and control of foliar and viral diseases of edible legumes with major emphasis on pathogens that affect dry peas, lentils, and chickpeas. The assignment involves all phases of host-pathogen relations and disease interactions of significance in dry edible legumes. The incumbent, independently or in cooperation with others, will develop new methods and techniques to study host plant resistance, pathogen variability, disease resistance genes, germplasm development and improvement, pest management practices, and the use of control strategies designed to improve dry edible legume yield and quality. Candidates must have a degree in plant pathology or a related scientific discipline. Skills in designing, conducting, and reporting research results are required. For information about the research program, contact: **Dr. Fred Muehlbauer; Telephone: 509-335-7647; e-mail: muehlbau@wsu.edu**. This position has specific education and experience requirements and factors that must be addressed. In order to ensure submission of a complete application, applicants must request a copy of the Vacancy Announcement by calling **Pam Dean; Telephone: 509-335-8663** or by printing from the **website: http://www.ars.usda.gov**. Applications must be postmarked by August 13, 2001. *USDA/ARS is an Equal Opportunity Employer and Provider.*

RESEARCH POSITION AVAILABLE

A research position is available at a rank depending on experience to study the activation mechanisms of platelets and leukocytes. The applicants should have a Ph.D. in biological sciences and/or M.D. with experience in cell culture, signaling mechanisms, molecular techniques, or knockout animals. Prior experience with platelets or leukocytes is a plus. Compensation commensurate with experience. Curriculum vitae with names, telephone numbers, and e-mail addresses of three references should be sent to: **e-mail: kunapuli@nimbus.temple.edu** or FAXED to: **Dr. S. P. Kunapuli; FAX: 215-707-4003.**

POSITIONS OPEN

SPECIALIST
Michigan State University
DNA Sequencing and Microarray Facility

Ph.D. in the biological sciences with four to five years of experience with automated DNA sequencing, analysis and assembly of large DNA sequencing projects, and/or the production and analysis of microarrays including the preparation of custom cDNA and/or oligonucleotide microarrays. Should also have expertise in the computer analysis of sequence and/or microarray data. This position requires good communication skills to interact with faculty and other clients to identify their level of understanding of the technology and to advise for appropriate experimental strategies. Specialist may submit grants either individually or in collaboration with other faculty to support research projects complementary to the goals of the Genomic Technology Service Facility. Applications due August 15, 2001. Send curriculum vitae and three letters of support to: **David DeWitt, 519 Biochemistry Building, Michigan State University, East Lansing, MI 48824. E-mail: dewittd@msu.edu**. *MSU is an Affirmative Action/Equal Opportunity Institution.*

POSTDOCTORAL POSITIONS: Two positions are available in the Department of Radiology at the University of California Davis Medical Center in Sacramento that focus on the feasibility assessment, design, construction, and evaluation of X-ray-computed tomography systems for breast imaging. A Ph.D. in engineering, physics, medical physics, or bioengineering is required and experience in computed tomography reconstruction (in C) or in computer interfacing is a plus. Send curriculum vitae with a one-page cover letter stating experience and career interests to: **Professor John M. Boone, Department of Radiology, UC Davis Medical Center, 4701 X Street, Sacramento, CA 95817**. *Equal Opportunity/Affirmative Action Employer.*

MEDICAL WRITERS

Leading medical education company based in New York City has an immediate opening for **MEDICAL WRITERS**. Familiarity with development of biological/biomedical sciences manuscripts required. Ph.D. or advanced degree in the biological sciences preferred. The ability to write clearly and concisely is essential. You will be expected to work on your own initiative and interface with physicians, clients, and program directors. Some travel may be required. Please send résumé to: **Harrison & Star Business Group, Human Resources Department, 10th Floor, 16 West 22nd Street, New York, NY 10010. FAX: 212-822-6693; e-mail: jobs@hsci.com; Attention: Medical Writers.**

POSTDOCTORAL RESEARCH ASSOCIATE
Virginia Mason Research Center
Seattle, Washington

