

The Biophysical Society

2017 Summer Research Program in Biophysics

University of North Carolina at Chapel Hill
Tuesday, May 9 – Friday, July 28

PROGRAM DESCRIPTION

The Biophysical Society Summer Program is designed to train undergraduate participants at the introductory graduate level. The Program combines didactic, scientific research, team-building, networking, and professional development components. These are integrated to introduce students to basic concepts and methods in selected areas of biophysics, build professional confidence and competence, expose participants to the excitement of biophysical research, illustrate the importance of physics, chemistry, and other quantitative sciences in advancing medical science, prepare students for the rigors of graduate or professional training, and establish a network of underrepresented biophysicists who will serve as “biophysics ambassadors” within minority and underrepresented universities and communities and serve as an alumni support system for each other.

PROGRAM OBJECTIVES

- 1) To introduce to basic concepts and methods in selected areas of biophysics
- 2) To build professional confidence and competence
- 3) To expose you to the excitement of biophysical research
- 4) To illustrate through classroom sessions, research, and seminars how physics, chemistry and other quantitative sciences are increasingly important in advancing medical science
- 5) To prepare you for the rigors of graduate or professional training, so as to improve the chance of success in applying to and being successful in graduate training in biophysics or related professions
- 6) To establish your connection to a growing network of under-represented biophysicists who will serve as “biophysics ambassadors” within the community and serve as an alumni support system to each other

STUDENT EVALUATION AND COMPETENCIES

Student will be evaluated by their performance on presentations, laboratory research, and recitation quizzes and assignments. Associated rubrics can be found on the SAKAI site. Students can earn an H (exceeds expectations - honors), P (meets expectations - pass), or L (does not meet expectations - low pass).

READING ASSIGNMENTS: These are given for each session and are available through Sakai (sakai.unc.edu). Your reading should not be limited to these, but these must be done and discussed in your groups. Precise reading assignments in Lodish *et al.* or Alberts *et al.* (baby or big) are not generally given, so you can choose which you prefer to adequately prepare for each topic. Assignments in Kuriyan *et al.* “The Molecules of Life”

as listed below and those scientific literature are provided and will be found on the Summer Course Program Sakai site.

RECITATION ASSIGNMENTS: These will be posted in Sakai at the beginning of each section. These **MUST** be completed in your Study Groups, with one problem per group submitted to the TA's electronically before 6 PM on the day before recitation. Responsibility for typing up responses will rotate between the group members. Although all students in a group must "sign" the assignments (list their names on the submitted work to indicate that they participated in the work), one will be indicated as "Scribe" for each assignment. The TAs will evaluate these assignments and the discussion during recitation will be guided by this evaluation - be prepared to discuss your responses. The TAs may also use "pop quizzes" based on the assignments or lectures at the beginning of recitations to determine whether students are keeping up with the material. Areas of misunderstanding will be revisited in subsequent recitations.

CLASS MEETING TIMES AND LOCATIONS

Lecture: 9:00 – 10:30 AM on indicated days; GMB 3007 unless otherwise noted.

Recitation: Thursdays 11:00 – 12:00 PM on indicated days; GMB 3007 unless otherwise noted.

Seminar: Time & Location noted by each SEMINAR; Lunch will follow.

Professional Development (PD) is required unless it is noted as option. Dates, times, and locations are noted in the schedule. PD will meet in 6004 Marsico Hall, 8:30 – 10:00 unless noted otherwise.

All events are required unless it is indicated as optional.

Please check the google calendar for the most up to date schedule. Changes will be made to the google calendar.

LAB TIMES

Every research experience will be unique and have its own necessary schedule. **IMPORTANTLY:** Science is not a 9 to 5 job; considerable effort and long hours are required to make progress on a research project. Recognizing and acknowledging this early in the program will be essential for you to become successful research scientist!

Summer Research Program Schedule

Week 1: May 8 -May 12

May 9: Tuesday

- 2:00 p.m. Arrive at UNC
- 4:30 p.m. Mike Jarstfer, Dorothy Erie, Lisa Phillippie, the TAs (Kevin Knight, Candice Crilly, and Mike Pablo) and BPS staff will meet you in 3007 Genetic Medicine Building. Registration. Course materials and texts distributed.
- 6:30 p.m. Dinner with TAs, Jarstfer, Erie, Phillippie, BPS Staff and course evaluator.

May 10: Wednesday

- 12:30 p.m. TAs meet students at Dorm to escort to GMB. **(Please be on time. If you are going to be late, please call the TA's mobiles)**
- 1:00 p.m. Initial Orientation and Lunch with Jarstfer & Phillippie: Computers will be distributed. **(1007 Genetic Medicine) STUDENTS MUST REGISTER PERSONAL LAPTOPS WITH UNC. Software to be distributed.**
- 3:30 p.m. Meet potential mentor faculty in their offices
ARRANGED BY STUDENTS BEFORE ARRIVING.

May 11: Thursday

- 9:00 a.m. Meet potential mentor faculty in their offices
ARRANGED BY STUDENTS BEFORE ARRIVING.
- 3:00 p.m. Discuss lab pairings with Jarstfer, Erie & Phillippie **(3007 Genetic Medicine)**

May 12: Friday

- 12:00 p.m. Return **CONTACT INFORMATION** for direct supervisors to Lisa in 3024 Genetic Medicine.
- By day's end **Report to lab to establish plans for first day of lab with mentors and/or direct supervisors.**

NOTE: Full time work in your research lab begins on Monday, May 15. Plan accordingly.

