

Exploring the Impact of Genetics Research on Minorities

One of the goals of the National Educational Foundation of Zeta Phi Beta Sorority, Inc., is to emphasize education in minority communities. In keeping with this goal, the foundation has planned and conducted three major informational conferences on the challenges and impacts of the Human Genome Project (HGP) within the last 3 years: New Orleans in April 1999, Philadelphia in July 2000, and Atlanta in July. Follow-up meetings and training sessions all over the country have been carried out by members of the educational foundation. Following is a summary of the Philadelphia meeting, held July 7 and 8, 2000.

The 250 attendees included representatives of minority organizations, civic and religious groups, health communities, government, student groups, and the public. Because the conference was held in conjunction with the sorority's national meeting (July 9-14), minority representatives from states across the country also were present.



Pictured left to right: Kathryn Malvern (Zeta Phi Beta Sorority, Inc.), Ari Patrinos (DOE Office of Biological and Environmental Research), Iessie Jenkins (Zeta Phi Beta Sorority, Inc.), and Daniel Drell (DOE Human Genome Program).

The conference took place several weeks after President Bill Clinton's announcement that a rough draft of the human genome sequence had been completed and that differences had been resolved between private and public sectors in the sequencing race. Meeting objectives were to make minority communities more aware of the HGP and its status, to inform them of the project's benefits, and to provide a forum for minority input. Other topics were implications and

concerns raised by HGP research, including ethical, legal, and social issues (ELSI). The symposium also addressed the need to expand the pool of minority scientists and the challenge of interesting minority students in science.

Conference Program

The keynote speaker was DOE Associate Director of Biological and Environmental Research Ari Patrinos. He discussed the history and accomplishments of the HGP and provided background information on Clinton's announcement. Indicating that the HGP's outcome will dramatically affect the country's economy, Patrinos emphasized the importance of involving minority communities so that all can share in project benefits and related concerns can be avoided or responsibly addressed.

Presenters included John Quackenbush (The Institute for Genomic Research), who spoke on "Decoding the Book of Life" and how genomics will influence approaches to a variety of problems in modern biology. The challenge for the future, he said, will be to identify specific genes, determine their functions, and explore genetic changes that can lead to disease.

Panels

A panel discussion on the project's implications for minority health issues included Georgia Dunston and Robert Murray (both at Howard University Medical School). In addressing recent programs that screen for genetically determined health

Toxicogenomics (from p. 14)

This challenge exemplifies the ongoing paradigm shift occurring across the life sciences. Researchers are moving toward monitoring cellular events on a large-scale, global level that will facilitate a broader view of how living systems respond to specific stresses, drugs, and toxicants. Data generated by such research will provide extraordinarily detailed information on coordination profiles for cellular networks of responding genes and proteins, help define important target molecules for toxicity studies, and suggest future biomarkers and alternative testing procedures.

Experiments using such microarray technologies also will help define complex regulatory circuitry within a cell, tissue, or organ that is responding to specific stressors. Studies may help pinpoint locations and time points for effectively interceding in a cascade of biochemical and molecular events influenced by environmental stressors,

making possible the early diagnosis of cellular responses and the prevention of or intervention in human disease.

Other NCT goals are to increase understanding of the pathways involved in biological response to environmental stressors and how these changes differ with genetic and dose differences; establish a publicly available relational database of toxicogenomics research; and promote collaborative research that will combine toxicology and disease pathology with gene-expression profiling, proteomics, and single-nucleotide polymorphism analysis using the Chemical Exposure in Biological Systems Data Base. A symposium on Gene Expression and Proteomics in Environmental Health Research will be held December 3-4 in Bethesda, Maryland. [James K. Selkirk, Deputy Director NCT, 919/541-2548, Fax: -1460, selkirk@niehs.nih.gov] ◇

In the News

disorders, Murray spoke of ethical and legal conflicts that can arise when the disorder will not be manifested for a number of years and intervention is unknown or of questionable value. He indicated that such problems often arise when a person is merely placed in a category of increased risk for developing the condition; this situation is more likely to have serious negative consequences for members of minority groups. Finding a solution to this dilemma is imperative before any widespread genetic screening programs are put in place, according to Murray. He and Dunstan agreed that, without protective measures, information from genetic screening could be

used to stigmatize or discriminate against minorities.

Dunston questioned the genetic samples being used in human genome research and whether they represent enough variation in populations. Indicating that the genome study deals with the foundation of identity, she expressed concern that current research could be too limited.

Mary Kay Pelias (Louisiana State University Medical School) spoke on genetic problems in clinical practice and biomedical research. Using hereditary traits and diseases as illustrations, Pelias described how they are manifested in Louisiana's diverse population and how relevant historical developments and patterns of immigration can influence health issues.

Fatimah Jackson (University of Maryland) emphasized that consideration of the African-American perspective on human genome research is critical, although it cannot be used as a substitute for those of other groups. Insights of African Americans are important because they so frequently have been victims of "science" and "quasigenetic" inquiries. This group was among the first to call for representative sampling in the HGP, Jackson said, and for the inclusion of African-American genetic sequences in the human genome's template. If all groups were

not included in the baseline template, some might not be considered by the big pharmaceutical companies intent on making commercial drugs linked to specific genotypes. Jackson pointed out that minorities cannot assume inclusiveness at any stage of the HGP and that the pattern of sampling often reflects power relationships. Minorities may need to demand such inclusiveness.

Daniel Drell (DOE Human Genome Program) presented a review of the HGP and a recap of the first day's proceedings.

