THE HUMAN GENOME

New opportunities in the genomic era

Ten years on from the publication of the draft human genome, *Naturejobs* takes a look at promising areas of job growth in bioinformatics, DNA sequencing and genomic medicine.

"We've crossed a threshold. Now the challenge is handling the amount of information that can be generated."

Eric Green, director of the National Human Genome Research Institute

IN NOVEMBER 2010, more than 6,000 scientists and clinicians gathered at the Walter E. Washington Convention Center in Washington DC for the 60th annual meeting of the American Society of Human Genetics (ASHG). This was a record attendance, and of the wide variety of break-out sessions one topic drew a particularly large crowd. "The only room that was overflowing—and it had seating for 770—was one of the statistical genetics sessions that focused on databases," explains ASHG executive vice president Joann Boughman.

JANE ADES, NHGRI

The session's popularity illustrates one of the key challenges—and opportunities —of the genomic era: what to do with the vast amount of data being generated by DNA sequencing. "When you start thinking about storing 3 billion base pairs of data from a million people, and then trying to figure out what that might mean, it becomes staggering," says Boughman.

Genomics is big business. A recent report by investment bankers Cowen and Company estimates that the gene sequencing market will grow to $1.5 billion by 2015, up from $600 million in 2009. This growth is being fuelled by improvements in speed and cost, making these technologies accessible to more researchers: sequencing a human genome can now be done in a week, according to some estimates, and costs less than $40,000—and will certainly become quicker and cheaper.

In the ten years since the publication of the first draft of the human genome, genomics has established itself as a powerful tool in biomedical research. Many predict the next decade will bring several more developments, including a bioinformatics boom and long-awaited changes in how clinical medicine is practiced, especially oncology.

Burgeoning bioinformatics

Genomic data are everywhere. The per-base cost of DNA sequencing is now around 100,000 times cheaper than it was a decade ago, and the current generation of sequencing machines can read around 250 billion bases each week. As the US National Human Genome Research Institute (NHGRI) points out in this issue of *Nature* (see Perspective in the Research section), sequencing DNA is no longer the bottleneck it once was in genomics. "We've crossed a threshold," says NHGRI director Eric Green. "Now the challenge is handling the amount of information that can be generated."

Tackling the challenges posed by the increasing volume of genomic data has helped bioinformatics to mature. "It's truly becoming recognized as a discipline in and of itself," says Harold Garner, director of the Virginia Bioinformatics Institute (VBI) in the United States, which provides bioinformatics services and training as well as conducting research. Garner says that many bioinformaticians are moving from a support role to directly making observations and discoveries. But while demand for bioinformaticians is growing, supply is not keeping up. A recent *Nature* survey of around 1,100 life scientists found that scarcity of bioinformatic expertise is one of the main obstacles to making full use of sequencing data (see go.nature.com/ss9FI3). Fortunately there are indications that this is being addressed. Plans are in place to double the size of the VBI over the next ten years to 500 staff, and funding remains strong despite the uncertain economic outlook. In the United Kingdom, the European Molecular Biology Laboratory's European Bioinformatics Institute (EBI), located next to the Wellcome Trust Sanger Institute in Cambridge, is also helping to plug the skills gap by providing a wide range of bioinformatics training for researchers plus postgraduate degrees in bioinformatics. "In 2004 we ran 20 formal training courses, and in 2009 we ran well over 150," says EBI director Janet Thornton. The courses are usually over-subscribed, and the EBI expects to run more in 2011. »

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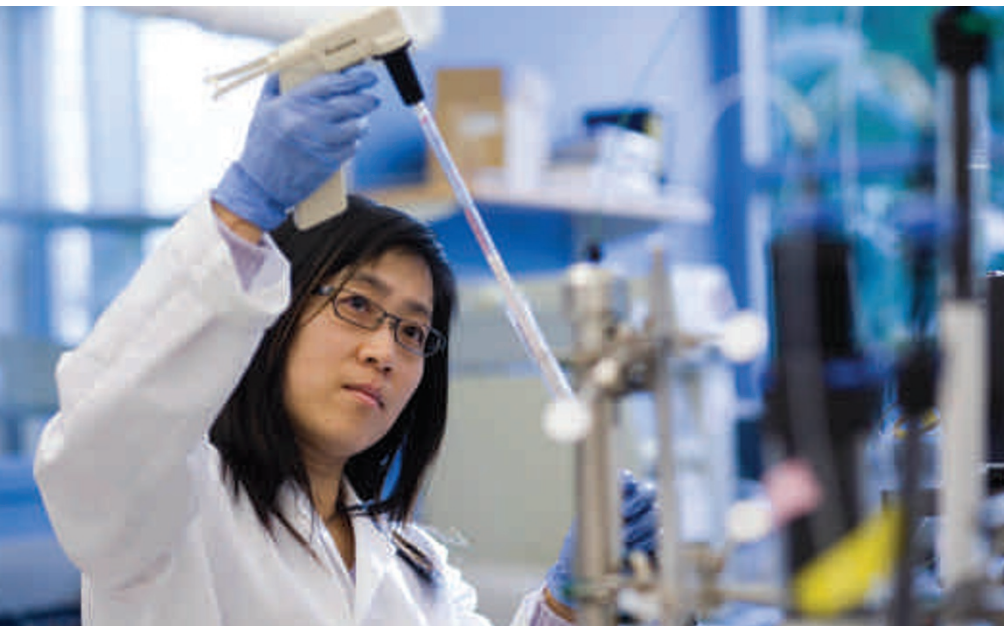

