

## Invited Course Faculty

**Alejandro Sanchez Alvarado**  
Stowers Institute for Medical Research

**Beth Duncan**  
University of Kentucky

**James Godwin**  
The Jackson Laboratory

**Vera Gorbunova**  
University of Rochester

**Joel Graber**  
MDI Biological Laboratory

**Itamar Harel**  
The Hebrew University of Jerusalem

**Celina Juliano**  
UC Davis

**Benjamin King**  
University of Maine

**Malcolm Maden**  
University of Florida

**James Monaghan**  
Northeastern University

**Nadia Rosenthal**  
The Jackson Laboratory

**Ashley Seifert**  
University of Kentucky

## Course Modules

Nexus between aging and  
regeneration

Planaria regeneration

Hydra regeneration

Heart regeneration

Histology and pathology

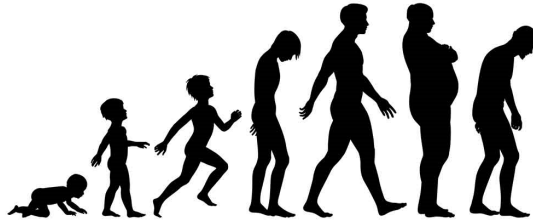
Limb Regeneration

## iCARB: Immersion in Comparative Aging and Regeneration Biology

An Applied Laboratory in Aging and Regeneration  
Research Models  
July 20-August 3, 2019

Director: Voot P. Yin, Ph.D., MDI Biological Laboratory  
Co-Director: Aric Rogers, Ph.D. MDI Biological Laboratory

This hands-on research training course brings together leading scientists and students to explore fundamental questions at the intersection of regenerative capacity and aging and its practical application. Held near Acadia National Park in Bar Harbor, ME, the course emphasizes research using diverse experimental approaches and model systems, complemented with seminars and networking opportunities by leaders of the field.



Within this dynamic environment each student will: 1) characterize and compare regenerative potential across a wide array of species; 2) investigate changes in regenerative potential during aging; 3) combine microsurgical methods with state of the art histology and molecular analysis; and 4) join a growing network of colleagues studying the cross-roads between regeneration and aging.

## More Information

Details on the use of specific model systems, technology and paradigms addressed in the course, as well as the online application, are available at

<https://mdibl.org/course/aging-regenerative-biology-2019/>

Applications will be reviewed on a rolling basis until the course is full. Students, Postdoctoral Fellows and Junior Faculty are encouraged to apply. **Maximum enrollment is 24, so apply now!**

## Inquiries

Education Office  
MDI Biological Laboratory  
[education@mdibl.org](mailto:education@mdibl.org)



# 2019 iCARB: immersion in Comparative Aging and Regenerative Biology Short Course Schedule

Note: Breakfast is self serve each day in the Dining Hall

As of 7/19/19, subject to change

## July 20, 2019 **Saturday**

- 5 PM Student arrival, check-in at Dining Hall, early arrivals can wait in the lounge with open wifi.
- 6-7 PM Dinner—Dining Hall
- 7-9PM **Introduction, Voot Yin and Aric Rogers, MDIBL tour and mixer --- MCBI**

## July 21, 2019 **Sunday**

- 8-10AM Breakfast on your own—Dining hall
- 10-11AM **Course introduction by Voot and Aric---blending the themes of regeneration and aging-- MCBI**
- 11-noon **Pit Talk, Celina Juliano and hydra regeneration---MCBI**
- Noon-1PM Lunch in Dining Hall
- 1-4PM Lab: Hydra experiments
- 4-6PM Free time
- 6-7 PM Dinner

## July 22, 2019 **Monday**

- 9-10 AM **Pit Talk, Ashley Seifert and Spiny mouse regeneration (mammals) and immune system--- MCBI**
- 10-noon Lab: Histology techniques the value to understanding regeneration
- 12-1PM Lunch in dining hall
- 2-6PM Lab: Hydra regeneration  
Tissue processing and histology
- 4-5PM **Cserr Lecture: Vera Gorbunova: “Mechanisms of Longevity in Long-Lived Mammals”-- Maren auditorium**
- 5-6PM Speaker Reception—Maren Foyer
- 6-8PM Dinner with Dr. Gorbunova—Dining Hall  
**Discussion point:** comparative aging in mammals and the intersection of regenerative capacity

## July 23, 2019 **Tuesday**

- 9-10AM **Pit Talk, Itamar Harel, African killifish and regenerative capacity decline during aging--- MCBI**
- 10-noon Lab: African killifish regeneration
- 12-1PM Lunch in dining hall
- 1-2-PM **Open discussion with faculty---MCBI**
- 2-6PM Lab: African killifish regeneration  
Continuation of hydra experiments
- 6-7PM Dinner in dining hall
- 7-9PM Lab: Imaging with light and confocal microscopy---MCBI

## July 24, 2019 **Wednesday**

- 9-10AM **Pit Talk, Alejandro Sanchez Alvarado—History of regeneration ---MCBI**
- 10-noon Lab: planaria, RNAi and markers of regeneration
- 12-1PM Lunch in dining hall
- 1-4PM Lab: Planaria experiments  
Imaging regeneration on the confocal  
Continuation of experiments
- 4-5PM **Kinter Lecture: Alejandro Sanchez Alvarado, “Past, Present and Possible Futures of Regeneration Research”---Maren auditorium**
- 5-6PM Speaker Reception—Maren Foyer

