

Envisioning the Future of Developmental Biology

Napa, California
March 19th- 22, 2023

Funded by NSF Grant #2310253



Additional support:



LEXOGEN
The RNA Experts

ThermoFisher
SCIENTIFIC



Co-Chairs: Siobhan Brady and Crystal Rogers

Organizing committee: Dominique Bergmann, Otger Campas, Ida Chow, Margaret Frank, Carole LaBonne, and Athula Wikramanayake

Conference Agenda

Sunday, March 19

4:00 pm	Registration Opens	Chardonnay AB
4:30 – 5:30 pm	Welcome and meeting orientation	Chardonnay AB
5:30 – 7:30 pm	Plenary Session I: Cutting edge meets traditional #DevBio <i>Carole LaBonne, Northwestern University</i> <i>Dominique Bergmann, Stanford University</i>	Chardonnay AB
7:30 – 8:00 pm	Town Hall Meeting: Outlining workshop goals and expectations	Chardonnay AB
8:00 – 10:00 pm	Welcome reception Introductions and ice breakers Reception refreshments sponsored by:	Fountain Court



Monday, March 20

7:00 – 8:00 am	Breakfast	Breakfast Room
8:00 – 9:30 am	Plenary Session II: Traditional approaches in #DevBio <i>Michael Barresi, Smith College</i> <i>Blair Benham-Pyle, Baylor College of Medicine</i>	Chardonnay AB
9:30 – 10:00 am	Coffee Break, Breakout Session Overview and Instructions	Chardonnay AB
10:00 – 11:00 am	Breakout Session I <u>Group I: Missing pieces- what did foundational discoveries that gave rise to principles of developmental biology miss?</u> <ul style="list-style-type: none"> - What resources or tools do we need or can we adapt to answer them now? - Why have so many developmental biologists moved on from investigations of functional pathways to big data and the creation of datasets? - When using “big data approaches” - is there active consideration of fundamental biological questions? Facilitator Carole La Bonne	Chardonnay AB, C, Sauvignon, Cabernet
	<u>Group II: Developmental biologists use a multitude of multicellular plant and animal models to understand how organisms change across scale and over time. How can we navigate around organism-specific limitations?</u> <ul style="list-style-type: none"> - How can we ensure that all of these researchers have the tools (funding, training, actual tools) they need for their model systems? - Is there a “best” research organism to answer a biological question? How do we facilitate discussions to ensure that researchers are truly using the “best” research organism or system? - By choosing the “best” organism, and not studying diversity, is your biological question too specific? By exploring a question across multiple species, is your question too broad? - What is the role of a “wild type” in terms of datasets that describe variation within a species? Facilitator Crystal Rogers	
	<u>Group III: Expanding and updating educational impacts in developmental biology.</u> <ul style="list-style-type: none"> - What are the “traditional” concepts and studies taught in developmental biology courses? - Should plants and animals be taught in the same developmental biology course (based on a theme of developmental genetics; or embryology; or evo-devo)? - How can we make #DevBio more accessible and increase inclusion? Should basic concepts of developmental biology be a requirement for 100 level courses for non-majors and majors? Facilitator Ida Chow	

Group IV: What holds up and is still useful and impactful?

- Are there traditional techniques and approaches that are still useful for impactful research today or that have been improved/adapted using new technological advances?
- Is genetics used sufficiently when validating observations from genomic data (i.e. single cell transcriptome sequencing)? Is it necessary to maximize the impact of the findings?
- How can we respect the past and proceed into the future?