At the panel on HGP ELSI for Minorities, facilitator Issie Jenkins (then foundation chair) raised the issue of confidentiality and uses of individual genetic information; the potential for discrimination in healthcare, health insurance, and employment; the potential for use and misuse of genetic data in the criminal justice system; and the benefits of minority participation in clinical trials. Jerroo Kotval (School of Public Health, New York State University) spoke of ethical issues involved in a market-driven healthcare system and identified the following four principles as central: just distribution and quality of healthcare, cost-effective care, and trust. Each of these principles could

Human Genome news

This newsletter is intended to facilitate communication and collaboration, help prevent duplication of research effort, and inform persons interested in genome research. Views expressed are not necessarily those of the Department of Energy Office of Biological and Environmental Research. Suggestions are invited.

Human Genome Management Information System (HGMIS)

Oak Ridge National Laboratory
1060 Commerce Park, MS 6480
Oak Ridge, TN 37830
865/576-6669, Fax: /574-9888
www.ornl.gov/hgmis

Managing Editor

Betty K. Mansfield
mansfieldbk@ornl.gov

Production Assistants

Marissa D. Mills
Sheryl A. Martin
Laura N. Yust

U.S. Department of Energy Office of Biological and Environmental Research

Ari Patrinos, Associate Director
www.science.doe.gov/ober/ober_top.html

Life Sciences Division, OBER

Marvin E. Frazier, Director
www.science.doe.gov/ober/lsd_top.html

Contact: Daniel W. Drell, 301/903-6488,
Fax: -8521

daniel.drell@science.doe.gov or
genome@science.doe.gov

Special thanks to Carolyn Krause, ORNL

Editors/Writers/ Designers

Anne E. Adamson
Denise K. Casey
Judy M. Wyrick

¶ Minorities and the Human Genome Project

The book *Plain Talk About the Human Genome Project*, edited by Edward Smith and Walter Sapp, is a compilation of talks presented during a 3-day conference at Tuskegee University in September 1996 [*HGN* 8(2), 9-10]. Distinguished leaders, scientists, ethicists, educators, and students spoke on wide-ranging topics related to the Human Genome Project's promise and perils, matters of race and diversity, and education about the project and its implications. 292 pp., 1997. [Ordering Information: http://agriculture.tusk.edu/Genome2/Plain_Talk_HGP/Plain_Talk.html]

The Human Genome Project and Minority Communities: Ethical, Social, and Political Dilemmas, edited by Raymond Žilinskas (Monterey Institute of International Studies) and Peter Balint (University of Maryland) addresses the divisions between minority groups and the scientific community, particularly in the area of medical and genetic research. The book consists largely of talks by distinguished speakers at the conference, "The Human Genome Project: Reaching the Minority Communities in Maryland," held in June 1997 at the University of Maryland at Baltimore [*HGN* 9(1-2), 19-21]. In an essay that was not part of the conference, the editors argue that, although minorities tend to be skeptical of medical research in general and genetics research in particular, the Human Genome Project has the potential to make dramatic positive contributions to the health of all people. 144 pp., 2000. [Available through bookstores, including online suppliers.] ◇

This newsletter is prepared at the request of the DOE Office of Biological and Environmental Research by the Life Sciences Division at Oak Ridge National Laboratory, which is managed by UT-Battelle, LLC, under contract AC05-00OR22725.

In the News

be impacted by the new genetic tests and their implications.

Jenifer Smith (DNA Analysis Unit, FBI Laboratory) explained how law enforcement officials use DNA evidence and the Combined DNA Index System (CODIS)—a collection of DNA databases from forensic laboratories around the United States. CODIS includes DNA profiles of individuals convicted of such serious crimes as rapes and homicides. These profiles are compared with those collected in other cases waiting to be solved. All states have legislation allowing the collection of DNA samples from convicted offenders. Questions were raised about the use of such evidence with respect to minorities.

Phyllis Epps (Health Law and Policy Center, University of Houston Law Center) spoke of recent advances in pharmacogenomics (drug targeting to a patient's genetic makeup) that have revealed drug-metabolism differences linked to race, ethnicity, and gender. As a result, drug manufacturers, researchers, and physicians will have legitimate reasons to consider race in judging the effectiveness of medicines. Given past history, patients will regard race-based treatment with suspicion, and the medical community will find it a great challenge to balance the benefits of different treatments against the risks inherent in classifying persons for whatever reason.

Workshops

Three afternoon workshops led to a series of recommendations and concerns that included the following:

- Monitor the status of health insurance coverage for genetic testing and counseling, an important issue for minority communities.
- Create more training opportunities for veteran teachers and encourage mentors for minority students in such scientific developments as genetics.
- Develop career-day presentations to increase minority student awareness of the large number and types of current and future opportunities in the genomic, biomedical, and biotechnology industries.
- Encourage minority students to volunteer, take part-time jobs, and

pursue internships in science and related fields.

- Interest minority students in math and science courses in middle and high school; college is too late to begin.

Closing Session

The closing session was conducted by Kathryn Malvern (now foundation chair) on "What Next?" for continued minority involvement in education about genomic research developments. Suggestions were made to continue information sessions at or involving local churches, prepare and disseminate conference proceedings and collaborate with other groups.

Attendees also recommended disseminating factual information written in layman's terms at Black Expo and minority festivals and on videotapes. Information in cartoon form should be developed for children.

They also saw a need to form local HGP Awareness Teams to keep abreast of developments; provide easily understood examples of the project's benefits; develop a Web site with short lists of benefits and positive and negative potentials; and

conduct more research into minority issues and concerns.

Leanne Washington (Pennsylvania House of Representatives member) was the closing luncheon speaker. She spoke of state involvement and of the important need for information in minority communities. She committed to sponsoring a state-wide conference on the HGP.

The foundation received many favorable comments on the informative conference. A number of participants expressed the desire to keep abreast of developments and contribute to policy and legislative decisions regarding genetic research and the use of genetic information. The proceedings of this meeting are on the Web (www.ornl.gov/hgmis/publicat/zetaphibeta/) [Issie L. Jenkins, Esq.]