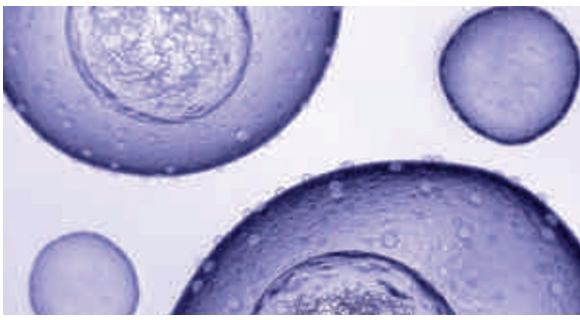

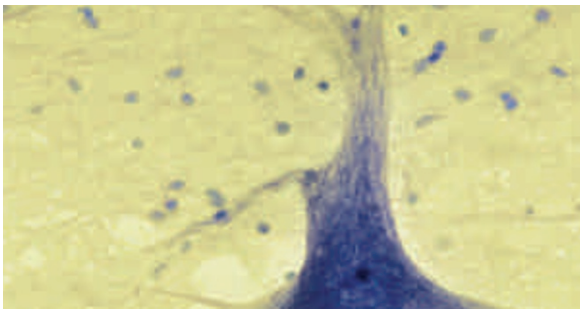

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The European Molecular Biology Laboratory's European Bioinformatics Institute is a leader in the bioinformatics revolution.

» As well as being in greater demand, the role of the bioinformatician is also becoming more diverse. "You have to be a bit of a jack-of-all-trades," says Thornton. "You're dealing with huge amounts of data, and you also need to have a pretty good knowledge of the broader biology." As more information is gleaned from the human genome, there will be a growing need for bioinformaticians who understand how the basic genetic data can help improve medical diagnosis and treatment. And away from the lab or clinic, there are opportunities for other bioinformaticians to publish original research by mining existing data. "[They] can take advantage of the tremendous amount of data amassing out there," says Garner. "It's so vast that nobody is really going through and analysing it with complete thoroughness."

Sequencing: the next generation

When the current generation of state-of-the-art DNA sequencers first emerged in 2005, scientists and technicians accustomed to working with first-generation capillary sequencers had to change their approach to research. Targeting sections of the genome has been replaced with "let's just sequence the whole thing and figure out what's going on", says Garner, adding that many technicians are now being asked to do much more data analysis. This is the case at the main gene sequencing facility at the Pasteur Institute in Paris, known as the Genopole. The facility had a next-generation Illumina sequencer installed in 2008 and upgraded in 2010, presenting new opportunities for the facility's two technicians. "They have a lot of interesting projects," explains Genopole head Philippe Glaser. "They are both doing the sequencing, but they also contribute to the analysis." Demand for the machine is high, and Glaser is looking at ways to increase capacity without taking on more technicians. "Some groups that are asking for a lot of sequences will construct the [DNA] libraries themselves," Glaser explains. He estimates that freeing technicians from this preparatory step should double productivity at the Genopole.

Other labs have taken different approaches. The Centre for Genomic Regulation (CRG) in Barcelona, Spain, began using second-generation sequencers in mid-2008. "We have seen quite a dramatic increase in the

use of these instruments," says Heinz Himmelbauer, head of the sequencing unit at the CRG, who has overseen an increase in the number of technicians from two to five.

Moving from end-user to manufacturer, the sequencing industry itself is also providing new opportunities. Illumina, a leading manufacturer of high-speed sequencing technology, was founded in 1998 with just seven personnel. It now employs more than 2,000 people worldwide, and it is planning to hire a further 500 staff in 2011. Chief technology officer Mostafa Ronaghi says that while there will be new jobs in R&D, the majority of the company's expansion will be on the commercial side, such as in sales and marketing—and scientific skills are a major asset in these positions. "The majority of people in our sales department have a PhD and have done a postdoc," explains Ronaghi. "These are technical sales, and they really need to understand the technology and the competitive landscape in order to address the needs of the customer."

Not all scientists have access to these advanced machines; some researchers still use capillary sequencers. As a low-cost, high-throughput alternative for these researchers, Illumina will be launching a compact sequencer, the MiSeq, later this year. The company says the MiSeq will be able to analyse data from purified DNA in as little as eight hours. Ronaghi adds that the company is planning to take this concept further, increasing the throughput to drive the cost-per-base down to a level where insurance companies would be willing to pay for full genome sequencing as part of treatment. "For wider use in the clinic we need to drop the cost below $1000 per genome," he says.

The $1000 genome is a major target for both industry and academia. In September 2010 the NHGRI awarded more than $18 million in grants to ten teams of researchers to help spur the development of a third generation of higher speed, lower cost sequencing technologies. The largest grant will support research into single-molecule DNA sequencing using engineered nanopores. This approach, which removes the need for DNA amplification and labelling, is also being developed into a viable technology by Oxford University spin-out company Oxford Nanopore Technologies. The company's chief executive, Gordon Sanghera, says working on the next generation of sequencers requires a certain mindset. "You need people who are prepared to raise their head above their discipline parapet and get a broader view," he says. The nature of the development pipeline also means that scientists and engineers must combine this creative thinking with a willingness to carry out less glamorous but equally important tasks. "There are moments of brilliance followed by lots and lots of bench science," Sanghera explains.

