New Opportunities to Study Origins of the Eukaryotic Cell

Sunday, April 15

3:00 pm   Check-in
6:00 pm   Reception (*Lobby*)
7:00 pm   Dinner (*table assignments noted in the Dining Room*)

8:00 pm   Welcome and Introductory Remarks
           *Mark Ellisman*, University of California San Diego & HHMI/Janelia

8:10 pm   Opening Talks

8:10 pm   *Thijs JG. Ettema*, Uppsala University
           *The origin of complex cells*

8:35 pm   *Victoria Orphan*, California Institute of Technology
           *Syntrophic interactions between methane-oxidizing archaea and bacteria in spatially structured consortia*

9:00 pm   Refreshments available at Bob’s Pub

NOTE:
Meals are in the *Dining Room*
Talks are in the *Seminar Room*
Posters are in the *Lobby*
# New Opportunities to Study Origins of the Eukaryotic Cell

**Monday, April 16**

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<th>Time</th>
<th>Event</th>
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<tr>
<td>7:30 am</td>
<td>Breakfast <em>(service ends at 8:45 am)</em></td>
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| 9:00 am | **Session: Cell biology, shape and size**  
**Chair:** David Stern |
| 9:00 am | **Karolin Luger**, University of Colorado at Boulder  
*The structure of histone-based chromatin in Archaea: Probing the origins of the eukaryotic nucleosome* |
| 9:25 am | **Ann-Christin Lindas**, Stockholm University  
*Cell division and actin cytoskeleton in archaea* |
| 9:50 am | **Buzz Baum**, University College London  
*Evolution of eukaryotic cell division* |
| 10:15 am | **Martin Hetzer**, Salk Institute for Biological Studies  
*Age mosaicism across multiple scales in adult tissues* |
| 10:40 am | Break |
| 11:05 am | **Session 2: Symbiosis and parasitism**  
**Chair:** Jan Löwe |
| 11:05 am | **John McCutcheon**, University of Montana  
*How does a bacterial endosymbiont become part of its host cell?* |
| 11:30 am | **Gareth Bloomfield**, MRC LMB  
*Sex and symbiosis in eukaryotic evolution* |
| 11:55 am | **David S. Roos**, University of Pennsylvania  
*Evolutionary cell biology: Deep insights from big data* |
| 12:20 pm | **General Discussion** |
| 12:45 pm | Lunch *(Service ends at 1:15 pm)* |
| 1:45 pm | **Session 3: Organelle evolution/membrane transport**  
**Chair:** Martin Hetzer |
| 1:45 pm | **Gregory Pazour**, University of Massachusetts Medical School  
*The eukaryotic cilium* |
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2:10 pm  **Short talk: Shane McInally**, University of California, Davis  
*Local regulation of IFT train assembly and injection at eight distinct flagellar pores in the multiflagellate, Giardia lamblia*

2:25 pm  **Jan Löwe**, MRC Laboratory of Molecular Biology  
*Where and when did eukaryotic F-actin and microtubules originate?*

2:50 pm  **Short talk: Itay Budin**, University of California, Berkeley  
*The role of membrane viscosity in cellular respiration and its implications for the evolution of lipid composition in eukaryotes*

3:05 pm  Break

3:30 pm  **Session 4: Organelle evolution and membrane transport**  
Chair: Laura Hug

3:30 pm  **Tobias Walther**, HHMI/Harvard Medical School  
*Mechanisms and origins of metabolic energy buffering*

3:55 pm  **Samara Reck-Peterson**, University of California, San Diego  
*Molecular mechanisms of the intracellular transport system*

4:20 pm  **Short talk: Emily K. Herman**, University of Alberta  
*Conservation and evolvability of membrane trafficking machinery in eukaryotes*

4:35 pm  **Short talk: María Inmaculada Ramírez Macías**, University of Alberta  
*Study of the contractile vacuole using Dictyostelium discoideum as a model*

4:50 pm  Break

5:05 pm  **BREAKOUT DISCUSSION SESSIONS** (each group discusses both topics)

5:05-5:50 pm  *Metagenomics: Searching for the last common ancestor of Eukaryotes*  
5:50-6:10 pm  Break  
6:10-6:55 pm  *Tools for studying Eukaryotic evolution*  
6:55-7:15 pm  Break

7:15 pm  Dinner (*Table assignments noted in the Dining Room*)

8:15 pm  **Regroup for breakout session summaries**

*Metagenomics: Moderated by Tom Cavalier-Smith and Karolin Luger*  
*Tools: Moderated by David Roos sand Anja Spang*