The conference was supported by DOE and NIH through the ELSI components of their respective human genome programs. The U.S. Equal Employment Opportunity Commission, Philadelphia District Office, provided assistance as a cooperating agency sponsor. Funding also was received from the March of Dimes and Merck Research Laboratories. ◇

Sandia, Celera, Compaq Work on Next-Generation Computing

In January, Sandia National Laboratories and Celera Genomics, Inc., signed a 4-year Cooperative Research and Development Agreement to begin work on the next generation of computer software and hardware for computational biology and a full range of applications in the life sciences. Under contract to Sandia, Compaq Computer Corporation will design the new machine, which is expected to achieve 100 trillion operations per second (100 TeraOps). By sharing some computing technologies developed by Sandia, Celera and Compaq ultimately may reach the "petacruncher" level (1000 TeraOps).

This level of cooperation is necessary to meet the dramatic demands of emerging genomics and proteomics applications at affordable prices by

bringing together the capabilities of three leaders in bioinformatics, high-performance computing, and massively parallel systems. Using both public and private resources, the multimillion-dollar arrangement first was suggested by Sen. Pete V. Domenici (R-N.M.) and guided to completion by Ari Patrinos, Associate Director of the DOE Office of Biological and Environmental Research.

J. Craig Venter, Celera's president and chief scientific officer, said, "Just 3 years ago, the computational needs of biology were thought to be minor and irrelevant to the computing industry. Today, biologists are setting the pace of development in the industry."

(see *Computing*, p. 18)

Scientists Decode Genes of Microbe that Thrives in Toxic Metals

Understanding the genetic makeup of microbes that thrive in polluted environments may one day help scientists engineer bacteria to clean contaminants from soil. In a step toward that goal, the DOE Joint Genome Institute has released the draft DNA sequence of the toxin-tolerant *Ralstonia metallidurans*. Researchers at DOE's Brookhaven National Laboratory (BNL), in collaboration with a Belgian

team, now are seeking to understand and manipulate the sequence. The research was funded in part by DOE's Microbial Genome Program.

This bacterium was first isolated in Belgium in 1976 from settling-tank sludge that was polluted with high concentrations of heavy metals. Examination revealed that, in addition to its chromosomal genes, *Ralstonia* has

extra genetic material (plasmids) that house genes conferring resistance to the harmful effects of a wide array of heavy metals. Having the draft genome sequence will make manipulation of these naturally existing resistance factors more feasible. Scientists also are working on ways to limit the ability of bacteria to spread genes inadvertently so they will stay in the bacteria where they are put. This can be done by crippling *Ralstonia's* ability to transfer genes or by using host strains that normally do not transfer genes.

Potential future benefits include transferring *Ralstonia's* heavy-metal resistance genes to microbes with capabilities for breaking down other pollutants, thereby engineering strains with a combination of useful traits. Another possible application is to link *Ralstonia's* heavy-metal uptake to genes that cause bacteria to glow, or bioluminesce, when indicating the presence of heavy metals in the soil. The higher the concentration of metals, the brighter the glow.

"What we're doing is building on the diversity of biology," said BNL's John Dunn. "Here's a bacterium that potentially could be used as a tool to help us clean up the environment and to monitor how well we're accomplishing that goal." ♦

¶ Microbial Genome Program Flyer Available

A brochure on the DOE Microbial Genome Program is available in print from HGMIS and can be downloaded from the Web site (www.ornl.gov/microbialgenomes/pubs.html). The text includes information on DOE's reasons for studying and sequencing microbes, possible microbial applications, and related research and Web sites. All current and past DOE-supported microbial projects are listed with details on their status and their potential usefulness.

☛ JGI Planning Another "Microbe Month"

Because of the success of last year's "Microbe Month," DOE's Joint Genome Institute (JGI) in Walnut Creek, California, is planning another such event for this fall. Last October, high-quality draft sequences of 15 bacterial genomes were produced—a rate of more than one genome for every one and a half working days (www.jgi.doe.gov/tempweb/News/news_11_2_00.html). In addition to their value in basic research, many microbes have immediate implications for the economy and the environment. *Xylella fastidiosa*, for example, is a pathogen carried by insects that infects grapevines; citrus and almond trees; oleander bushes, used as median strips on California highways; and other important plants. [More information: <http://compbio.ornl.gov/channel>]

☛ Educational Kit on the HGP

The Human Genome Project and other sponsors have created a multimedia kit as an educational tool for high school students and the general public. *The Human Genome Project: Exploring our Molecular Selves* includes a CD-ROM with seven varied segments; *The Secret of Our Lives*, an award-winning video documentary; a commemorative wall poster; and *Genetics, The Future of Medicine*, an informational brochure. Request a free copy or use the kit online (www.nhgri.nih.gov/educationkit). ♦

Computing (from p. 17)

Patrinios noted, "The most fertile ground for scientific discovery lies at the interface of disciplines, with the most important at the junction of biology and information science."

To accomplish the consortium's goal of creating a prototype by 2004, Compaq and Sandia will collaborate on system hardware and software. Celera and Sandia will focus on advanced algorithms and new visualization technologies for analyzing the massive amounts of data generated by high-throughput machines. All three groups will contribute to

integrating system hardware and software and on optimizing performance.

The alliance will use Compaq Alpha processors connected in a massively parallel configuration with extremely high bandwidth and low-latency mesh interconnects. Sandia currently operates the most powerful Linux-based supercomputer in existence and is home to ASCI Red, the first TeraOp supercomputer, one of the fastest in the world. ♦

Resources

HGMIS Notes

HGP Fact Sheet Published

Updating articles drawn from the November 2000 issue of *Human Genome News*, the Human Genome Management Information System (HGMIS) has published the 4-page *Human Genome Project Fact Sheet* to provide quick and timely answers to frequently asked questions.