These people are hard to find, and Oxford Nanopore works hard to attract top talent. It counts 19 nationalities among its 90 staff, and has a relatively flat management structure with merit-based remuneration to foster innovation. Sanghera says the effort is worth it: "When you get those people, you get this great confluence of ideas. They push that innovation to the next level."

From bench to bedside

Many experts are predicting that the next decade will see a large-scale expansion of genomic medicine, with a range of associated career opportunities. "The medicine of the future will be data-rich and individualized," says Hans Lehrach at the Max Planck Institute for Molecular Genetics. There is particular promise in oncology, where sequencing the genomes of both healthy and cancerous tissue could soon become routine practice. "This is not something that is going to happen a few decades from now," says Lehrach. "It's what we're trying to do now." Researchers are also looking beyond the genome itself to associated concepts such as the microbiome, which is a genetic catalogue of the microbial species that inhabit a defined environment such as the human body. "We have more microbial cells than human cells," says Karen Nelson, director of the Rockville, Maryland campus of the J. Craig Venter Institute (JCVI), one of four sequencing centres taking part in the Human Microbiome Project. These microbes, she continues, "contribute significantly to our health, disease and development".

The fast pace of discovery poses several challenges that must be overcome before the potential of genomic medicine can be fully realized. "Clinicians and researchers need to have more of a dialogue," says Nelson. Boughman agrees there is a knowledge gap, saying that although medical schools are doing a good job of teaching genetics and how it fits into the practice of medicine to the current trainees, there is a huge number of physicians who have been in practice for a long time who need to be brought up to date. This need to make primary care doctors aware of the latest research is leading to a growth in the number of geneticist educators, and there are also calls for an increase in the number of genetic counsellors for patients.

A bright future

NHGRI's Green is confident that scientists who combine experience in biology or medicine with another discipline such as informatics, computer science or mathematics have a bright future in genomics. He also sees a need for people who are "multilingual" in genomics and areas such as policy, political science, ethics or law. "The perfusion of genomics into so many areas of science, clinical medicine and society means that we need people who are trained in more than one area," he says. But he calls for more research to ensure funding is used most effectively in today's challenging financial climate.

Those in the vanguard of genomics also emphasize the need for scientists interested in the field to develop a deeper appreciation of its potential for improving healthcare. Boughman says she is always surprised at the large number of molecular scientists or biochemists who had never met a patient with the disorder they were studying. "To really figure this out," she says, "we are going to need to have all the pieces of the puzzle".

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John A. Hannah Distinguished Professor Faculty Position in the Molecular Metabolism and Disease Program Michigan State University

Applications are invited for an endowed John A. Hannah Chair position in the Molecular Metabolism and Disease Program at Michigan State University. This position is tenured at the level of Full Professor. We seek an outstanding investigator with a strong externally funded research program directed towards understanding the pathobiology of metabolic disease processes with emphasis on diabetes, obesity and inflammation. The ideal candidate will have expertise in the area of neuroendocrine function, gene regulation, stem cell biology and/or translational research. The selected candidate is expected to interact with and contribute to the leadership of a growing group of strong investigators in this area (http://molecularmetabolism.msu.edu/faculty.html). The primary faculty appointment will be in one of the basic science departments including Biochemistry and Molecular Biology, Microbiology and Molecular Genetics, Physiology, or Pharmacology and Toxicology. Molecular Metabolism and Disease is a targeted area of future investment at MSU, including new hires and infrastructure development. This position comes with significant operating funds provided annually for program support and generous laboratory space. In addition, the applicant will have access to MSU's broad range of core facilities (https://www.msu.edu/~vprgs/analytical_core_facilities.htm) and rich multi- interdisciplinary environment. Interested individuals should provide an electronic (PDF) document that includes curriculum vitae, statement of research interests, contact information for five references, and copies of relevant publications to: Pam Fraker, Ph.D., Director, Molecular Metabolism Disease Program (MMDHannah@cns.msu.edu). Review of applications will begin March 2011 and continue until the position is filled.

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Dr. Ronald L. Davis, Chairman, Department of Neuroscience
c/o Hollie Alkema
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The Scripps Research Institute, Scripps Florida
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Applications are invited for an Assistant/Associate Professor tenure track, appointment in the Molecular Metabolism and Disease Program at Michigan State University. We seek an outstanding investigator with exceptional promise and a proven record of research achievement and ability to attract funding to join a strong and growing group of researchers in the broad area of metabolic disease with emphasis on diabetes, obesity and inflammation (http://molecularmetabolism.msu.edu/faculty.html). The ideal candidate will have expertise in the area of neuroendocrine function, gene regulation, stem cell biology and/or translational research with demonstrated interest in the pathobiology of metabolic disease processes. Candidates must hold a Ph.D., M.D. or equivalent degree and have a minimum of 3 years postdoctoral experience. Excellent start up packages will be available to the successful candidate. The selected candidate will be expected to participate in departmental teaching of graduate and professional students. The primary faculty appointment will be in one of the basic science departments including Biochemistry and Molecular Biology, Microbiology and Molecular Genetics, Physiology, or Pharmacology and Toxicology. Interested individuals should provide an electronic (PDF) document that includes a curriculum vita, statement of research interests and copies of relevant (MMD@cns.msu.edu). Applicants should also request letters of recommendation from 3 to 5 individuals who can evaluate their accomplishments and potential for research and teaching. Review of applications will begin March 2011 and continue until the position is filled.