9:15 pm  Refreshments available at Bob’s Pub
Tuesday, April 17

7:30 am  Breakfast *(service ends at 8:45 am)*

9:00 am  Session 5: Phylogenomics and metagenomics  
Chair: Jennifer Lippincott-Schwartz

9:00 am  Tom Cavalier-Smith, University of Oxford  
*Intracellular coevolutionary logic and phylogeny of eukaryogenesis: Firmibacterial L-forms, the neomuran revolution, and the phagotrophic origin of eukaryotes*

9:25 am  Anja Spang, Royal Netherlands Institute for Sea Research  
*The metabolic potential of ASGARD archaea in light of eukaryogenesis*

9:50 am  Laura Hug, University of Waterloo  
*Environmental metagenomic influences on phylogenomics*

10:15 am  Matthew Brown, Mississippi State University  
*A step into the future of protistology, a single cell transcriptome revolution*

10:40 am  Break

11:05 am  Session 6: Theory  
Chair: Scott Dawson

11:05 am  Eric Libby, Umeå University  
*Theoretical framework for understanding the evolutionary origins of multicellularity*

11:30 am  Short talk: Chris Kempes, Santa Fe Institute  
*Biological scaling and the transition to eukaryotes*

11:45 am  Michael Lynch, Arizona State University  
*The bioenergetic cost of producing and maintaining cells: An evolutionary perspective*

12:10 pm  Short talk: István Zachar, Centre for Ecological Research  
*The origin of mitochondria from an eco-evolutionary point of view*

12:25 pm  Lunch *(service ends at 1:00 pm)*

1:00 pm  Building Tour *(optional - meet at reception)*

1:45 pm  Session 7: Tools  
Chair: Samara Reck-Peterson

1:45 pm  Scott Dawson, University of California, Davis  
*New methods to access free-living amoebae genomes from mixed consortia*
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2:10 pm  **Short talk: David S. Booth**, University of California, Berkeley  
*New genetic tools for studying the origin of animals*

2:25 pm  **Steven Haddock**, Monterey Bay Aquarium Research Institute  
*Scrutinizing the inscrutable: What ctenophores can and cannot tell us about metazoan origins*

2:50 pm  **Leonid L. Moroz**, University of Florida  
*Origins of eukaryotes, cell types & multicellularity through the lens of single-cell genomics: Insights from 1st one million cells sequenced across phyla*

3:15 pm  Break

3:40 pm  **Session 8: Microbial ecology, diversity and multicellularity**  
**Chair:** Eric Libby

3:40 pm  **Short talk: Sarah Guest**, University of California, Davis  
*Branching cytoskeletal networks and generation of complexity in the aggregatively multicellular *Rhizarian amoebae*

3:55 pm  **Roland Hatzenpichler**, Montana State University  
*Multicellular magnetotactic bacteria - a window into the early evolution of advanced life*

4:20 pm  **Marc Kirschner**, Harvard Medical School  
*How early eukaryotes were able to contribute to the subsequent evolvability of multicellular organisms*

4:45 pm  Break

5:00 pm  **BREAKOUT DISCUSSIONS** (4 groups, each discussing both topics)

5:00-5:45 pm  **Evolution of signaling networks and their relationship with metabolic pathways**

5:45-6:05 pm  Break

6:05-6:50 pm  **Evolution of subcellular compartments and cytoskeleton**

6:50-7:15 pm  Break

7:15 pm  Dinner

8:15 pm  **Regroup for breakout session summaries**  
*Signaling Networks: Moderated by Mark Kirschner and Jennifer Lippincott-Schwartz*  
*Subcellular Compartments: Moderated by Buzz Baum and Samara Reck-Peterson*

9:15 pm  Refreshments available at Bob’s Pub
Wednesday, April 18

7:30 am  Breakfast *(service ends at 8:45 am)*

9:00 am  **Session 9: Cell biology, shape and size**  
*Chair: Mark Ellisman*

9:00 am  **Elitza Tocheva**, University of Montreal  
*Evolution of the bacterial outer membrane*

9:25 am  **Rut Carballido-Lopez**, French National Institute for Agricultural Research  
*Dynamic interplay between the bacterial actin cytoskeleton and the bacterial cell wall*

9:50 am  **Jennifer Lippincott-Schwartz**, Janelia Research Campus/HHMI  
*Inter-organelle communication and dynamics: Implications for the evolution of different eukaryotic cell types*

10:15 am  Break

10:45 am  **Closing Discussion / Conclusions from Breakouts / Final Remarks**

12:00 pm  Lunch and/or Departure

12:30 pm  First shuttle to Dulles
1:30 pm  Second shuttle to Dulles
2:30 pm  Last shuttle to Dulles