Topics include gene patenting, the "rivalry" between public and private sectors, HGP funding since 1987, and challenges for the future. This free document is available in bulk for meetings and educational purposes (865/576-6669, mansfieldbk@ornl.gov).

HGMIS Requests Change of Address, Subscription Status

After each issue of *HGN* is printed and mailed, many copies are returned to HGMIS because the addressee has moved. Some subscribers may wish to drop their print subscriptions. Please use the back page of any issue to notify HGMIS of a change in address or subscription status or to request information.

Send article suggestions to Betty Mansfield (mansfieldbk@ornl.gov).

HGP Handouts

HGMIS will send multiple copies of *HGN* and other genomics-related materials to relevant meetings on request and without charge (see contact, p. 16).

HGMIS Documents, Web Site Win Awards

The DOE *Microbial Genome Program Report*, produced by HGMIS, won a number of awards in the 2000-2001 competitions sponsored by the Society for Technical Communication (STC). HGMIS was initiated in 1989 by DOE to make information about the Human Genome Project accessible to many audiences.

In the STC East Tennessee Chapter (ETC) competition, the microbial report (www.ornl.gov/hgmis/publicat/microbial) received a Distinguished (first place) Award in Online Communications and two Merit (third place) Awards, one in Technical Publications and the other in Technical Art. In addition, the document was judged ETC's Best of Show in Online Communications and went on to receive another Distinguished Award at the international level. Only first place

winners in chapter competitions were eligible for the international contest.

A HGMIS entry in the News and Trade Articles category, "Genes, Dreams, and Reality: The Promises and Risks of the New Genetics" by Denise Casey, won a Merit Award in Technical Publications. The article appeared in the journal *Judicature* **83**(3) (www.ornl.gov/hgmis/publicat/judicature).

STC, the largest organization of its type in the world, is dedicated to advancing the arts and sciences of technical communication. Its 25,000 members include writers, editors, illustrators, printers, publishers, educators, students, engineers, and scientists employed in a variety of technological fields.

Web Awards

HGMIS also has received numerous awards for its Human Genome Project Information Web site (www.ornl.gov/hgmis). Some recent ones are from Scientific American, Schoolsnet, BigChalk, KidsHealth, CyberU, sciLINKs, Geniusfind, ISI, Hardin MD, Awesome Library, and ResPool Research Network. ◇

Genetic Testing, Counseling Resources

GeneTests and GeneClinics, companion resources on genetic counseling and testing for hereditary disorders, are freely available on the Web. In the past year, several new features and many disease profiles have been added.

GeneTests (www.genetests.org):

Genetics Laboratory Directory: List of about 500 U.S. and international laboratories that are testing for some 820 diseases; searchable by a variety of parameters, including disease name, gene name, affected organ system, and others.

Genetics Clinic Directory: List of 950 U.S. genetics and prenatal diagnosis

clinics; searchable by geography, population (age group), and subspecialty, if applicable.

About Genetic Services: Primer of educational materials about genetics counseling and testing; useful for consumers and nongeneticist healthcare providers.

Teaching Tools: Downloadable PowerPoint slide presentation on the availability and use of genetic services; suitable for genetics professionals to teach nongenetics healthcare providers.

GeneClinics (www.geneclinics.org)

Contains 113 expert-authored and peer-reviewed full-text articles on

specific hereditary diseases, as well as overviews on disease families. GeneClinics contains about 80 disease profiles and overviews.

The two resources gradually are becoming more integrated, with links from GeneClinics profiles to specific testing, counseling, and educational resources in GeneTests. GeneTest search results link to relevant GeneClinics profiles.

One-time registration is required for GeneTests (use the New Users button on the Home Page to register and select your passwords). [Contacts: genetests@genetests.org or geneclinics@geneclinics.org] ◇

Resources

 Web Sites

Biotechnology Business

www.genomeweb.com

News and information on the business and technology of genomics and bioinformatics worldwide.

www.genengnews.com

Information about all facets of the biotechnology field worldwide from *Genetic Engineering News*.

www.bio.com/os/start/

bioOnline site. Industry and research news, reports, education, career center.

www.signalsmag.com

Online magazine of biotechnology industry analysis.

ELSI

www.humgen.umontreal.ca

Database on legal, social, and ethical aspects of human genetics. Organized around a list of international policymaking organizations and bibliographies of policy statements on various topics. ◇

¶ Encyclopedia of Ethical, Legal, and Policy Issues in Biotechnology

In a comprehensive 2-volume, 1160-page reference work, the editorial team of Thomas Murray (The Hastings Center) and Maxwell Mehlman (Case-Western Reserve's Law-Medicine Center) bring together leading experts from a variety of fields to describe ethical, regulatory, and policy issues in biotechnology; analyze their implications; and present public policy options. Published late in 2000, the encyclopedia includes a chapter written by Daniel Drell of the DOE Human Genome Program's Ethical, Legal, and Social Issues program. This is the fourth and final entry in the *Wiley Biotechnology Encyclopedias* series.

Visit the Web site for a detailed description, table of contents, and a sample article, "Human Enhancement Uses of Biotechnology," by Robert Wachbroit (www.wiley.com/products/subject/reference/murray_index.html). [Orders: Web site, 800/225-5945, or catalog@wiley.com] ◇

 U.K. Scholarships

Marshall Scholarships

Up to 40 scholarships for study toward a degree in the United Kingdom are awarded yearly to U.S. citizens who hold a first degree with a minimum GPA of 3.7 after freshman year. The scholarships pay full costs, including travel and an allowance for a dependent spouse. Candidates must have received an undergraduate degree in any discipline within 3 years of taking up the scholarship, which is tenable at any British university for 2 to 3 academic years. Applications must be made through a regional center in the United States and are due in mid-October of the year preceding tenure.