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The College of Pharmacy and Nutrition, University of Saskatchewan, invites applications for a **Chair in Rational Drug Design,** to begin July 1, 2011. The Chair will be a nationally recognized and distinguished scholar with documented success in conducting research in the area of drug design, which may include expertise in structural biology and/or computational methods. The Chair will be appointed to a tenure track position, and will contribute to the academic programs of the College through research, graduate training and teaching. S/he will facilitate opportunities for exchange of ideas and team research on the intricacies of drug design within our University as well as with scholars from other institutions and partners in industry. The successful candidate will lead a talented group of scientists in the *Drug Design and Discovery Group,* located in the College. The mandate of this Group is to conduct fundamental research on drug discovery, drug delivery, pharmacokinetics and metabolism. The Chair will also work with researchers from across campus, notably at the *Canadian Light Source* synchrotron and in the *Molecular Design Research Group,* in cutting-edge research, and will be expected to attract and maintain substantial research funding from various granting agencies. Applications will be accepted until **March 15, 2011** or until the position is filled. Please submit curriculum vita, research interests and experience, and the names of three referees, preferably electronically, to:

Dr.Dennis Gorecki (dennis.gorecki@usask.ca) Selection Committee Chair, College of Pharmacy and Nutrition, University of Saskatchewan, 110 Science Place, Saskatoon SK S7N 5C9 CANADA (www.usask.ca/pharmacy-nutrition/news/read.php?id=204)

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For more information about these vacancies you may contact:
Prof. Peter Lansdorp, Scientific Director, ERIBA;
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Information about ERIBA:
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DIVISION OF EXTRAMURAL RESEARCH
HEALTH SCIENTIST ADMINISTRATOR

The National Human Genome Research Institute (NHGRI), a major research component of the National Institutes of Health (NIH) and the Department of Health and Human Services (DHHS), has led the groundbreaking enterprise known as the Human Genome Project, and is now vigorously exploring the application of advances in genome research to human health. The NHGRI is inviting applicants to apply for a Federal position of Program Director in the Division of Extramural Research. The incumbent will serve as a senior Health Scientist Administrator managing a portfolio of extramural grants and contracts related to the development of the Trans – NIH Common Fund Project: Human Heredity and Health in Africa (H3Africa). The Program Director will have advanced scientific training, as evidenced by a Ph.D degree, or equivalent relevant research experience, with a particular expertise in cutting edge genomic technology as applied to the analysis of the genetic basis of human disease, or senior level experience in an appropriate related discipline or profession of biomedical research. It is desirable that the Program Director also have experience in conducting or managing research in Africa. The incumbent will maintain an active knowledge of advances in the fields of genomics, human genetics, bioinformatics and the application of such research to the advances of health and prevention of disease, particularly in Africa. Responsibilities will encompass scientific and programmatic management of a full range of grant and contract mechanisms; surveying, evaluating and integrating available knowledge in the areas of genome-related health research; and identifying research that might produce new knowledge. The NHGRI vacancy announcements for this position contain complete application procedures and list all mandatory information which must be submitted with your application. The vacancy announcements for this position will be available on http://www.usajobs.gov and posted under announcements for GS-14 as NIH-NHGRI-DE-11-434826 and NIH-NHGRI-MP-11-434895, and GS-15 as NIH-NHGRI-DE-11-434828 and NIH-NHGRI-MP-11-434901, from February 16, 2011 to March 2, 2011. You may also visit the NIH website at: www.jobs.nih.gov. Applications must be received no later than March 2, 2011.

Questions pertaining to scientific responsibilities and expertise can be referred to Dr. Jane Peterson at jane.peterson@nih.gov. This is a full time permanent position offering benefits including health and life insurance, retirement, sick and annual leave. U.S. citizenship is required.

DHHS and NIH are Equal Opportunity Employers.

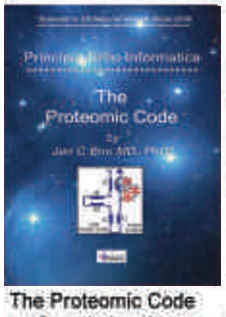
NW209561R

HOMULUS FOUNDATION

The HOMULUS FOUNDATION & Jan C Biro MD., PhD
wish to contribute to the development of a new scientific field related to the

PROTEOMIC CODE &
Nucleic Acid Assisted Protein Folding.

We have: books, lectures, education, network, conferences, peer-reviewed journal, patent, grants and awards for qualified researchers and the Biotech. Industry.



The Proteomic Code Completing the Genetic Code

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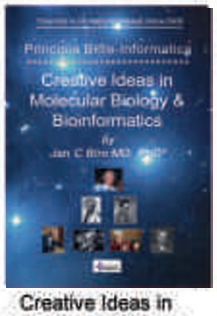

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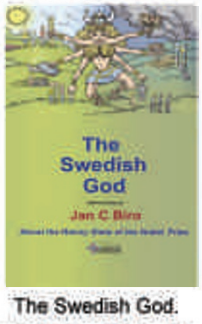

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Post doctoral fellowships in São Paulo, Brazil

FAPESP

The São Paulo Research Foundation, FAPESP, one of the main research funding agencies in Brazil, invites talented researchers with a recent PhD degree and a successful research track record to apply for postdoctoral fellowships. In 2010, 66 positions were opened and this year already 8 have come up, in virtually all fields of knowledge (see http://www.oportunidades.fapesp.br/en/)

Fellowships may also be requested through specific proposals presented by a candidate and a supervisor from any research group affiliated to higher education and research institutions in the state of São Paulo.

FAPESP's PD Fellowships are granted for 24 months and can be renewed for 12 months. It includes a monthly stipend, travel to and from Brazil expenses for the selected candidate and his family, and an overhead for small research expenses.

