

Final Progress Report

The Tapestry of Life: Lateral Transfers of Heritable Elements – Scientific Meeting

December 12-13, 2005

Grant No.: DE-FG02-06ER64153

Principal Investigator: Claire M. Fraser, Ph.D.



The Tapestry of Life: Lateral Transfers of Heritable Elements

December 12-13, 2005



Beckman Center of the National Academies
Irvine, California

Organized by Siv Andersson, Jonathan Eisen,
Claire Fraser, and Jeffrey Gordon



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Tapestry of Life: Lateral Transfers of Heritable Elements

Organizers: Siv Andersson, Jonathan Eisen, Claire Fraser, and Jeffrey Gordon

Co-Chairs: Claire Fraser and Jeffrey Gordon
Beckman Center, Irvine, California
December 12-13, 2005

[Final Program and Presentations](#)

[Meeting Overview](#)

The Sackler Colloquium *The Tapestry of Life: Lateral Transfers of Heritable Elements* was held on December 12-13, 2005. What Darwin saw as a tree of life descending in a linear fashion, is now more accurately seen as a tapestry of life, an anastomosing network, with important lateral transfers of heritable elements among parallel lines of descent. These transfers range in complexity from small insertion sequences, to whole genes, gene islands, and portions of whole genomes which may be combined in symbiogenesis. The colloquium brought together researchers, empirical and theoretical, working at all levels on genomics, comparative genomics, and metagenomics to identify common and differentiating features of lateral gene transfer and to examine their implications for science and for human concerns.

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THE TAPESTRY OF LIFE: LATERAL TRANSFERS OF HERITABLE ELEMENTS

December 12-13, 2005
Beckman Center of the National Academies, Irvine, California

Organized by Siv Andersson, Jonathan Eisen, Claire Fraser, and Jeffrey Gordon
Co-Chairs: Claire Fraser and Jeffrey Gordon

FINAL PROGRAM

Sunday, December 11

6:00-8:00pm Registration and Welcome Reception, Hyatt Regency Newport Beach

Monday, December 12

7:15am & 7:45am Buses leave Hyatt Regency Newport Beach for Beckman Center

7:15am Poster setup in Huntington Room

7:30am Registration and Buffet Breakfast, Dining Room

8:45am Greetings, Jeffrey Gordon (Washington University of Medicine)
Introductory comments about purpose/goals of meeting

Session I: Mechanisms and Experimental Studies of LGT

Chair: Abigail Salyers (University of Illinois)

9:00am Forest Rohwer (Scripps), *Global Phage Diversity and the Movement of Genes*

9:30am Penny Chisholm (MIT), *Prochlorococcus Diversity: How to Dominate the Oceans with 2000 Genes*

10:00am Abigail Salyers (University of Illinois), *LGT in the Human Colon: How Much and How Important?*

10:30am Break

11:00am Marlene Belfort (Wadsworth Center, NYS Department of Health), *Molecular Machinery for Lateral Transfer of Introns*

11:32am Poster Abstract Presentation: Michael Miller (Stanford University), *Natural Transformation as a Source of Diversity Among Vibrio Cholerae Isolates*

12:00pm-1:00pm Buffet Lunch, Dining Room

Session II: Methods of Detection

- Chair: Jeffrey Lawrence (University of Pittsburgh)
- 1:15pm Jeffrey Lawrence (University of Pittsburgh), *Measuring Non-Random LGT Among Bacterial Lineages*
- 1:45pm Herve Philippe (University of Montreal), *Are Horizontal Gene Transfers the Most Disturbing Limitation for Inferring Prokaryotic Phylogeny?*
- 2:15pm Christos Ouzounis (European Bioinformatics Institute), *Genome Conservation and the Net of Life*
- 2:45pm Break
- 3:15pm James Lake (UCLA), *The Ring of Life and the Origin of Eukaryotes*
- 3:45pm Poster Abstract Presentation: Kaiyuan Shi (University of Connecticut), *Parametric Bootstrap Analyses of Bacterial 16SrRNA Mosaicism*
- 4:15pm-5:15pm Panel discussion featuring speakers from Sessions I and II
- 5:30pm Poster Session in Huntington Room
- 7:00pm Dinner in Atrium
- 8:00pm Buses leave Beckman Center for Hyatt Regency Newport Beach

Tuesday, December 13

- 7:15am & 7:45am Buses leave Hyatt Regency Newport Beach for Beckman Center
- 7:30 am Buffet Breakfast, Beckman Center Dining Room

Session III: Case Studies

- Chair Siv Andersson (University of Uppsala)
- Goals: More in depth presentations of illustrative/provocative case studies of LGT
- 8:30am Jeffrey Palmer (Indiana University), *Plant Mitochondrial Genomes: Unexpected Bounties of Lateral Gene Transfer*
- 9:00am Gary Dunny (University of Minnesota), *Enterococcal Pheromone-Responsive Plasmids: Broad-Host Range Transfer Controlled by Narrow-Host Range Cell-Cell Signaling*
- 9:30am Patrick Keeling (University of British Columbia), *Impact of Lateral Gene Transfer on the Eukaryotic Nuclear Genome*
- 10:00am Break
- 10:30am Siv Andersson (University of Uppsala), *Alpha-Proteobacterial Gene Transfers and the Origin of Mitochondria*