Position available for motivated Scientist responsible for core production laboratory for generation of soluble MHC molecules. Research and development applications in autoimmune diseases, infectious diseases, and cancer. Ph.D. required and experience in immunology and protein purification highly desirable. Please send inquiries and curriculum vitae to: **Human Resources, Virginia Mason Research Center, 1201 Ninth Avenue, Seattle, WA 98101. E-mail: jobs@vmresearch.org; website: http://www.vmresearch.org**. *Equal Opportunity Employer/Affirmative Action.*

POSTDOCTORAL POSITION is available for Ph.D. in molecular biology or genetics to use oligonucleotide microarray technology for mRNA expression analysis. Microarray analysis will be applied to transgenic mouse models for neurologic disease. Familiarity with genomic databases is desirable. Send curriculum vitae and names of three references to: **Dr. Greer Murphy, Psychiatry Neuroscience, MSLS P–104, Stanford University School of Medicine, Stanford, CA 94305-5485. E-mail: gmurphy@stanford.edu.**

Rapid Access to Intervention Development "RAID"

The **NATIONAL CANCER INSTITUTE** is requesting applications for the following initiative: Rapid Access to Intervention Development (RAID). RAID will make available to academic investigators, on a competitive basis, the preclinical development contract resources of NCI's Developmental Therapeutics Program. RAID is not a grant program to originating investigators. The goal of RAID is the rapid movement of novel molecules and concepts from the laboratory to the clinic for proof-of-principle clinical trials, using NCI's contract research mechanisms. RAID will assist investigators who submit successful applications by providing any (or all) of the preclinical development steps that may be obstacles to clinical translation. These may include, for example, production, bulk supply, GMP manufacturing, formulation and toxicology. Suitable agents for RAID will include small molecules, biologics or vaccines. There are two receipt dates for proposals per year, February 1 and August 1. Current applications must be received by August 1, with all materials submitted directly to the office listed below. For information on process and procedure, visit the web site http://dtp.nci.nih.gov. Inquiries are encouraged, the opportunity to clarify issues or questions is welcome. Academic investigators may have collaborations with small-business partners and still qualify for RAID funding. Non-profit organizations other than universities may also submit RAID applications. Please note that a maximum of two distinct proposals per investigator can be submitted for each application review date. Please contact:

RAID
Office of Associate Director
Developmental Therapeutics Program
National Cancer Institute
Executive Plaza North Building, Suite 8022
6130 Executive Blvd.
Rockville, MD 20852
Tel: 301-496-8720; Fax: 301-402-0831
raid@dtpax2.ncifcrf.gov

POSITIONS OPEN

POSTDOCTORAL FELLOWS RESEARCH AND TENURE-TRACK FACULTY

A new Center of Biological Research Excellence (COBRE) at the University of Nevada School of Medicine is seeking Postdoctoral Fellows and research and tenure-track faculty to conduct investigations into the structure, function, and genetics of cardiovascular chloride transport proteins. Various molecular, biochemical, electrophysiological, functional, genomic, and imaging techniques are utilized in these studies. Preference will be given to applicants experienced with (1) *in vivo* animal (murine) models of cardiovascular disease and protection, (2) small animal surgery and telemetry, (3) molecular genomics of ion transport proteins, (4) human molecular genetics or cytogenetics, (5) transgenesis and gene targeting, (6) protein biochemistry, (7) cellular electrophysiology, or (8) morphology and immunocytochemistry. Requires Ph.D., M.D., or equivalent degree in biomedical sciences. Competitive salaries, start-up funding, and state-of-the-art instrumentation and facilities are available. View complete announcement and requirements at **website: http://jobs.unr.edu**. Send curriculum vitae and the names of three references addressed to: **Joseph R. Hume, Ph.D.** or **Burton Horowitz, Ph.D., Center of Biomedical Research Excellence, Department of Pharmacology/318, University of Nevada School of Medicine, Reno, NV 89557**. Review of applications will begin August 1, 2001. *Affirmative Action/Equal Opportunity Employer.*