For additional information, see http://www.fapesp.br/en/materia/5427/scholarships/post-doctorate-fellowship.htm

For guidance write to pd@fapesp.br

Scripps Translational Science Institute

The Future of Genomic Medicine IV Conference

Thursday March 3 and Friday March 4, 2011

Scripps Institution of Oceanography
Samuel H. Scripps Auditorium
La Jolla, California

Course Overview

The fourth Future of Genomic Medicine conference will focus on the extraordinary advances that are occurring in the field, which include whole genome and exome sequencing, new gene expression tests for routine medical practice, and consumer genomics. The 2011 conference will include in depth sessions on cancer genomics and diabetes, two areas in which there have been particularly remarkable progress. We will feature sessions on "views from the outside" with speakers who are journalists and public figures, not scientists. Our overarching goal is to spearhead efforts to change medicine using genomics.

Overall Course Educational Objectives:

- Demonstrate the unmet needs of medicine today with respect to more targeted, individualized prevention and treatments.
- Discuss the opportunities of the genome, proteome, metabolome discovery to change medical practice as it exists today.
- Assess how changes and advances in technology are rapidly ushering in a whole array of new pathways for individualized medicine of the future.
- Explore specific strategies in cancer, cardiovascular and pharmacogenomic futuristic interventions.

More information and a complete program can be found here: http://bit.ly/h72b7b

Eric J. Topol, MD, Course Director
Director, Scripps Translational Science Institute
Chief Academic Officer, Scripps Health
Professor of Translational Genomics, The Scripps Research Institute
The Gary and Mary West Chair of Innovative Medicine

Samuel Levy, PhD, Planning Committee
Director of Genomic Sciences
Scripps Translational Science Institute
Scripps Health and The Scripps Research Institute

Sarah S. Murray, PhD, Planning Committee
Director, Genetics
Scripps Translational Science Institute
Scripps Health and The Scripps Research Institute

Nicholas J. Schork, PhD, Planning Committee
Director of Research, Biostatistics and Bioinformatics, Scripps Genomic Medicine, Scripps Health
Professor, Department of Molecular and Experimental Medicine, The Scripps Research Institute

NW209407E

The 2011 Department of Energy
Joint Genome Institute
(DOE JGI)

sixth annual

GENOMICS OF ENERGY & ENVIRONMENT MEETING

March 22-24
Walnut Creek, California

JGI
DOE JOINT GENOME INSTITUTE
US DEPARTMENT OF ENERGY
OFFICE OF SCIENCE

http://go.usa.gov/1Vy

topics include:

Synthetic Biology • Ecogenomics and Ecoresilience of the Gulf Oil Spill • Hardware and Software Trends in Genomics Supercomputing • Computational Approaches to Massive Short Read Metagenomic Data Sets • Genomics of Biofuel Crops • Behavioral Genetics of Pollinating Bees • Microbiome Analyses from Humans to Shipworms • Metatranscriptomics of Marine Microbial Communities • Successful Transposable Elements Secrets • Great Prairie Soil Metagenomics

confirmed speakers include:

Peer Bork, European Molecular Biology Laboratory (EMBL)
Ed Buckler, Cornell University
Dan Distel, Ocean Genome Legacy
Dusko Ehrlich, French National Institute for Agricultural Research (INRA)
Terry Hazen, Lawrence Berkeley National Laboratory (LBNL)
Scott Hodges, University of California, Santa Barbara
Tom Juenger, University of Texas at Austin
Rob Knight, University of Colorado
Ruth Ley, Cornell University
Mary Ann Moran, University of Georgia
Magnus Nordborg, Gregor Mendel Institute
Gene Robinson, University of Illinois at Urbana-Champaign
Christopher Scholin, Monterey Bay Aquarium Research Institute (MBARI)
Stephan Schuster, Penn State University
Pam Silver, Harvard
Jim Tiedje, Michigan State University
Mike Thomashow, Michigan State University
Jerry Tuskan, Oak Ridge National Laboratory/DOE JGI
Sue Wessler, University of California, Riverside
Katherine Yelick, National Energy Research Scientific Computing Center (NERSC) at LBNL

workshops include:

Integrated Microbial Genomes (IMG)/Metagenomes data analysis systems http://img.jgi.doe.gov/

Mycocosm fungal genomics portal provides data access, visualization, and analysis tools for comparative genomics of fungi http://genome.jgi-psf.org/ programs/fungi/index.jsf

Phytozome provides data access and visualization tools for comparative plant genomics http://www.phytozome.net/

RNA Technologies & Analysis: a comprehensive suite for transcriptome interrogation, including RNA-Seq for expression profiling, etc.

U.S. DEPARTMENT OF ENERGY
Office of Science

NW208549EL

cea

CNG
CENTRE NATIONAL DE GENOTYPAGE

ESGI

CEPH

The CEPH and the Centre National de Génotypage in association with the European Sequencing and Genotyping Infrastructure are pleased to announce

The 4th Paris Workshop on Genomic Epidemiology

Dates: May 30, 31 & June 1, 2011

The Paris Workshops on Genomic Epidemiology are held every two years to introduce researchers to new methodologies that underpin large-scale genomic studies of diseases and other applications in the life sciences, particularly in the context of on-going research funded by the EU. The last two years have witnessed the emergence of powerful new sequencing methodologies with vast consequences for systems approaches in biology. The inclusion of these into epidemiological scale studies allows the rapid identification of biological markers underlying many diseases. This workshop will discuss progress in these and other technologies for biomolecular analysis, and their applications in research and clinical settings. Solutions will be presented for the accumulation, handling and interpretation of huge data sets, including the identification of rare and common genetic variants associated with disease, functional evaluation of genetic variation, understanding of gene networks and epigenomic phenomena in health and disease, pharmacogenomics, gene-gene and gene-environment interactions. Examples of the application of these technologies for epidemiological scale studies in different disease areas will be presented.