11:00am Poster Abstract Presentation: Nicola Patron (University of British Columbia), *Intracellular Gene Transfer in Endosymbiotic Genome Integration*

11:30am-12:30pm Buffet Lunch, Dining Room

Session IV: Evolutionary Implications of LGT

Chair Jonathan Eisen (The Institute for Genomic Research)

12:45pm Jonathan Eisen (The Institute for Genomic Research), *Environmental Genomics and LGT: Can we Identify Organisms through their DNA if all Organisms are Chimeras?*

1:15pm Sandra Baldauf (University of York), *Inferring Eukaryotic Divergences*

1:45pm Patrick Forterre (University of Paris), *How to Recover the History of the Archaeal Domain, despite Lateral Gene Transfer?*

2:15pm Ford Doolittle (Dalhousie University), *"Web of Life"*

2:45pm Poster Abstract Presentation: M. Virginia Sanchez Puerta (University of Maryland-College Park), *The Plastid Genome of the Haptophyte *Emiliana Huxleyi* and the Evolution of the Chlorophyll C Containing Plastids*

3:15pm Break

Wrap-Up: Impact, Applications, Future Challenges

3:45pm Claire Fraser (The Institute for Genomic Research), *Comparative Microbial Genomics: Insights into Evolution and Organismal Diversity*

4:15pm Panel Discussion of major future intellectual/disciplinary/technical challenges for the field featuring speakers from Sessions III and IV

5:15pm Buses leave Beckman Center for Hyatt Regency Newport Beach and Orange County Airport

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DECEMBER 12-13, 2005
BECKMAN CENTER OF THE NATIONAL ACADEMIES, IRVINE, CA
FINAL PARTICIPANT ROSTER

First Name	Last Name	Organization	Category
Siv	Andersson	University of Uppsala	Organizer/Speaker
Gemma	Atkinson	University of York	Student
Holly	Atkinson	University of California, San Francisco	Student
Peter	Atkinson	University of California, Riverside	General participant
Jamie	Bacher	The Scripps Research Institute	Student
Jonathan	Badger	The Institute for Genomic Research	General participant
Sandra	Baldauf	University of York	Speaker
Arthur	Beauregard	Wadsworth Center, NYS Department of Health	Student
Robert	Beiko	The University of Queensland	Student
Marlene	Belfort	Wadsworth Center, NYS Department of Health	Speaker
Eva	Berglund	University of Uppsala	Student
Peter	Bickel	University of California, Berkeley	General participant
Melanie	Blokesch	Stanford University	Student
Mya	Breitbart	San Diego State University	Student
Bjorn	Brindefalk	University of Uppsala	Student
Adriana	Briscoe	University of California, Irvine	General participant
Roy	Britten	Caltech	General participant
Yiping	Cao	University of California, Santa Barbara	Student
Venkata	Chalamcharla	Wadsworth Center, NYS Department of Health	Student
Viann	Chan	University of British Columbia	Student
Casey	Chen	USC School of Dentistry	General participant
Penny	Chisholm	Massachusetts Institute of Technology	Speaker
Alex	Cohen	National Academy of Sciences	Staff/Press
Joel E.	Cohen	Rockefeller & Columbia Universities	Staff/Press
Maureen	Coleman	MIT	Student
R. Sidney	Cox	Caltech	Student
Nicole	Creanza	Rockefeller University	Student
Alyssa	Cruz	National Academy of Sciences	Staff/Press
Peter	Dailey	Roche Molecular Diagnostics	General participant
Aaron	Darling	University of Wisconsin-Madison	Student
Audrey	de Koning	University of British Columbia	Student
Patrick	Dennis	National Science Foundation	General participant
Ford	Doolittle	Dalhousie University	Speaker
Gary	Dunny	University of Minnesota	Speaker
Jonathan	Eisen	The Institute for Genomic Research	Organizer/Speaker
Brian	Federici	University of California, Riverside	General participant
Patrick	Forterre	Institut de Génétique et Microbiologie	Speaker
Claire	Fraser	The Institute for Genomic Research	Organizer/Speaker
Francesca	Frentiu	University of California, Irvine	Student
Ken	Fulton	National Academy of Sciences	Staff/Press
Sudhindra	Gadagkar	University of Dayton	General participant
Arnold	Goodman	University of California, Irvine	General participant
Jeffrey	Gordon	Washington University School of Medicine	Organizer/Speaker