Marshall Sheffield Postdoctoral Fellowships

Two postdoctoral fellowships will be awarded in 2002 for U.S. scientists and engineers to undertake up to a year of research at British universities or research institutes. Fellowships cover full costs and allowances for travel and accompanying spouse and children. Awardees are expected to engage in a meaningful collaboration with a university or institute whose research is complementary to their areas of expertise. Applications are due October 9.

More information about both programs is on the Web (www.acu.ac.uk/marshall). ◇

¶ Nature 2001 Yearbook of Science and Technology

The *Nature Yearbook of Science and Technology 2001* provides a comprehensive view of the major trends and players in the fast-moving world of science. It profiles thousands of institutions and organizations in almost every country in the world, including developing nations, and all U.S. states. The reference work also includes specially commissioned articles and essays by leading experts in their fields. One volume, 2000 pp., 2001. [Orders: www.naturereference.com/NatureYearbook/nature_yearbookspecial.htm] ◇

¶ New Report Looks at Small-Scale Solutions

Global Environmental Change: Microbial Contributions, Microbial Solutions, a new report from the American Society for Microbiology (ASM), suggests that microbiology can provide solutions to such serious environmental challenges as the increase in greenhouse gases and other stresses. Written by Gary M. King (University of Maine), James Tiedje (Michigan State University) and the ASM Committee on Environmental Microbiology, the report makes four recommendations for enhancing microbiological solutions to global change:

- Integrate an understanding of microbiological processes at all organizational levels, from individual organisms to ecosystems.
- Discover, characterize, and harness the abilities of microbes that play important roles in transformations of trace gases and various toxic elements.
- Implement policies that promote effective long-term research on the microbiology of global change.
- Establish programs to train people to solve tomorrow's complex environmental problems.

The report can be downloaded (www.asmtusa.org/pasrc/pdfs/globalwarming.pdf). ◇

 **Next Wave Online Publication**

Next Wave, a weekly online publication from *Science*, covers scientific training, career development, and the science job market. It includes features, news items, career columns, and perspectives in the job market, career transitions, job hunting, diversity and work life, advice for graduate students, science policy, and postdoctoral and faculty issues. Some articles are freely accessible, and others require a modestly priced subscription (<http://nextwave.sciencemag.org>). ◇

Resources

Twisted Ladder Media Issues Two CD-ROMs

Two new groundbreaking CD-ROMs use innovative multimedia and easy navigation techniques to make the genomic revolution understandable and accessible to many audiences.

The New Genetics: Courseware for Physicians is designed for medical doctors who wish to update their knowledge about genetics and genomics. Price includes Continuing Medical Education (CME) credits from Stanford University.

The New Genetics: Medicine and the Human Genome presents the same content, without CME credits, for college students, researchers, nurses, policymakers, attorneys, and others who are interested in the impact of genetics and genomics on healthcare and society.

Both CD-ROMs can be ordered through the Web site, which contains sample text, complete content outline, feature demonstrations, and animations (www.twistedladdermedia.com). They were produced by Sara Tobin (Stanford University) and Ann Boughton (Twisted Ladder Media), with support from the Ethical, Legal, and Social Issues component of DOE's Human Genome Program. ◇

BSCS High-School Curriculum Modules

Four high-school curriculum modules produced by the Biological Sciences Curriculum Study (BSCS) and sponsored by DOE can be downloaded free of charge from the BSCS site (www.bscs.org):

- *Genes, Environment, and Human Behavior* (2000)
- *The Puzzle of Inheritance* (1997)
- *The Human Genome Project: Biology, Computers, and Privacy* (1996)
- *Mapping and Sequencing the Human Genome: Science, Ethics, Policy* (1997)

All but the last also are available in print at \$5 each for shipping and handling (BSCS, 719/531-5550, info@bscs.org). ◇

In the News

Winners of Postdoctoral Fellowships Announced

Since 1995, the Sloan Foundation and DOE have jointly supported up to ten Postdoctoral Fellowships in Computational Molecular Biology each year. The program, which has been renewed for another 3 years, is aimed at catalyzing career transitions into computational molecular biology from physics, mathematics, computer science, chemistry, and related fields. See the Sloan Web site for many other funding opportunities (www.sloan.org/programs/scitech_fellowships.shtml).

Winners of the competition that closed in February are shown below with their Ph.D. institution and field, postdoctoral institution, and sponsoring senior scientist.

Joyce Duan (Baylor College of Medicine; Biochemistry): University of California, Los Angeles; David Eisenberg

Hugh MacMillan (University of Colorado; Applied Mathematics): University of California, San Diego; Andrew McCammon

Jay Storz (Duke University; Biology): University of Arizona; Michael Nachman

Justin Fay (University of Chicago; Population Genetics): University of California, Berkeley; Michael Eisen

Shayan Mukherjee (Massachusetts Institute of Technology; Computational Neuroscience): Whitehead Institute; Todd Golub

Duncan Odom (California Institute of Technology; Chemistry): Whitehead Institute; Richard Young

ANL's Advanced Photon Source Illuminates Ribosomal Activities

Using the Advanced Photon Source at Argonne National Laboratory (ANL) to gain a detailed picture of ribosomal function, a team from the U.K. Medical Research Council Laboratory of Molecular Biology (LMB) has developed insights into how ribosomes manufacture proteins from amino acids to the exact specification of genes on DNA. Led by LMB head Venki Ramakrishnan, the team published its work in *Science* on May 4 [J. M. Ogle et al., *Science* **292**(5518), 897-902].

Such information aids in understanding not only how antibiotics work but also the basis of certain kinds of resistance. If an antibiotic could induce a ribosome to make a "mistake" and add the wrong amino acid onto the protein chain, for example, such incorrectly made proteins would not function. If this happened in bacteria during development, they would be rendered ineffective.