The 4th Paris Workshop inaugurates a major new EU initiative, The European Sequencing and Genotyping Infrastructure (ESGI). The ESGI groups major European genome centres into a single infrastructure designed to increase European access to the most recent genomic technologies. ESGI platforms and access modalities will be presented at the meeting.

Confirmed speakers: Gonçalo Abecasis (U. Michigan, USA), David Balding (U. College London, UK), David Bentley (Illumina, USA) Alvis Brazma (EBI, UK), Anne-Cambon Thomsen (UMR Inserm, France), Bill Cookson (Imperial College London, UK), Ivo Gut (CNAG, Spain), Margret Hoehe (MPI-MG, Germany), Richard Houlston (ICR, UK), Norbert Hübner (MDC, Germany), Maneesh Jain (Life Technologies, France), Achillefs Kapanidis (Oxford, UK), Peter Laird (U. Southern California, USA), Liang Liming (Harvard, USA), Kerstin Lindblad-Toh (Broad, USA), Yukihide Momozawa (U. Liège, Belgium), Mats Nilsson (U. Uppsala, Sweden), Shaun Purcell (MGH, USA), Mark Ratain (U. Chicago, USA), Kathryn Roeder (Carnegie Mellon, USA), Sascha Sauer (MPI-MG, Germany), Daniel Schaid (Mayo Clinic, USA), Harold Swerdlow (Sanger, UK), Ann-Christine Syvänen (U. Uppsala, Sweden), Jenny Taylor (U. Oxford, UK), Mathias Uhlen (KTH, Sweden), Hubert Vidal (Inserm/Inra, France), Hugh Watkins (U. Oxford, UK), Dan Weeks (U. Pittsburgh, USA), John Whittaker (GSK, UK), Kurt Zatloukal (Med. U. Graz, Austria).

Organisers: **Ivo Gut, Mark Lathrop, Sascha Sauer and Dan Weeks**

Place: **Maison de la Chimie, 28 rue Saint-Dominique, 75007 Paris, France** (Strictly limited to 200 participants)

Sponsors: **CEPH, CNG and European Commission FP7 projects: ESGI (Infrastructure), READNA, CAGEKID (large-scale collaborative projects)**

Further information and registration: http://www.cng.fr/workshop2011

W209387EL

COURSES AND CONFERENCES
HINXTON CAMBRIDGE UK

ADVANCED COURSES

Molecular Basis of Bacterial Infection
8–14 May 2011

Functional Genomics and Systems Biology
13–22 June 2011

Human Genome Analysis: Genetic Analysis of Multifactorial Diseases
23–29 July 2011

Drosophila Genetics and Genomics
7–22 August 2011

Molecular Approaches to Clinical Microbiology in Africa
Blantyre, Malawi
10–16 September 2011

Next Generation Sequencing
2–10 October 2011

Practical Aspects of Biopharmaceutical Drug Discovery
Autumn 2011 (dates t.b.c.)

WORKSHOPS

Working with the Human Genome Sequence
Dubai, United Arab Emirates
19–21 March 2011

Hinxton, UK
9–11 May 2011

Working with Pathogen Genomes
Montevideo, Uruguay
20–25 March 2011

SCIENTIFIC CONFERENCES

Biomarkers for Brain Disorders: Challenges and Opportunities
27 February–2 March 2011

Genomic Disorders: The Genomics of Rare Diseases
23–26 March 2011

Cellular Cytoskeletal Motor Proteins
30 March–1 April 2011

Genomic Standards
3–6 April 2011

Nicotinic Acetylcholine Receptors
18–21 May 2011

Applied Bioinformatics & Public Health Microbiology
1–3 June 2011

Mouse Colony Management
13–16 June 2011

Molecular Biology of Hearing and Deafness
6–9 July 2011

The Structure and Dynamics of Chromatin
3–4 August 2011

Wellcome Trust School on Biology of Social Cognition
14–21 August 2011

The Leena Peltonen School of Human Genomics
21–25 August 2011

The Genomics of Common Diseases
30 August–2 September 2011

wellcome trust

COURSES AND CONFERENCES 2011

The Wellcome Trust Genome Campus at Hinxton is home to world-class scientific training and conference programmes, provided by The Wellcome Trust and the European Bioinformatics Institute (EBI).