Facilitator Siobhan Brady

Day 1- Morning			
Breakout Session I: Traditional approaches in #DevBio			
Group 1	Group 2	Group 3	Group 4
1. Rachel Shahan	1. Richard Behringer	1. Ben Blackman	1. Ricardo Zayas
2. Dan Wagner	2. Madelaine Bartlett	2. Jasmin Camacho	2. Bill Browne
3. Leslie Babonis	3. Dominique Bergmann	3. Aman Husbands	3. Ajna Rivera
4. Athula Wikramanayake	4. Katelyn Hansen-McKown	4. Chris Amemiya	4. Loydie Jerome-Majewska
5. Stewart Gillmor	5. Cecilia Moens	5. Chiswili Yves Chabu	5. Jaimie Van Norman
6. J.D Swanson	6. Dan Rokhsar	6. Billie Swalla	6. Chris Lowe
7. Neelima Sinha	7. Flora Rutaganira	7. Ondine Cleaver	7. Loic Royer
8. Kristen Koenig	8. Iswar Hariharan	8. Margaret Frank	8. Jonah Cool
9. Jazz Dickinson	9. Eric Haag	9. Michael Layden	9. Anna K. Allen
10. Christian Mosimann	10. Swathi Arur	10. Blair Benham-Pyle	10. Stefano Di Talia
11. Megan Martik	11. Michael Barresi	11. Titus Brown	11. Megan Dennis
12. Robert Reed	12. Joyce Onyenedum	12. Dede Lyons	12. Sophia Zebell
13. Facilitator: Carole Labonne	13. Facilitator: Crystal Rogers	13. Facilitator: Ida Chow	13. Facilitator: Siobhan Brady
Chardonnay AB	Chardonnay C	Sauvignon	Cabernet
11:00 – 12:00 pm	Report Out/Group Discussion		Chardonnay AB
12:00 – 1:00 pm	Lunch		Wine Barrel Terrace
1:00 – 2:30 pm	Plenary Session III: New technology and approaches in #DevBio <i>Loïc Royer, Chan Zuckerberg Biohub</i> <i>Stefano Di Talia, Duke University</i>		Chardonnay AB
2:30 – 3:00 pm	Coffee Break		Chardonnay AB
3:00 – 4:00 pm	Breakout Session II <u>Group I: Using, scaling and making new technology accessible to answer fundamental developmental biology.</u> <ul style="list-style-type: none"> - How do we ensure that we each understand each other's "field-specific vocabulary or language" and basic principles? - How can we use, scale and make new technology accessible? - Do we give enough value (and funding) to new technology that can take 5-10 years to develop to answer critical developmental biology questions? Facilitator Athula Wikramanayake		Chardonnay AB, C, Sauvignon, Cabernet
	<u>Group II: Identifying funding mechanisms that support new technology and its integration with developmental biology.</u> <ul style="list-style-type: none"> - Are there federal or private funding opportunities to 1) increase access to technology for developmental biologists can use institutions that are under-resourced and 2) provide funding for multi-user cores that across institutions? - Are there funding mechanisms that support new technology development (i.e. CZI/PCA/community-started vs funder initiatives)? - Are there opportunities to use current mechanisms to maximize impact? Facilitator Dominique Bergmann		
	<u>Group III: Integration of developmental biology in an interdisciplinary manner - gaps and niches.</u> <ul style="list-style-type: none"> - Given our previously identified gaps and niches session I, how do we create true interdisciplinary partnerships across labs that are both innovative in technology and approaches and inclusive of scientists with a diversity of life and professional experiences? - Is it more valuable to build local or large communities? Or both? - How has Zoom changed our capacity to be interdisciplinary? What can be gained, what is lost? - What education should a future developmental biologist have? Should it be 		

interdisciplinary or multidisciplinary?
Facilitator Margaret Frank

Group IV: How do we incorporate teaching of innovative methodologies, approaches or technologies in developmental biology courses?

- What is currently being taught in #DevBio classes?
- What are the best methodologies to teach that exemplify advances in developmental biology?
- How does this scale between undergraduate and graduate courses?
- How can we improve pedagogy and make it more inclusive in #DevBio?
- How could developmental biology serve as the starting point of an integrative biology curriculum rather than a specialty course at the upper levels?

Facilitator Siobhan Brady

Day 1- Afternoon			
Breakout Session II: New technology and approaches in #DevBio			
Group 1	Group 2	Group 3	Group 4
1. Jasmin Camacho 2. Dan Rokhsar 3. Jazz Dickinson 4. Bill Browne 5. Ondine Cleaver 6. Christian Mosimann 7. Ida Chow 8. Kristen Koenig 9. Sophia Zebell 10. Michael Barresi 11. Flora Rutaganira 12. Dede Lyons 13. Facilitator: Athula Wikramanayake	1. Rachel Shahan 2. Crystal Rogers 3. Ricardo Zayas 4. Megan Martik 5. Megan Dennis 6. Ben Blackman 7. Titus Brown 8. Stewart Gillmor 9. J.D Swanson 10. Billie Swalla 11. Blair Benham-Pyle 12. Stefano Di Talia 13. Facilitator: Dominique Bergmann	1. Chiswili Yves Chabu 2. Anna K. Allen 3. Chris Lowe 4. Richard Behringer 5. Aman Husbands 6. Neelima Sinha 7. Iswar Hariharan 8. Cecilia Moens 9. Ajna Rivera 10. Loic Royer 11. Jaimie Van Norman 12. Robert Reed 13. Facilitator: Margaret Frank	1. Eric Haag 2. Katelyn Hansen-McKown 3. Jonah Cool 4. Loydie Jerome-Majewska 5. Dan Wagner 6. Carole Labonne 7. Swathi Arur 8. Chris Amemiya 9. Michael Layden 10. Madelaine Bartlett 11. Leslie Babonis 12. Joyce Onyenedum 13. Facilitator: Siobhan Brady
Chardonnay AB	Chardonnay C	Sauvignon	Cabernet