Two NIH-funded **POSTDOCTORAL POSITIONS** are available immediately in the programs in neuroscience and molecular biophysics in the area of sensory systems. (1) Development of the visual system using transgenic and genetic methods in zebrafish. Current projects focus on application of novel transposon-based technologies for identification of transcriptionally active regions of the genome essential to retinal development and function. Experience in embryology, biochemistry, or genetics is desired. Contact: **Dr. James M. Fadool; e-mail: jfadool@bio.fsu.edu**. (2) Receptor tyrosine kinase modulation of voltage-gated ion channels using genetically altered mice and site-directed mutagenesis with heterologous expression systems. Current projects focus on insulin- and brain-derived neurotrophic factor signaling pathways and their role for olfactory coding, electrical excitability, and regeneration. Experience in patch clamp (single channel and slice) or molecular biology required; knowledge of programming and biophysics useful but not necessary. Contact: **Dr. Debra Ann Fadool; e-mail: dfadool@bio.fsu.edu**. Applicants should have a Ph.D. and/or M.D. degree. Send curriculum vitae, names of at least three referrences, and statement describing research skills and career goals to one of the above investigators at: **Biomedical Research Facility, The Florida State University, Tallahassee, FL 32306. Website: http://www.neuro.fsu.edu**.

POSTDOCTORAL POSITION available to study nitric oxide synthase and oxidative stress (*PNAS* **93**:6770; *JBC* **273**:25804; *Biochem. J.* **355**:357). Candidates should be highly motivated. Background in molecular, cellular biology, and biochemistry is desirable. Send curriculum vitae, research interests, and names of three references to: **Dr. Yong Xia, Division of Cardiology, Johns Hopkins School of Medicine, Room LA–14, 5501 Hopkins Bayview Circle, Baltimore, MD 21224. E-mail: yongxia@jhmi.edu**.

POSTDOCTORAL POSITION AVAILABLE

Position will involve the study of heart development during vertebrate embryogenesis utilizing mouse and frog model systems. Please send curriculum vitae and names of three references to: **Dr. Sylvia Evans, Department of Medicine, 0613–C, University of California San Diego, La Jolla, CA 92093. Telephone: 858-822-2452; FAX: 858-534-8081; e-mail: syevans@ucsd.edu**. *Affirmative Action/Equal Opportunity Employer.*

POSITIONS OPEN

POSTDOCTORAL RESEARCH POSITION

NIH-funded Postdoctoral Research position available at the R. S. Dow Neurobiology Research Laboratory to study the molecular biology of brain ischemia. Areas of interest include (1) acid-sensing ion channels in brain ischemia, (2) death domain-induced pathways in ischemia, and (3) mechanisms of ischemic tolerance. Requires a Ph.D. and/or M.D. and experience in molecular/cell biology, biochemistry, or neurobiology. Please contact:

Dr. Roger P. Simon
E-mail: rsimon@downeurobiology.org
c/o Deborah Akins
Physician Recruiter
Legacy Employment Services
1120 N.W. 20th Street, Suite 111
Portland, OR 97209
Telephone: 866-888-4428, Extension 2
E-mail: dakins@lhs.org
Website: http://www.legacyhealth.org

Equal Opportunity Employer.

A **POSTDOCTORAL POSITION** in gene regulation and development is available immediately to study *cis*-regulatory motifs controlling human β-globin gene switching during development in transgenic mice produced with β-globin locus yeast artificial chromosomes. Candidates should have a Ph.D. in molecular biology or related field. Experience with basic molecular biology techniques is essential; training in ES cell methods, transgenic mice procedures, or yeast biology is desirable. Please send curriculum vitae, brief summary of research experience and career goals, and names of three references to: **Kenneth R. Peterson, Ph.D., Department of Biochemistry and Molecular Biology, University of Kansas Medical Center, 3901 Rainbow Boulevard, Kansas City, KS 66160. E-mail: kpeterson@kumc.edu**. *An Equal Opportunity/Affirmative Action Employer.*

UNIVERSITY OF PENNSYLVANIA SCHOOL OF MEDICINE

POSTDOCTORAL POSITION available immediately to record monoamine neurons in behaving rats to study their roles in attention and performance. Positions are within the Laboratory of Neuromodulation and Behavior **(G. Aston-Jones, director)**. Applicants must have a strong academic background with appropriate experience. Competitive salary and benefits. Send curriculum vitae and names of three references to: **Dr. Gary Aston-Jones, Department of Psychiatry, University of Pennsylvania, VAMC (151), University and Woodland Avenues, Philadelphia, PA 19104. E-mail: gaj@mail.med.upenn.edu**.