For current details of all Campus events, please visit:
www.hinxton.org

Epigenomics of Common Diseases
13–16 September 2011

Pharmacogenomics and Personalised Medicine
29 September–2 October 2011

Functional Genomics & Systems Biology 2011
29 November–1 December 2011

Full details of Wellcome Trust Advanced Courses and Scientific Conferences at:
www.wellcome.ac.uk/hinxton

HANDS-ON TRAINING AT EBI

Small Molecule Bioactivity Resources at the EBI
14–18 February 2011

Advanced RNA-Seq and ChiP-Seq Data Analysis
7–9 March 2011

Programmatic Access to Biological Databases (Java)
9–13 May 2011

FEBS: In Silico Systems Biology for Complex Diseases: Network Reconstruction, Analysis and Network Based Modelling
23–27 May 2011

EBI-Wellcome Trust Summer School in Bioinformatics
20–24 June 2011

Proteomics Bioinformatics Workshop
15–19 July 2011

EMBO Practical Course: Analysis and Informatics of Transcriptomics Data
24–29 October 2011

EMBO Practical Course: Computational Structural Biology - From Data to Structure to Function
14–18 November 2011

Full details of EBI training at:
www.ebi.ac.uk/training

EMBL-EBI

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2011 COLD SPRING HARBOR ASIA MEETINGS SCHEDULE

www.csh-asia.org
Cold Spring Harbor Asia Conferences
Suzhou Dushu Lake Conference Center
No.299 Qiyue Road
SIP, Suzhou, Jiangsu Province, China
Phone: +86 512 8272 9029
Fax: +86 512 8272 9028
meetings@csh-asia.org

Cold Spring Harbor Asia conferences will be held at Suzhou Dushu Lake Conference Center in Suzhou, China, sixty miles west of Shanghai and in easy reach of international and domestic airports. Suzhou is an ancient city known as the Venice of China, famous for its canals and private gardens and home to scholars for more than two millenia. Symposia, conferences and summer schools follow the Cold Spring Harbor tradition in showcasing meeting-based scientific advances in an informal but intense atmosphere.

To encourage significant international participation from throughout Asia, Europe and the Americas, the language of all programs will be English.

SPRING CONFERENCES

High Throughput Biology
April 19-23, Abstract due February 4
Bing Ren, Eddy Rubin, Tian Xu

New Advances in Optical Imaging of Live Cells & Organisms
May 9-13, Abstract due February 25
Atsushi Miyawaki, Sunney Xie, Xiaowei Zhuang

Membrane Proteins: Structure & Function
May 16-20, Abstract due March 4
Carola Hunte, Chuck Sanders, Yigong Shi

Translational Approaches to Cancer
May 23-27, Abstract due March 11
Saijuan Chen, David Huang, Yongzhang Luo, Hiroyuki Mano, Scott Powers

Plant Cell and Developmental Biology
May 31-June 4, Abstract due March 18
Xiao-ya Chen, Hong Ma, Weicai Yang, Zhenbiao Yang

FALL CONFERENCES

Infection & Immunity
September 9-12, Abstract due June 29
Shizuo Akira, Xuetao Cao, Genhong Cheng, Luke O'Neill

Global Health & Microbial Genomics
September 13-17, Abstract due July 1
Matthew Berriman, Julian Parkhill

Protein Structure-Based Drug Design
September 19-23, Abstract due July 8
Arthur Grollman, Hualiang Jiang, Joel L. Sussman, Soichi Wakatsuki

Protein Homeostasis in Health & Disease
September 26-30, Abstract due July 15
Richard Morimoto, Kazuhiro Nagata, Chih-chen Wang

Developmental Biology
October 11-15, Abstract due July 22
Stephen Cohen, Takashi Shimehara, Ting Xie

Assembly, Plasticity, Dysfunction & Repair Of Neural Circuits
October 17-21, Abstract due July 29
Barry Dickson, Zhigang He, Hitoshi Okamoto, Yimin Zou

Joint CSH Asia/ISSCR Conference on Cellular Programs & Reprogramming
October 24-28, Abstract due August 19
HongKui Deng, Narry Kim, Ronald McKay, Toshio Suda, Richard Young

2011 Symposium: Design & Synthesis of Biological Systems
November 6-11, Abstract due August 24
Daniel Gibson, Sang Yup Lee, Pamela Silver

Bioinformatics of Human and Animal Genomics
November 14-18, Abstract due September 2
Ewan Birney, Lincoln Stein, Jun Wang, Zhiping Weng

For the most updated information, please visit our website at www.csh-asia.org

LANDSCAPE Yun Shou-p'ing (1633-1690) / Ch'ing dynasty, Ink on paper / Size: 16.8 x 32.2 cm.

Yun Shou-p'ing was a native of Wu-chin, Kiangsu. He was originally named Ku. His style names were Shou-p'ing, which became his more commonly known name, and Cheng-shu. His sobriquets were Nan-t'ien, Tung-yuan hs'ao-i, Tung-yuan's'u, and Pai-yun sui-shih. Since he was an old patrician family, he did not serve the new Ch'ing regime. His poetry and writing were transcendental in quality. He was the head of the Six Scholars of P'i-ling. Initially he was a landscape painter who strove to revive the ancient, traditional style. Afterseeing the works of Wang Hui of Yu-shan and Ching-yu he could not surpass Wang in land-scape, he thereafter pursued competence in flower painting. In still life painting he followed the Northern Sung painter Hsu Ch'ung-ssu. His compositions retained with a scholar's style. His modesty about his landscape painting kept him from aspiring to be as prolific as most others; however, his works deeply reflected the tranquil and subtle qualities of the Yuanand were also sought after as models. Yun Shou-p'ing's inkspheres possessed a beautiful flavor. His calligraphy was elegant and had a style of its own. His painting, poetry and calligraphy were called "San-t'ien's three excellencies."