Ramakrishnan stated that pharmaceutical and biotechnological companies are keenly interested in such studies because of their potential usefulness in the design of new antibiotics that can overcome the growing problem of resistance. ◇

In Memoriam

Walter Goad, a pioneer in DNA sequence analysis, died November 2, 2000. After a distinguished career in theoretical physics at Los Alamos National Laboratory, he created the first DNA database, GenBank, a key event in the formulation and success of the Human Genome Project. ◇

Calendar of Genome and Biotechnology Meetings*

More comprehensive lists of genome-related meetings and organizations offering training are available on the Web (www.ornl.gov/hgmis) and from HGMIS (see p. 16 for contact information).

September 2001

10-11. NIH Natl. Advisory Council for Human Genome Research; Bethesda, MD [K. Malone, 301/402-2205, Fax: -0837; kimberly@od.nhgri.nih.gov]

13-15. Computational Challenges in the Post-Genomic Age-II; Durham, NC [A. Komornicki, 650/786-0003; andrew.komornicki@sun.com; www.sdsc.edu/Workshops/postgenomic]

17-19. Human Genetic Variation and Pharmacogenomics; Boston [CHI, 617/630-1300, Fax: -1325; chi@healthtech.com; www.healthtech.com]

20. Human Genetics, Environment, and Communities of Color: Ethical and Social Implications; New York [S. Prakash, 212/961-1000 ext. 333, Fax: -1015; conference@weact.org; www.weact.org/conference]

24-25. Next-Generation Technologies for High-Throughput Proteomics; San Francisco [GBR, 530/478-1523, Fax: -1773; www.annualproteomics.com]

28-30. Integrating Genome Sequence, Sequence Variation, and Gene Expression; Cold Spring Harbor, NY [CSHL, 516/367-8346, Fax: -8845; meetings@cshl.org; www.cshl.org]

October 2001

5-6. Genetics Policy and Law: Natl. Forum of the Natl. Conf. of State Legislators; Washington, DC [NCSL, 303/830-2200; ncsl_genetics@ncsl.org; www.ncsl.org/programs/health/genetics/oct-meet.htm]

9-10. Functional Genomics: Using a Systems Biology Approach to Develop Novel Therapeutics; Boston [see contact, Sept. 17-19]

9-12. Genomics Meets Nanoscience; Bar Harbor, ME [N. Place, 207/288-6257, Fax: -6080; nancyp@jax.org; www.jax.org/courses/documents/courses_2001.html]

10-12. Genetic Nursing: Cultures, Consumers, Discoveries; San Diego [ISONG, E. Rawnsley, 603/643-5706; eileen.rawnsley@valley.net; www.nursing.creighton.edu/isong/Bulletin_board/Conferences]

10-13. SNP and Complex Genome Analysis; Stockholm [A. Brookes, +46-08-7286630, Fax: -331547; cgr_snp2001@kisac.cgr.ki.se; <http://snp2001.cgr.ki.se>]

11-12. Applications of Genomics to Animal Models for Pharmaceutical Studies; Boston [see contact, Sept. 17-19]

12. 11th Intl. HUGO Mutation Database Initiative Meeting; San Diego [R. Horaitis; horaitis@mail.medstv.unimelb.edu.au; www.genomic.unimelb.edu.au/mdi/meetings/sandiego.html]

12-16. American Society of Human Genetics; San Diego [M. Ryan, 301/530-7010, Fax: -7014; mryan@genetics.faseb.org; www.faseb.org/meetings/]

14-16. Genomic Information: Whitehead Symp. XIX; Boston [G. Cervini, 617/258-0633; cervini@wi.mit.edu; www.whitehead.mit.edu/cee/cee_conf.html]

16-18. Functional Genomics; (Environ. Mut. Conf. satellite meeting); Seattle [C. Aaron, 616/833-1399, Fax: -9722; Sid.Aaron@pharmacia.com; www.genomicfunctions.org]

17-18. Pharmacogenomics 2; Paris [Institut Pasteur; euroconf@pasteur.fr; www.pasteur.fr/applications/euroconf/]

18-19. Pharmacogenomics and Population Groups; Louisville, KY [C. Rupf, 502/852-4985; cfrupf01@louisville.edu]

18-19. Biosilico 2001: Scientific American's 2nd Annu. Bioinformatics and Genomics Conf.; New York [BioEdge, 402/996-9185, Fax: 973/429-8234; BioSilicoInfo@bioedge.net; www.bioedge.net]

18-21. Bioinformatics and Medicine. From Molecules to Humans, Virtual and Real; 2nd Bioinformatics Industrialization Workshop; Hinxtton, Cambridge, UK [N. Clarkson, +44-1223/495002; Fax: /495023; nicky.clarkson@hinxtton.wellcome.ac.uk; www.wellcome.ac.uk/en/1/biosersymhinscibin.html]

21-24. 15th Intl. Mouse Genome Conf.; Edinburgh [D. Miller, 865/574-0858, Fax: -1283; millerdr@ornl.gov; www.imgc2001.com]

24-25. Structural Genomics in Pharmaceutical Design: 15th Annu. Symp. for the Center for Advanced Biotechnol. and Medicine; Princeton, NJ [PTI, 609/987-0586, Fax: -0092; www.genomics-bioinformatics.com]

25-28. Genome Sequencing and Analysis Conf.; San Diego [TIGR, 301/610-5959, Fax: /838-0229; www.tigr.org]

28-Nov. 1. 9th Intl. Conf. on Microbial Genomes; Gatlinburg, TN [J. Zhou, 865/576-7544, Fax: -8646; zhouj@ornl.gov; www.esd.ornl.gov/microbial_genomes]