4:00 – 5:30 pm

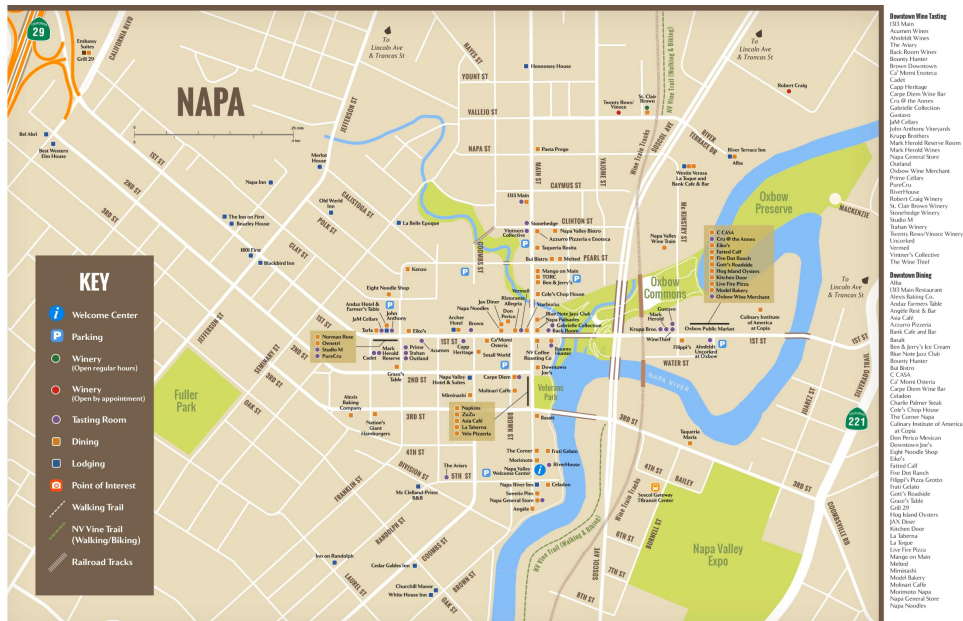
Report Out/Group Discussion

Chardonnay AB

6:00 pm

Dinner on your own

Downtown Napa



Tuesday, March 21

7:00 – 8:00 am	Breakfast	Breakfast Room
8:00 – 9:30 am	Plenary Session IV: Interdisciplinary concepts and collaboration in #DevBio <i>Titus Brown, UC Davis</i> <i>Ondine Cleaver, UT Southwestern</i>	Chardonnay AB

9:30 – 10:00 am	Coffee Break, Breakout Session Overview and Instructions	Chardonnay AB
-----------------	---	---------------

10:00 – 11:00 am	Breakout Session III	Chardonnay AB, C, Sauvignon, Cabernet
------------------	-----------------------------	---------------------------------------

Group I: What disciplines are inherently merged with developmental biology?

- Are there ways to cross-integrate into related fields (i.e. stem cells, cancer)?
- How can we stimulate collaborations between developmental biologists and computational, mathematical, biophysical innovations and the investigation of how life changes over time?
- How do we improve our messaging and recruitment to compete with quickly growing related fields (i.e. stem cells, regeneration, neuroscience)?

Facilitator Crystal Rogers

Group II: How do we make expertise in Dev Bio a sought after skill in collaborations?

- How can developmental biologists market their value in interdisciplinary collaborations?
- How can developmental biologists budget for work across fields?
- How can we identify causes of unsuccessful and successful collaborations?

Facilitator Dominique Bergmann

Group III: How do we incorporate teaching of distinct disciplines in developmental biology (e.g. microbiome/immunology?)