2002 ASM/NCID POSTDOCTORAL RESEARCH POSITIONS IN MICROBIOLOGY

Positions are available for Postdoctoral Scientists to conduct novel research with the overall objective of developing practical applications of microbiology, immunology, and epidemiology for diagnosis and prevention of infectious diseases. Associates will perform research in residence at the National Center for Infectious Diseases, which is headquartered at the Centers for Disease Control and Prevention in Atlanta, Georgia. Applications can only be submitted electronically. Application deadline: November 15, 2001. **Website: http://www.asmusa.org/edusrc/edu23e.htm; e-mail: Fellowships-CareerInformation@asmusa.org.**

POSTDOCTORAL POSITION available immediately to study molecular genetics of psoriasis (see *AJHG* **66**:1833, 2000). Project involves final stages of gene identification. Send curriculum vitae and references to: **Dr. James T. Elder, 3312 CCGC, University of Michigan, Ann Arbor, MI 48109-0932. FAX: 734-763-4575; e-mail: jelder@umich.edu**. *The University of Michigan is an Equal Opportunity Employer.*

POSITIONS OPEN

POSTDOCTORAL FELLOWSHIPS: Department of Molecular and Cellular Biology, Department of Organismic and Evolutionary Biology, and the Center for Genomics Research, Harvard University. A limited number of Postdoctoral Research positions become available from time to time. Some appointments are funded through research grants awarded to faculty members and are ordinarily for one year, sometimes renewable; other appointments are possible through Postdoctoral Fellowships. For a list of faculty members who may have postdoctoral positions available and for application instructions, please visit the following **websites: MCB: http://mcb.harvard.edu/careeropps, OEB: http://www.oeb.harvard.edu/files_faculty/opportunities.htm,** and **CGR: http://cgr.harvard.edu**.

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POSTDOCTORAL AND RESEARCH ASSOCIATE (B.S./M.S.) POSITIONS University of Colorado, Boulder

Available immediately: two NIH-funded positions in *Yeast Molecular Genetics* to study oxygen-sensing and oxygen-regulated gene expression in eukaryotes. Individuals who are highly motivated, interested in using yeast as a model system, and have experience in molecular biology are encouraged to apply. Send curriculum vitae along with names of three references to: **Dr. R. O. Poyton, Department of Molecular, Cellular, and Developmental Biology, University of Colorado, Boulder, CO 80309. E-mail: Poyton@spot.Colorado.EDU**.

POSTDOCTORAL POSITION to study the CFTR chloride channel that is implicated in cystic fibrosis and secretory diarrhea. Current projects address intermolecular and intramolecular interactions that regulate CFTR channel activity (e.g., *J. Clin. Invest.* **105**:377, 2000; *Science* **286**:544, 1999; *Nature* **390**:302, 1997). Ph.D. and/or M.D. required. Expertise in patch clamping or oocyte recording preferred. Contact: **Kevin L. Kirk, Ph.D., Department of Physiology and Biophysics, University of Alabama at Birmingham, 982B MCLM, Birmingham, AL 35294-0005. E-mail: kirk@physiology.uab.edu**.

POSTDOCTORAL/JUNIOR FACULTY POSITION available to study virulence gene regulation and protein-DNA interaction in diarrheagenic *E. coli* pathotypes. Genetics and/or protein chemistry experience required. Outstanding research environment. Inquire: **James Nataro, M.D., Ph.D., Center for Vaccine Development, University of Maryland School of Medicine, 685 West Baltimore Street, Baltimore, MD 21201. E-mail: jnataro@medicine.umaryland.edu**. *Equal Opportunity Employer/Affirmative Action.*

Two **POSTDOCTORAL POSITIONS** available immediately in structure/function analysis/design of proteins involved in transient handling and reduction of metal ions. Good chemistry knowledge and experience with proteins ideal. Interest in rapid reaction kinetics essential. Please send curriculum vitae and contact information for three references to: **Dr. Susan Miller, Department of Pharmaceutical Chemistry, University of California, San Francisco, CA 94143-0446. E-mail: smiller@cgl.ucsf.edu**. *UCSF is an Affirmative Action/Equal Opportunity Employer.*