29-Nov. 1. Chips to Hits; San Diego [IBC, 508/616-5550, Fax: -5522; www.ibcusa.com]

November 2001

4-7. 20th Annu. NSGC Educ. Conf.; Washington, DC [A. Lombard, 610/872-7608, Fax: /565-6220; www.nsgc.org]

4-7. 2nd Intl. Conf. on Systems Biology; Pasadena, CA [ICSB, 626/395-6911, Fax: /796-8914; icsb2001@caltech.edu; www.icsb2001.org]

7-8. Uses of Genomic Data in Risk Assessment: State of the Art 2001; Washington DC [Society of Toxicology, 703/438-3115; www.toxicology.org]

7-10. NABT 2001 Natl. Conv.; Montreal [NABT, 703/264-9696, Fax: -7778; office@nabt.org; www.nabt.org/sup/conferences]

9-12. Beyond the Identification of Transcribed Sequences: Functional and Expression Analysis; Washington, DC [K. Gardiner, 303/336-5652; gardiner@eri.uchsc.edu; www.ornl.gov/meetings/bits2001/]

15-18. In Silico Biology: Bioinformatics After the Human Genome; Atlanta [Organizing Committee, 404/385-3501, Fax: /894-8925; register@conted.swann.gatech.edu; <http://exon.biology.gatech.edu/conference/>]

16. Chemical Genomics/Chemogenomics: High-Throughput Discovery of Disease Genes and Drugs; Boston [see contact, Sept. 17-19]

16-18. Science and Society: From Genomes to Cures; Heidelberg, Germany [EMBL; courses@embl-heidelberg.de; www-db.embl-heidelberg.de/4321/CoursesConferences.html]

27-28. BERAC Meeting; Washington, DC [J. Corcoran, 301/903-6488; joanne.corcoran@science.doe.gov; www.sc.doe.gov/production/ober/berac.html]

29-Dec. 1. 5th Annu. Conf. on Computational Genomics; Baltimore [see contact, Oct. 25-28]

December 2001

3-4. Symp. on Gene Expression and Proteomics in Environmental Health Research; Bethesda, MD [J. Selkirk; selkirk@niehs.nih.gov; www.niehs.nih.gov/nct/workshop.htm]

6-9. Physiological Genomics & Rat Models; Cold Spring Harbor, NY [see contact, Sept. 28-30]

17-19. 12th Intl. Conf. on Genome Informatics; Tokyo [Secretariat, +81-3/5449-5615, Fax: -5442; giw@ims.u-tokyo.ac.jp; <http://giw.ims.u-tokyo.ac.jp/giw2001/index.html>]

January 2002

3-7. Pacific Symp. on Biocomputing 2002; Kauai, HI [K. Lauderdale, 650/725-0659, Fax: -7944; psb@smi.stanford.edu; <http://psb.stanford.edu>]

5-11. Structural Genomics: From Gene Sequence to Function; Breckenridge, CO [970/262-1230, Fax: /1525; info@keystonesymposia.org; www.symposia.com]

5-11. Frontiers of Structural Biology; Breckenridge, CO [see contact, Jan. 5-11]

7-13. Molecular Mechanisms of DNA Replication and Recombination; Snowbird, UT [see contact, Jan. 5-11]

9-11. Second Annu. Human Proteome Project; San Diego [see contact, Sept. 17-19]

12-16. Plant Animal & Microbe Genomes X; San Diego [D. Scherago, 212/643-1750 ext. 20, Fax: 1758; pag@scherago.com; www.intl-pag.org/pag]

20-25. Protein Folding Dynamics; Ventura, CA [GRC, 401/783-4011, Fax: -7644; grc@grcmail.grc.uri.edu; www.grc.uri.edu]

28-31. Bioinformatics Technol. Conf.; Tucson, AZ [A. Calvo, 707/829-0515, ext. 441; andrewc@oreilly.com; conferences.oreilly.com/bioconf/cfp.html]

February 2002

2-6. Genomics and Structural Biol. in Medicine: Miami Nature Biotechnol. Symp.; Miami [S. Black, 305/243-3597, Fax: /324-5665; mnbws-biochem@miami.edu; www.med.miami.edu/mnbws/]

10-14. 27th Annu. Lorne Conf. on Protein Structure and Function; Lorne, Australia [L. Sparrow, +61-3/9662-7284, Fax: -7101; Lorne.Proteins@hsn.CSIRO.au; www.biochemistry.unimelb.edu.au/lorne]

*Dates and meeting status may change; courses may also be offered at other times and places; check with contact person. Attendance may be either limited or restricted.

For Your Information

11-12. NIH National Advisory Council for Human Genome Research; Bethesda, MD [see contact, Sept. 10-11]

14-19. AAAS 2002 Annu. Meeting; Boston [AAAS, 202/326-6450, Fax: /289-4021; aaasmeeting@aaas.org; www.aaas.org]

19-24. Genotype to Phenotype: Focus on Disease; Santa Fe, NM [see contact, Jan. 5-11]

21-26. Epigenetics in Development and Disease; Taos, NM [see contact, Jan. 5-11]

22-23. The End of Natural Motherhood? The Artificial Womb and Designer Babies; Tulsa, OK [S. Gelfand, 405/744-9238; Fax: -4635; gelfand@okstate.edu; <http://philosophy.okstate.edu/motherhood.html>]

23-24. Genomic Partnering: Emerging and Early Stage Partners; (Genome TriConference); Santa Clara, CA [see contact, Sept. 17-19]

25-27. Human Genome Discovery: Commercial Implications (Genome TriConference); Santa Clara, CA [see contact, Sept. 17-19]

28-Mar. 1. Gene Functional Analysis (Genome TriConference); Santa Clara, CA [see contact, Sept. 17-19] ◇

Training Calendar

September 2001.....