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First Name	Last Name	Organization	Category
Charles	Hall	Duke University Medical Center	Student
Julia	Halo	Duquesne University	Student
Craig	Herbold	University of California, Los Angeles	Student
Emma	Hill	Public Library of Science	Staff/Press
Erik	Hom	University of California San Francisco	Student
William	Hsiao	Simon Fraser University	Student
Jinling	Huang	University of Connecticut	Student
William	Inwood	University of California, Berkeley	General participant
Marcin	Joachimiak	University of California, Berkeley	Student
Katherina	Kechris	University of California San Francisco	Student
Patrick	Keeling	University of British Columbia	Speaker
Eric	Knox	Indiana University	General participant
Nakao	Kubo	Indiana University	Student
Victor	Kunin	DOE Joint Genome Institute	Student
James	Lake	University of California, Los Angeles	Speaker
Morgan	Langille	Simon Fraser University	Student
Jeffrey	Lawrence	University of Pittsburgh	Speaker
Rachel	Lesinski	National Academy of Sciences	Staff/Press
Ruth	Ley	Washington University School of Medicine	General participant
Haiping	Li	Western Institute for Food Safety and Security	Student
Miranda	Lim	Emory University	Student
Michael	Mahowald	Washington University in St. Louis	Student
Bob	Mau	University of Wisconsin-Madison	General participant
Allison	McDonald	University of Toronto	Student
Calvin	McLaughlin	University of California, Irvine	General participant
Jeffrey H.	Miller	University of California, Los Angeles	General participant
Michael	Miller	Stanford University	Student
Randall	Murch	Virginia Polytechnic Inst and State Univ	General participant
Kenlee	Nakasugi	University of New South Wales	Student
Patrick	O'Donoghue	University of Illinois at Urbana-Champaign	Student
Han Chuan	Ong	Indiana University	Student
Christos	Ouzounis	The European Bioinformatics Institute	Speaker
Jeffrey	Palmer	Indiana University	Speaker
Nicola	Patron	University of British Columbia	Student
Kevin	Penn	TIGE	General participant
Marty	Perreault	National Academy of Sciences	Staff/Press
Herve	Philippe	University of Montreal	Speaker
April	Phillips	University of California, Irvine	Student
Nelida	Pohl	University of California, Irvine	Student
Lita	Proctor	The Gordon and Betty Moore Foundation	General participant
Guenola	Ricard	CMBI/NCMLS	Student
Danny	Rice	Indiana University	Student
Aaron	Richardson	Indiana University	Student

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First Name	Last Name	Organization	Category
Maria	Rivera	University of California, Los Angeles	General participant
Alberto	Roca	University of California, Irvine	Student
Matthew	Rogers	University of British Columbia	Student
Forest	Rohwer	San Diego State University	Speaker
Abigail	Salyers	University of Illinois at Urbana-Champaign	Speaker
M. Virginia	Sanchez Puerta	University of Maryland-College Park	Student
Suzanne	Sandmeyer	University of California, Irvine	General participant
Daniel	Santillano	University of California, Merced	Student
Jason	Schwarz	Rockefeller University	Student
Jacqueline	Servin	University of California, Los Angeles	Student
Kaiyuan	Shi	University of Connecticut	Student
Melinda	Simmons	Gordon and Betty Moore Foundation	General participant
Anne	Simonson	The Burnham Institute	Student
Ryan	Skophammer	University of California, Los Angeles	Student
Marc	Smith	University of Dayton	Student
David	Soergel	University of California, Berkeley	Student
Rob	Steele	University of California, Irvine	General participant
Diane	Sullenberger	PNAS	Staff/Press
Fumihiko	Takeuchi	Juntendo University	General participant
George	Todaro	Targeted Growth, Inc.	General participant
Peter	Turnbaugh	Washington University in St. Louis	Student
Jacob	Waldbauer	MIT/WHOI	Student
Hans	Wildschutte	University of Pittsburgh	Student
Dongying	Wu	The Institute for Genomic Research	General participant
Martin	Wu	The Institute for Genomic Research	General participant
Shurong	Xiang	University of California, Santa Barbara	Student
Gregory	Young	Indiana University	Student
Anthony	Zuccarelli	Loma Linda University	General participant

114 Colloquium Participants

Number of Students	Number of Postdocs	Number of Female Participants	Number of Male Participants	Number of institutions	Number of represented countries
59 (52%)	14 (24%)*	41 (36%)	73 (64%)	56	8

Represented Countries

United States
Canada
United Kingdom
Australia
Sweden
France
Japan
Netherlands

Top 5 United States Institutions

University of California, Irvine
Indiana University
University of California, Los Angeles
The Institute for Genomic Research
Washington University in St. Louis

Canada

University of British Columbia
Simon Fraser University
Dalhousie University
University of Montreal
University of Toronto

United Kingdom

University of York
European Bioinformatics Institute

Australia

The University of Queensland
University of South Wales

Sweden

University of Uppsala

France

Institut de Génétique et Microbiologie

Japan

Juntendo University

Netherlands

Center for Molecular and Biomolecular Informatics/Nijmegen
Centre for Molecular Life Sciences

*24% of students are postdocs
12% of participants are postdocs