ADVANCED POSTDOCTORAL FELLOWSHIP. Laboratory of **Stephen B. Liggett** is seeking a Fellow with potential for subsequent faculty position at the University of Cincinnati College of Medicine. Research expertise in G protein-coupled receptor biology, pharmacogenetics, or transgenic mice preferable. Send résumé to: **Stephen B. Liggett, University of Cincinnati College of Medicine, 231 Albert Sabin Way, Room G167, P.O. Box 670564, Cincinnati, OH 45267-0564. Telephone: 513-558-0484; FAX: 513-558-0835; e-mail: stephen.liggett@uc.edu**. *The University of Cincinnati is an Equal Opportunity Employer and encourages the application of women and minorities.*

POSITIONS OPEN

FOUR POSTDOCTORAL POSITIONS FUNCTIONAL GENOMICS

Applications are invited for four Postdoctoral Research Positions to join a collaborative research program funded by the NSF 2010 Project. This three-year study will determine the biological function of the *Arabidopsis thaliana* beta glucosidases and beta galactosidases. Beginning September 1, 2001, two positions are available at each institution. One position requires a Ph.D. in molecular biology and expertise in protein overexpression in suitable hosts. The second position requires a Ph.D. with extensive experience in enzyme and/or substrate (glycosides or other secondary metabolites) purification and characterization. Send a brief description of research experience and interests, curriculum vitae with list of publications, and three reference letters to: **Dr. Asim Esen** (those interested in VA positions), **Department of Biology, Virginia Tech, Blacksburg, VA 24061-0406; e-mail: aevatan@vt.edu** or **Dr. Jonathan Poulton** (those interested in IA positions), **Department of Biological Sciences, University of Iowa, Iowa City, IA 52242; e-mail: jonathan-poulton@uiowa.edu**. *Equal Opportunity/Affirmative Action Employers.*

POSTDOCTORAL POSITIONS BACTERIAL PATHOGENESIS/ CELL BIOLOGY University of Pennsylvania

Two Postdoctoral positions are available immediately.

Dr. Howard Goldfine: We are studying interactions of *Listeria monocytogenes* with host macrophages. Of special interest are signaling pathways affecting the fate of the bacterium in the host. We seek a recent Ph.D. with a strong background in cell biology. **Telephone: 215-898-6384; e-mail:goldfinh@mail.med.upenn.edu**.

Dr. Ming H. Yuk: We are studying the Type III secretion system in *Bordetella* pathogenesis: identification of novel Type III-secreted virulence factors and how they interact with host cell signal transduction pathways. Candidates should have extensive experience in molecular and cell biology. **Telephone: 215-573-6690; e-mail: mingy@mail.med.upenn.edu; website: http://www.med.upenn.edu/micro/faculty.html**. Please send curriculum vitae and names of three references to the individual Investigator. *Equal Opportunity/Affirmative Action Employer.*

POSTDOCTORAL POSITION

A Postdoctoral position at the Van Andel Research Institute is available to study the role of the diaphanous-related formins in Rho GTPase-regulated changes in development, cytoskeleton, signal transduction, and proliferation of normal and tumor cells (see **Tominaga, T. et al.**, *Mol. Cell.* 5:13–25, 2000; **Alberts, A. S.**, *J. Biol. Chem.* 276:2824–2830, 2001). Molecular biology experience is required.

Please send curriculum vitae and the names of three references to: **Dr. Art Alberts, Laboratory of Cell Structure and Signal Integration, Van Andel Research Institute, 333 Bostwick Avenue, Grand Rapids, MI 49503. E-mail: art.alberts@vai.org.** For further information, see **website: http://www.vai.org/VARI/albertslab.htm**. *Equal Opportunity Employer.*

POSTDOCTORAL POSITION DNA RADIATION CHEMISTRY

EPR, HPLC, MS, and gel electrophoresis are used to study the mechanisms by which ionizing radiation damages DNA. Expertise in nucleic acid and radiation chemistry is desirable. See **website: http://dbb.urmc.rochester.edu/Bernhard.htm**. The appointment can start as early as summer of 2001 and is renewable yearly. Send curriculum vitae, summary of research interests, and three references. **W. A. Bernhard, Box 712, Biochemistry and Biophysics, University of Rochester Medical Center, Rochester, NY 14642**. If possible, use **e-mail: William Bernhard@urmc.rochester.edu**. *University of Rochester is an Affirmative Action/Equal Opportunity Employer.*