23-Oct. 6. Molecular Biol. Techniques; Chapel Hill, NC [W. Litaker, 919/966-1730, Fax: -6821; litaker@med.unc.edu; www.med.unc.edu/pmbb/welcome.htm]

29-Oct. 6. DNA Microarrays: Applications and Data Analysis; Heidelberg, Germany [EMBL; courses@embl-heidelberg.de; www-db.embl-heidelberg.de:4321/CoursesConferences.html]

30-Oct. 7. Mathematical Approaches to the Analysis of Complex Phenotypes; Bar Harbor, ME [N. Place, 207/288-6326; nancyp@jax.org; www.jax.org/courses/documents/courses_2001.html]

October 2001.....

10-23. Gene Identification: From Candidate to Phenotype; Cold Spring Harbor, NY [CSHL, 516/367-8346, Fax: -8845; meetings@cshl.org; www.cshl.org]

15-28. Bioinformatics: Writing Software for Genome Research; Cold Spring Harbor, NY [see contact, Oct. 10-23]

24-26. Analysis of Gene Expression Data; Piscataway, NJ [G. Stolovitzky, gustavo@us.ibm.com; <http://dimacs.rutgers.edu/Workshops/GeneExpression.html>]

31-Nov. 5. Computational Genomics; Cold Spring Harbor, NY [see contact, Oct. 10-23]

November 2001.....

14-16. Gene Identification and Protein Functional Analysis; Hinxton, Cambridge, UK [Human Genome Mapping Project Resource Centre, +44-1223/494-513; Fax: -512; training@hgmp.mrc.ac.uk; www.hgmp.mrc.ac.uk]

28-30. Protein Structure Prediction; Hinxton, Cambridge, UK [see contact, Nov. 14-16]

Exploring DNA in the Classroom

With the support of the DOE Human Genome Program, the Biotechnology Institute has published an interactive CD-ROM for 7th to 12th grade classrooms. *DNA and Genes Odyssey*, which can be used on PC or MAC, contains seven lectures, numerous animations, and an extensive teacher's guide and is accompanied by a short videotape. Lecture topics are "DNA and Genes Basics," "Uniqueness and Inheritance," "Human Genome Program," "Genetic Testing," "Evolutionary Biology," "Careers," and "Predicting the Future." Lecture overheads and teacher materials can be displayed on screen or printed. A teacher survey is at <http://psych.la.psu.edu/jswim/biosci/DNAandGenes.htm>.

The spring issue of *Your World* magazine, *Cracking the Code*, explores the impact of the Human Genome Project. Its publication coincided with the release of a 2-hour television special titled "Cracking the Code of Life," produced by NOVA and WGBH-TV and broadcast on PBS stations (www.pbs.org/wgbh/nova/genome). Written for 7th to 10th graders, *Your World* is the magazine of biotechnology fundamentals and applications in healthcare, agriculture, the environment, and industry. The publishers are preparing *Cancer and Biotechnology* for the fall issue and *Microbial Genomics* for spring 2002.

[Contact for CD-ROM and magazine: 800/796-5806, jeff@biotechinstitute.org; www.biotechinstitute.org]

Text versions of main articles and the teacher's guide for the 1997 Human Genome issue of *Your World* magazine are on the Web (www.bio.org/library/yourworld/v5iss2.htm). ◇

December 2001.....

3-5. Introd. Molecular Biol. Computing; Cambridge, UK [see contact, Nov. 14-16]

10-14. Advanced Linkage Course; New York [K. Montague, 212/327-7979, Fax: -7996; montagk@rockvax.rockefeller.edu; <http://linkage.rockefeller.edu>]

18-20. Human Linkage Analysis; London [see contact, Nov. 14-16] ◇

Contractor-Grantee Meeting Scheduled for DOE Human Genome Program

■ Jan. 27-Feb. 3, 2002, in Oakland, California (contact: Donn Davy, 510/486-4162, dfdavy@lbl.gov)

U.S. Genome-Related Research Funding

Investigators wishing to apply for funding are urged to discuss projects with agency staff before submitting proposals.

DOE Office of Biological and Environmental Research Human and Microbial Genome Programs

- Funding opportunities: www.sc.doe.gov/production/grants/grants.html
- Life Sciences Division: 301/903-6488, genome@science.doe.gov
- Medical Sciences Division: 301/903-3213, sharon.betsan@science.doe.gov

Computational Molecular Biology Postdoctoral Fellowships

Support career transitions into computational molecular biology from other scientific fields. Funded by DOE and the Alfred P. Sloan Foundation.

- Contact: Pat Stanley, Sloan Foundation; 212/649-1628, stanley@sloan.org; www.sloan.org/main.shtml

NIH National Human Genome Research Institute

- NHGRI program: 301/496-7531, www.nhgri.nih.gov/About_NHGRI
- Funding opportunities: www.nhgri.nih.gov/Grant_info
- ELSI: 301/402-4997

Small Business Innovation Research Grants

DOE and NIH invite small business firms (under 500 employees) to submit grant applications addressing the human genome topic. The two agencies also support the Small Business Technology Transfer (STTR) program to foster transfers between research institutions and small businesses.

Contacts:

- DOE SBIR/STTR Office: 301/903-1414 or -0569, Fax: -5488, sbir-sttr@science.doe.gov; <http://sbir.er.doe.gov/sbir>; DOE SBIR and STTR due February 2002.
- Bettie Graham (see ELSI contact, NHGRI). NIH SBIR and STTR due April 1, August 1, and December 1.
- National resources, calendar: www.zyn.com/sbir
- National SBIR/STTR conferences: 360/683-5742, Fax: -5391, sbir@zyn.com.
- Alerting service: <http://lyris.pnl.gov/cgi-bin/?enter=sbir-alert> ◇