6-8PM Dinner with Dr. Alvarado—Dining hall  
**Discussion point:** immortality and scientific imagination

**July 25, 2019 Thursday**

9-10AM **Pit Talk, Beth Duncan, planaria regeneration and RNAi---MCBI**  
10-noon Lab: Check on experiments  
12-1PM Lunch in dining hall  
1-6PM Free time. Options: Bar Harbor visits; kayaking in Frenchman's Bay; hiking in Acadia National Park (bag lunches available)  
6-7PM Dinner  
7-9PM **Discussion Point:** cross species comparison among model systems during spinal cord regeneration. Merging modern techniques with traditional model systems—advances and limitations of each system, CRISPRs, making transgenics---Dining Hall

**July 26, 2019 Friday**

9-10 **Pit Talk, Joel Graber, RNA-sequencing and bioinformatic analyses--MCBI**  
10-10:30 **Pit Talk, Voot Yin, MSI-1436 and regeneration--dataset set that serves as the background for RNA-seq analysis--MCBI**  
10:30-12 Lab module: Bioinformatics and analysis of MSI-1436 dataset  
12-1 Lunch  
1-4PM Lab: Continue bioinformatics module  
Check in on experiments  
4-5PM **Pit talk, Dr. Rogers, aging research and the impact of C. elegans-MCBI**  
6-7PM Dinner in dining hall  
7-9PM **Networking panel discussion with faculty**  
**Roundtables on ethics, teaching and research around regenerative and developmental biology---MCBI**

**July 27, 2019 Saturday**

9-10AM **Pit talk, James Monaghan, axolotl limb regeneration,--MCBI**  
10-noon Lab: axolotl limb regeneration  
Noon-1 Lunch-dining hall  
1-6PM Lab: axolotl limb regeneration  
Imaging of regeneration  
6-7PM Dinner in dining hall

**July 28, 2019 Sunday**

9-11AM Student presentation (10 minutes each)  
11-12 Break  
12-1PM Lunch-Dining Hall  
1-2PM **Pit Talk, Voot Yin, Zebrafish heart regeneration and the influence of the epicardium-MCBI**  
2-6PM Lab: zebrafish heart regeneration  
axolotl experiments  
Imaging  
6-7PM Dinner-Dining Hall

**July 29, 2019 Monday**

9-10AM **Pit talk, James Godwin, Axolotl heart regeneration and immune response---MCBI**  
10-12PM Lab: Axolotl heart injury  
Image zebrafish hearts; section hearts  
12-1PM Lunch-Dining Hall  
1-4PM Lab: axolotl experiments  
4-5PM **Goss Lecture: Malcolm Maden: "Discovering the Secrets of Scar-free Healing and Tissue Regeneration"---Maren Auditorium**  
5-6PM Speaker Reception—Maren Foyer  
6-8PM Dinner with Dr. Maden-Dining Hall

**Discussion Point:** Scarring and aging

**July 30, 2019 Tuesday**

- 4:00AM Sunrise and coffee on Cadillac mountain  
11-noon **Pit Talk, Voot Yin, Zebrafish appendage regeneration and microRNA control---MCBI**  
12-1PM Lunch  
1-2PM **Pit Talk, Ben King, Noncoding RNAs and regulatory circuits---MCBI**  
2-6PM Lab: Decoding the roles of noncoding RNAs-bioinformatics approach; lncRNAs zebrafish appendage regeneration  
Axolotl regeneration  
Continuation of other experiments  
6-7PM Dinner

**July 31, 2019 Wednesday**

- 9-noon **Status update on regeneration experiments**  
**Think tank-identifying the important questions---MCBI**  
12-1PM Lunch  
1-6PM Lab: Check in on experiments as needed  
Histology of tissue sections  
Combing web databases for conserved genetic programs; molecular analysis, RNAseq, bioinformatics  
Status update on axolotl experiments, planaria RNA  
6-7PM Dinner  
7-9PM Regeneration review - updates on hydra, axolotls, planaria and zebrafish---MCBI

**August 1, 2019 Thursday**

- 9-noon Free Time: Explore on your own  
12-1PM Lunch  
3-6PM Lab: EKG analysis of heart function  
Zebrafish Imaging  
Axolotl heart analysis  
4-5PM **Public Lecture: Nadia Rosenthal, "Regenerative Medicine and the End of Aging" ---Maren Auditorium**  
5-6PM Speaker Reception—Maren Foyer  
6-8PM Dinner with Dr. Rosenthal—Dining Hall  
**Discussion point:** Immune system and impact on decline in cardiac regeneration during aging

**August 2, 2019 Friday**

- 9-noon Lab: tissue collection and wrap-up of experiments  
12-6PM FREE TIME: Explore on your own  
6-10PM Lobster bake dinner celebration, Emery Cove Beach, weather permitting  
Faculty tales of past trainees and famous failures

**August 3, 2019 Saturday**

- 9-noon Departure, housing units **must be vacated by 9am**. Luggage can be stored in the dining hall while you wait for ground transport to the airport.