NW209499EL

The Great Meadow | 2010 | Renee Lammers | www.ReneeLammers.com

2011 Courses, Workshops and Meetings

(subject to change)

March 7 — 9	Workshop on Colony Management: Principles and Practices — inStem, Bangalore, India
March 8 — 11	Workshop on Surgical Techniques in the Laboratory Mouse — Scripps Research Institute, La Jolla
April 3 — 8	Workshop on Surgical Techniques in the Laboratory Mouse
April 17 – 22	Workshop on Comprehensive Approaches to the *in vivo* Assessment of Cardiovascular Function in Mice
May 8 – 12	Workshop on Colony Management: Principles and Practices
June 9 — 10	Mammary Stem Cell Training Course
June 14 — 17	Workshop on Embryo Transfer
June 20 — 24	Workshop on Cryopreservation of Mouse Germplasm
July 17 — 29	52nd Annual Short Course on Medical and Experimental Mammalian Genetics
August 14 — 18	Short Course on the Genetics of Addiction
August 19 — 27	20th Annual Short Course on Experimental Models of Human Cancer
September 8 — 16	Genomic and Proteomic Approaches to Complex Heart, Lung, Blood & Sleep Disorders
September 18 – 23	Workshop on Phenotyping Mouse Models of Human Lung Disease
September 23 — 29	10th Annual Workshop on the Pathology of Mouse Models for Human Disease — Purdue University, Indianapolis
October 2 — 9	Short Course on Systems Genetics
October 9 – 11	Coming Together on Epilepsy Genetics: From Human to Model Organisms and Back
October 16 — 20	Workshop on Techniques in Modeling Human Colon Cancer in Rodents
October 23 — 28	Workshop on Surgical Techniques in the Laboratory Mouse
December 6 — 9	Workshop on Surgical Techniques in the Laboratory Mouse — Scripps Research Institute, La Jolla

All events are held at The Jackson Laboratory in Bar Harbor, Maine unless specified otherwise.
Dates are subject to change. Details and updates are available on line: courses.jax.org/event-listings

The Jackson Laboratory
Leading the search for tomorrow's cures

600 Main Street
Bar Harbor, Maine 04609-1500
courses.jax.org
coursesandconferences@jax.org

NW208548EL

2011 Cold Spring Harbor Laboratory Meetings & Courses

Meetings

Systems Biology: Networks
March 22 - 26

Computational Cell Biology
March 29 - April 1

Stem Cell Engineering & Cell-Based Therapies
April 7 - 10

Synapses: From Molecules to Circuits & Behavior
April 12 - 16

The Biology of Cancer: Microenvironment, Metastasis & Therapeutics
April 26 - 30

Telomeres & Telomerase
May 3 - 7

Honey Bee Genomics & Biology Workshop
May 8 - 10

The Biology of Genomes
May 10 - 14

The Ubiquitin Family
May 17 - 21

Retroviruses
May 23 - 28

76th Symposium: Metabolism & Disease
June 1 - 6

Single Cell Analysis
July 22 - 24

Yeast Cell Biology
August 16 - 20

Eukaryotic mRNA Processing
August 23 - 27

Mechanisms of Eukaryotic Transcription
August 30 - September 3

Eukaryotic DNA Replication & Genome Maintenance
September 6 - 10

Microbial Pathogenesis & Host Response
September 13 - 17

Stem Cell Biology
September 20 - 24

Personal Genomes
September 30 - October 2

Neurobiology of *Drosophila*
October 3 - 7

Cell Death
October 11 - 15

Genome Informatics
November 2 - 5

Harnessing Immunity to Prevent & Treat Disease
November 16 - 19

Plant Genomes & Biotechnology: From Genes to Networks
November 30 - December 3

RNA & Oligonucleotide Therapeutics
December 4 - 7

Rat Genomics & Models
December 7 - 10

Courses

Protein Purification & Characterization
April 6 - 19

Cell & Developmental Biology of *Xenopus*
April 8 - 19

Workshop on Autism Spectrum Disorders
June 8 - 15

Advanced Bacterial Genetics
June 8 - 28

Ion Channel Physiology
June 8 - 28

Molecular Embryology of the Mouse
June 8 - 28

Proteomics
June 13 - 28

Workshop on Pancreatic Cancer
June 16 - 22

Molecular Neurology & Neuropathology
June 27 - July 3

Computational Cell Biology
July 1 - 21

Frontiers & Techniques in Plant Science
July 1 - 21

Neurobiology of *Drosophila*
July 1 - 21

Structure Function & Development of the Visual System
July 6 - 19

Advanced Techniques in Molecular Neuroscience
July 6 - 21

Biology of Memory
July 21 - August 3

Eukaryotic Gene Expression
July 26 - August 15

Imaging Structure & Function in the Nervous System
July 26 - August 15

Yeast Genetics & Genomics
July 26 - August 15

Integrated Statistical Analysis for Genome Scale Data
August 2 - 15

Cellular Biology of Addiction
August 9 - 15

Live Cell Imaging, Super-Resolution Imaging and Image Analysis
October 19 - November 1

Programming for Biology
October 17 - November 1

X-Ray Methods in Structural Biology
October 17 - November 1

Circuits & Connectivity in the Vertebrate Brain
October 19 - November 1

Advanced Sequencing Technologies & Applications
November 8 - 21

C elegans
November 8 - 21

Computational & Comparative Genomics
November 9 - 15

The Genome Access Course
April 19 - 20, November 29 - 30

Photo above: Cocktails during the 2010 Symposium at the unveiling of the Darwin statue.

Cold Spring Harbor Laboratory
Meetings & Courses Program, 1 Bungtown Road, Cold Spring Harbor, NY 11724
Phone 516 367 8346 email meetings@cshl.edu www.cshl.edu/meetings

Please visit our web site for the latest updates and additions.

NW209501EL