- How can we best communicate the importance of using animal and developmental models as innovative solutions to biological questions?
- Is there novel research identifying links between fields we may have missed in the past due to tech and tool limitations?

Facilitator Ida Chow

Group IV: Vertical and horizontal integration: translation across organisms.

- How can findings from invertebrate models be compared and utilized to enhance research in vertebrate models and vice versa?
- Highly conserved pathways exist in all living things. How can we increase opportunities for clinical, translational, and cell biological studies in plants?
- How to group specific biological questions and approach from different scales and organisms.
- How can we make broadly comparative work "legitimate"?
- The discipline of global ecology draw inferences from models when they can't do functional experiments. Is there a way to think about Dev Bio from this standpoint?
- How do we come to terms with the drive toward "mechanism and function" studies, but the fact that these will tend to tie us to a few research/model organisms and exclude diversity.

Facilitator Margaret Frank

Day 2- Morning			
Breakout Session III: Interdisciplinary concepts and collaboration in #DevBio			
Group 1	Group 2	Group 3	Group 4
1. Stefano Di Talia	1. J.D Swanson	1. Bill Browne	1. Joyce Onyenedum
2. Dan Rokhsar	2. Dan Wagner	2. Ricardo Zayas	2. Swathi Arur
3. Robert Reed	3. Leslie Babonis	3. Jasmin Camacho	3. Eric Haag
4. Chris Lowe	4. Loic Royer	4. Cecilia Moens	4. Jonah Cool
5. Flora Rutaganira	5. Carole Labonne	5. Anna K. Allen	5. Loydie Jerome-Majewska
6. Sophia Zebell	6. Madelaine Bartlett	6. Michael Barresi	6. Neelima Sinha
7. Christian Mosimann	7. Chiswili Yves Chabu	7. Katelyn Hansen-McKown	7. Billie Swalla
8. Chris Amemiya	8. Rachel Shahan	8. Richard Behringer	8. Stewart Gillmor
9. Iswar Hariharan	9. Titus Brown	9. Jazz Dickinson	9. Kristen Koenig
10. Aman Husbands	10. Jaimie Van Norman	10. Ben Blackman	10. Athula Wikramanayake
11. Michael Layden	11. Megan Martik	11. Ondine Cleaver	11. Blair Benham-Pyle
12. Anja Rivera	12. Megan Dennis	12. Dede Lyons	12. Siobhan Brady
13. Facilitator: Crystal Rogers	13. Facilitator: Dominique Bergmann	13. Facilitator: Ida Chow	13. Facilitator: Margaret Frank
Chardonnay AB	Chardonnay C	Sauvignon	Cabernet
11:00 – 12:00 pm	Report Out/Group Discussion		Chardonnay AB