POSITIONS OPEN

POSTDOCTORAL POSITIONS Cell and Developmental Physiology

RESEARCH ASSOCIATE positions available immediately to study role(s) of calcium dynamics during somite formation and myofibril assembly. Experience in protein biochemistry or molecular biology highly desirable. Salaries commensurate with qualifications and experience. Research and position descriptions can be found at **website: http://biology.uark.edu/ferrari**. Please send cover letter, curriculum vitae, and names of three references to: **Dr. Michael Ferrari, University of Missouri-Kansas City, School of Biological Sciences, Division of Molecular Biology and Biochemistry, 505 BSB, 5007 Rockhill Road, Kansas City, MO 64110-2499. E-mail: ferrari@uark.edu**. *The University of Missouri-Kansas City is an Affirmative Action/Equal Opportunity Employer.*

POSTDOCTORAL POSITION available for an electrophysiologist to study the regulation of the CFTR chloride channel. The laboratory focuses on the mechanism of channel activation and the role of intracellular domain associations in activation and gating. Successful candidates should have prior experience in single channel analysis. Knowledge of protein chemistry or site-directed mutagenesis would be helpful. An M.D. or Ph.D. in a relevant discipline is required; Bioengineers are encouraged to apply. Please submit letter of interest, curriculum vitae, and names of three references to: **Dr. William Reenstra, Institute for Human Gene Therapy, Wistar Institute, Room 313, University of Pennsylvania, 3601 Spruce Street, Philadelphia, PA 19104-4268. E-mail: Reenstra@mail.med.upenn.edu**. *An Equal Opportunity Employer.*

POSTDOCTORAL FELLOW

Position available immediately for Fellow with experience in cellular molecular immunology to work in the neuroimmunology research laboratory at Oregon Health Science University. Please send curriculum vitae to: **Arthur A. Vandenbark, Ph.D., Neuroimmunology Research R&D–31, Portland VA Medical Center, 3710 S.W. U.S. Veterans Hospital Road, Portland, OR 97201**. *We are an Affirmative Action/Equal Opportunity Employer.*

POSTDOCTORAL POSITIONS in molecular neurobiology of olfaction. Opportunities to investigate olfactory receptors and the regeneration of olfactory neurons using functional genomics approaches and other advanced molecular and cell biology techniques. Apply to: **Tim McClintock, Ph.D., Department of Physiology, University of Kentucky, 800 Rose Street, Lexington, KY 40536-0298, FAX: 859-323-1070; e-mail: mcclint@pop.uky.edu**. *An Equal Opportunity Employer.*

POSTDOCTORAL POSITIONS

Immediately available to study signaling pathways by tumor necrosis factor family members. Candidates with experience in molecular cell biology, biochemistry, or immunology are encouraged to send résumés to: **Dr. Hong-Bing Shu, Department of Immunology, National Jewish Medical and Research Center, Denver, CO 80206. FAX: 303-398-1396; e-mail: shuh@njc.org.**

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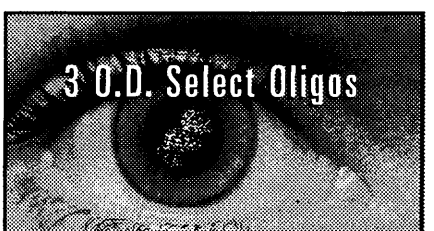

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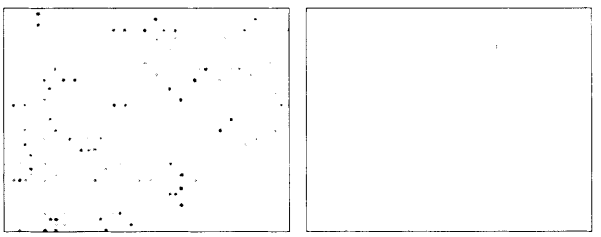

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