12:00 – 1:00 pm	Lunch	Wine Barrel Terrace																																																																				
1:00 – 2:00 pm	Plenary Session V: Current funding opportunities in #DevBio <i>JD Swanson, NSF</i> <i>Jonah Cool, Chan Zuckerberg Initiative</i>	Chardonnay AB																																																																				
2:00 – 3:00 pm	Breakout Session IV <u>Group I: Current and future funding opportunities</u> <ul style="list-style-type: none">- What are well known and underutilized federal funding mechanisms for supporting basic and transformative #DevBio projects?- Can education, DEI, and technology calls be adapted for Dev Bio?- Are there ways to improve the success rates of these opportunities?- If there was a full portfolio of different funding types (lengths, goals, participants) what would be ideal to drive Dev Bio forward? Facilitator Athula Wikramanayake <u>Group II: Marketing developmental biology to funders</u> <ul style="list-style-type: none">- How can we redefine #DevBio in the eyes of the funding agencies?- Competing with more “charismatic” fields (cancer, stem cells)- Are we missing opportunities to market our science?- Who do we need to convince—the old and established because they have \$\$ or the young because we need to woo them on this path. What are the messages to these communities?- Are there other fields that are doing better at marketing (i.e. neuroscience)? How can we learn from their efforts (consider Wallingford paper)? Facilitator Carole LaBonne <u>Group III: How can we improve the chances of successful applications for NSF TIP or NIH DP2 style grants in #DevBio?</u> <ul style="list-style-type: none">- Are there examples of success in the field to date?- How can investigators from different types of institutions (R1, R2, PUI, etc.) create successful innovative collaborations to better compete for funding? Facilitator Siobhan Brady <u>Group IV: How can we improve the chances of successful applications for private funding in #DevBio?</u> <ul style="list-style-type: none">- Are there current opportunities that exist? (i.e. Foundation, Rare Diseases, Translational)- Are there up and coming opportunities or open calls?- How can developmental biologists be considered for impactful opportunities? Facilitator Crystal Rogers	Chardonnay AB, C, Sauvignon, Cabernet																																																																				
3:00 – 3:30 pm	Coffee Break	Chardonnay AB																																																																				
<table><tr><th colspan="4">Day 2- Afternoon</th></tr><tr><th colspan="4">Breakout Session IV: Current funding opportunities in #DevBio</th></tr><tr><th>Group 1</th><th>Group 2</th><th>Group 3</th><th>Group 4</th></tr><tr><td>1. Flora Rutaganira</td><td>1. Richard Behringer</td><td>1. Aman Husbands</td><td>1. Katelyn Hansen-McKown</td></tr><tr><td>2. Robert Reed</td><td>2. Jaimie Van Norman</td><td>2. Ajna Rivera</td><td>2. Joyce Onyenedum</td></tr><tr><td>3. Neelima Sinha</td><td>3. Titus Brown</td><td>3. Leslie Babonis</td><td>3. Bill Browne</td></tr><tr><td>4. Loic Royer</td><td>4. Loydie Jerome-Majewska</td><td>4. Anna K. Allen</td><td>4. Christian Mosimann</td></tr><tr><td>5. Stewart Gillmor</td><td>5. Chris Amemiya</td><td>5. Billie Swalla</td><td>5. Chiswili Yves Chabu</td></tr><tr><td>6. Madelaine Bartlett</td><td>6. Rachel Shahan</td><td>6. J.D Swanson</td><td>6. Chris Lowe</td></tr><tr><td>7. Ricardo Zayas</td><td>7. Margaret Frank</td><td>7. Michael Barresi</td><td>7. Iswar Hariharan</td></tr><tr><td>8. Dan Rokhsar</td><td>8. Dominique Bergmann</td><td>8. Ben Blackman</td><td>8. Ida Chow</td></tr><tr><td>9. Blair Benham-Pyle</td><td>9. Dan Wagner</td><td>9. Jasmin Camacho</td><td>9. Sophia Zebell</td></tr><tr><td>10. Stefano Di Talia</td><td>10. Megan Martik</td><td>10. Megan Dennis</td><td>10. Jonah Cool</td></tr><tr><td>11. Ondine Cleaver</td><td>11. Eric Haag</td><td>11. Kristen Koenig</td><td>11. Cecilia Moens</td></tr><tr><td>12. Dede Lyons</td><td>12. Michael Layden</td><td>12. Swathi Arur</td><td>12. Jazz Dickinson</td></tr><tr><td>13. Facilitator: Athula Wikramanayake</td><td>13. Facilitator: Carole Labonne</td><td>13. Facilitator: Siobhan Brady</td><td>13. Facilitator: Crystal Rogers</td></tr><tr><td>Chardonnay AB</td><td>Chardonnay C</td><td>Sauvignon</td><td>Cabernet</td></tr></table>			Day 2- Afternoon				Breakout Session IV: Current funding opportunities in #DevBio				Group 1	Group 2	Group 3	Group 4	1. Flora Rutaganira	1. Richard Behringer	1. Aman Husbands	1. Katelyn Hansen-McKown	2. Robert Reed	2. Jaimie Van Norman	2. Ajna Rivera	2. Joyce Onyenedum	3. Neelima Sinha	3. Titus Brown	3. Leslie Babonis	3. Bill Browne	4. Loic Royer	4. Loydie Jerome-Majewska	4. Anna K. Allen	4. Christian Mosimann	5. Stewart Gillmor	5. Chris Amemiya	5. Billie Swalla	5. Chiswili Yves Chabu	6. Madelaine Bartlett	6. Rachel Shahan	6. J.D Swanson	6. Chris Lowe	7. Ricardo Zayas	7. Margaret Frank	7. Michael Barresi	7. Iswar Hariharan	8. Dan Rokhsar	8. Dominique Bergmann	8. Ben Blackman	8. Ida Chow	9. Blair Benham-Pyle	9. Dan Wagner	9. Jasmin Camacho	9. Sophia Zebell	10. Stefano Di Talia	10. Megan Martik	10. Megan Dennis	10. Jonah Cool	11. Ondine Cleaver	11. Eric Haag	11. Kristen Koenig	11. Cecilia Moens	12. Dede Lyons	12. Michael Layden	12. Swathi Arur	12. Jazz Dickinson	13. Facilitator: Athula Wikramanayake	13. Facilitator: Carole Labonne	13. Facilitator: Siobhan Brady	13. Facilitator: Crystal Rogers	Chardonnay AB	Chardonnay C	Sauvignon	Cabernet
Day 2- Afternoon																																																																						
Breakout Session IV: Current funding opportunities in #DevBio																																																																						
Group 1	Group 2	Group 3	Group 4																																																																			
1. Flora Rutaganira	1. Richard Behringer	1. Aman Husbands	1. Katelyn Hansen-McKown																																																																			
2. Robert Reed	2. Jaimie Van Norman	2. Ajna Rivera	2. Joyce Onyenedum																																																																			
3. Neelima Sinha	3. Titus Brown	3. Leslie Babonis	3. Bill Browne																																																																			
4. Loic Royer	4. Loydie Jerome-Majewska	4. Anna K. Allen	4. Christian Mosimann																																																																			
5. Stewart Gillmor	5. Chris Amemiya	5. Billie Swalla	5. Chiswili Yves Chabu																																																																			
6. Madelaine Bartlett	6. Rachel Shahan	6. J.D Swanson	6. Chris Lowe																																																																			
7. Ricardo Zayas	7. Margaret Frank	7. Michael Barresi	7. Iswar Hariharan																																																																			
8. Dan Rokhsar	8. Dominique Bergmann	8. Ben Blackman	8. Ida Chow																																																																			
9. Blair Benham-Pyle	9. Dan Wagner	9. Jasmin Camacho	9. Sophia Zebell																																																																			
10. Stefano Di Talia	10. Megan Martik	10. Megan Dennis	10. Jonah Cool																																																																			
11. Ondine Cleaver	11. Eric Haag	11. Kristen Koenig	11. Cecilia Moens																																																																			
12. Dede Lyons	12. Michael Layden	12. Swathi Arur	12. Jazz Dickinson																																																																			
13. Facilitator: Athula Wikramanayake	13. Facilitator: Carole Labonne	13. Facilitator: Siobhan Brady	13. Facilitator: Crystal Rogers																																																																			
Chardonnay AB	Chardonnay C	Sauvignon	Cabernet																																																																			
3:30 – 4:30 pm	Report Out/Group Discussion	Chardonnay AB																																																																				
4:30 – 6:30 pm	White Paper Think Tank Work together with your tables to synthesize common concepts emerging from small and large group discussions. Create an outline of a white paper with the goal of creating a roadmap towards long-term impactful and sustainable #DevBio research and education.	Chardonnay AB																																																																				
6:30 – 7:00 pm	Break																																																																					

7:00 – 10:00 pm **Dinner**
 Reception refreshments sponsored by:

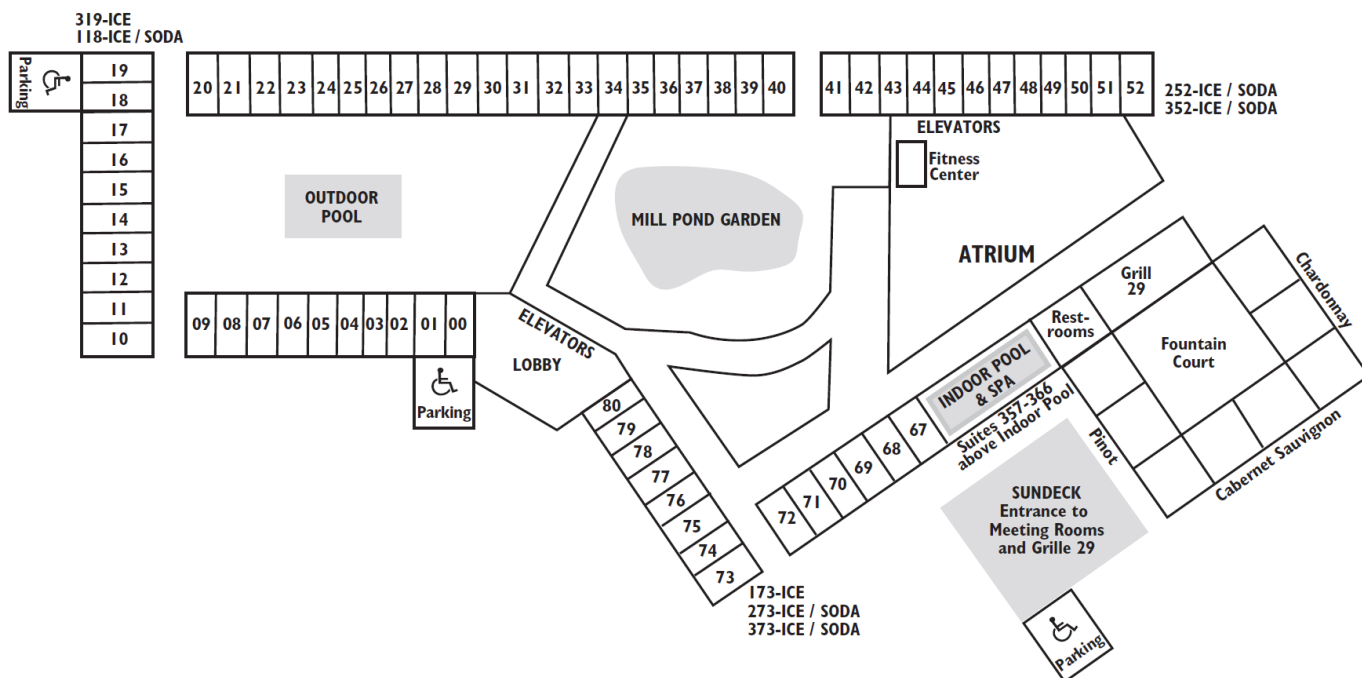
Wine Barrel Terrace



Wednesday, March 22

7:00 – 8:00 am	Breakfast	Breakfast Room
7:30 – 8:30 am	Organizing Committee Meeting	Breakfast Room
7:30 – 11:00 am	Assessment Survey (Available online)	
12:00 pm	Hotel check out and travel home	

Map of hotel



Envisioning the Future of Developmental Biology Participants

Last name	First name	Institution
Allen	Anna K.	NSF-IOH/Howard

Amemiya	Chris	UC Merced
Arur	Swathi	MD Anderson
Babonis	Leslie	Cornell University
Barresi	Michael	Smith College
Bartlett	Madelaine	UMass Amherst
Behringer	Richard	MD Anderson Cancer Center
Benham-Pyle	Blair	Baylor College of Medicine
Bergmann	Dominique	Stanford University
Blackman	Ben	UC Berkeley
Brady	Siobhan	UC Davis
Brown	Titus	UC Davis
Browne	Bill	University of Miami
Camacho	Jasmin	Stowers Institute
Chabu	Chiswili Yves	University of Missouri
Chow	Ida	SDB
Cleaver	Ondine	UT Southwestern
Cool	Jonah	Chan Zuckerberg Initiative
Dennis	Megan	UC Davis
Di Talia	Stefano	Duke University
Dickinson	Jazz	UC San Diego
Frank	Margaret	Cornell University
Gillmor	Stewart	Cinvestav Research Institute
Haag	Eric	University of Maryland
Hansen-McKown	Katelyn	Stanford University
Hariharan	Iswar	UC Berkeley

Last name	First name	Institution
-----------	------------	-------------

Husbands	Aman	University of Pennsylvania
Jerome-Majewska	Loydie	McGill University
Deidre	Lyons	Scripps
Koenig	Kristen	Harvard University
Labonne	Carole	Northwestern University
Layden	Michael	Lehigh University
Lowe	Chris	Stanford University
Lyons	Diedre	UC San Diego
Martik	Megan	UC Berkeley
Moens	Cecilia	Fred Hutch Cancer Center
Mosimann	Christian	University of Colorado Anschutz Medical Campus
Onyenedum	Joyce	Cornell University
Reed	Robert	Cornell University
Rivera	Ajna	University of the Pacific
Rogers	Crystal	UC Davis
Rokhsar	Dan	UC Berkeley
Royer	Loic	Chan Zuckerberg Biohub
Rutaganira	Flora	Stanford University
Shahan	Rachel	Duke University
Sinha	Neelima	UC Davis
Swalla	Billie	University of Washington
Swanson	J.D	NSF EPSCOR/Salve Regina
Van Norman	Jaimie	UC Riverside
Wagner	Dan	UC San Francisco
Wikramanayake	Athula	University of Miami
Zebell	Sophia	Cold Spring Harbor