Week 2: May 15 - May 19**SECTION I: LIFE AND ENERGY: 3 lectures****May 15: Monday**

Read & discuss prior to class: All: Reading in Kuriyan et al. Chs 7,8 and 9. *DISCUSSION IS KEY:* you are not expected to understand all this on your own, but if you read/discuss with others, you will learn a lot!

Lec 1. What is life? An attempt at a definition. Energy, heat, and Work: Temperature and thermal equilibrium. The First Law. Why do organisms need energy? **(B Lentz) (9:00 a.m., 3007 Genetic Medicine)**

Agree on Study Group composition.

Work in lab after class session

The first day should focus on discussing the background and significance of your project with your mentor and or direct supervisor and developing an outline of the project. This is essential for effective participation in the project and is critical for effective communication of your work. This first day in lab will also allow to acclimate yourselves to the schedule of the lab you are in and discuss expectations. You will likely be expected to read several articles related to your project.

May 16: Tuesday**Move into Ram Village (9:00 a.m.)****Work in lab all day**

Anticipate that much of the time will be spent discussing specific techniques that will be routinely used with you mentor/direct supervisor.

May 17: Wednesday

Lec 2. Mother Nature plays dice: the Boltzmann distribution, partition functions and entropy. **(B Lentz) (9:00 a.m., 3007 Genetic Medicine)**

Work in lab after class**May 18: Thursday****Recitation 1 (9:30 a.m., 2007 Genetic Medicine)****Work in lab after recitation****May 19: Friday****Work in lab**

Week 3: May 22 - May 26***SECTION II: THE CELL: Biophysics meets Cell Biology: 6 lectures*****May 22: Monday****Lec 3. (K. Slep, 3007 Genetic Medicine)****Work in lab after lecture****May 23: Tuesday****Lec 4. (James Sellers, NIH) 9:00 a.m., 2007 Genetic Medicine)****Grad School Welcome Social (5:00 p.m., Graduate Student Center, Cameron Avenue)****Afternoon Work in lab****May 24: Wednesday****Lab demonstration – actin polymerization, 10 AM with Dr. James Sellers.****SEMINAR 1: Dr. James Sellers, NIH, (11:30 a.m., 3002 Marsico)****Work in lab after lunch****May 25: Thursday****Work in lab 9-12****Lunch with Dr. Jarstfer:** 1] comments on the first full week of the program; 2] present brief outline of research project – figures would be helpful to tell your story 3] Organizing schedule for hosting seminar guests **(12:00 – 1:30 p.m. 2007 Genetic Medicine)****Work in lab after Lunch****May 26: Friday****Lec. 5 Coding and decoding of cellular communication (J. Purvis). (9:00 a.m., 3007 Genetic Medicine)****Work in lab**

Week 4: May 29 – June 2***SECTION III. NUCLEIC ACIDS AND GENETIC INFORMATION: 4 lectures*****May 29: Monday****Memorial Day Holiday (*No classes*)****May 30: Tuesday****PD: Responsible Conduct of Research – Tope Keku (8:30 – 10:00 a.m., 6004 Marsico Hall)****Work in lab****May 31: Wednesday****Lec 6. (A. Maddox). (9:00 a.m., 3007 Genetic Medicine)*****Workshop 1:* Jarstfer- How to Prepare & Deliver good presentation: Posters and Seminars. **(10:30 AM, 3007 Genetic Medicine)**. **Breakfast will be provided.******Work in lab****June 1: Thursday****Recitation 2 (11:00 a.m., 3007 Genetic Medicine) lec 3-6****Work in lab****SPECIAL EVENT: Group trip to Bull City Escape and Bullock's BBQ (4:45 p.m. – 10:00 p.m.)
Van will depart from Ram's Village at 4:45.*****SECTION III. NUCLEIC ACIDS AND GENETIC INFORMATION: 3 lectures*****June 2: Friday****Read & *discuss* prior to next classes:****Lec 7. DNA Replication and The End of the Chromosome: Aging, Cancer, and Evolution and maybe Therapeutic Relevance (M. Jarstfer) (9:00 a.m., 3007 Genetic Medicine)**

Week 5: June 5 – June 9***SECTION III. NUCLEIC ACIDS AND GENETIC INFORMATION: 3 lectures*****June 5: Monday**

Lec 8. How DNA Is Packed In The Cell: Chromosomes, Genes, Nucleosomes (**B. Strahl**) (9:00 a.m., 3007 Genetic Medicine)

PD: Applying to Graduate School – (12:00 p.m., Graduate Student Center, Cameron Avenue)

June 6: Tuesday

Work in lab

June 7: Wednesday

Lec 9 Investigating Nucleic Acid Dynamics (**Q. Zhang**) (9:00 a.m., 3007 Genetic Medicine)

Work in lab after lecture.

June 8: Thursday

Recitation 3 (11:00 a.m., 3007 Genetic Medicine) on lec 7-9

Work in lab

SECTION IV: PROTEIN STRUCTURE & FUNCTION: 5 Lectures**June 9: Friday**

Lec 9. The structural organization within proteins: primary, secondary, tertiary, and quaternary levels of organization; varieties of proteins: globular and fibrous. PyMOL exercise (**Thomas Lane/K. Slep lab**) (9:00 a.m., 3007 Genetic Medicine)

Work in lab afternoon to evening

June 10: Saturday

SPECIAL EVENT: Social Event to be decided as a group

Week 6: June 12 – June 16***SECTION IV: PROTEIN STRUCTURE & FUNCTION: 5 Lectures*****June 12: Monday**

Lec 10. Build your own Non-Random Polymers: Protein folding and protein design. (B. Kuhlman) (9:00 a.m., 3007 Genetic Medicine)

LAB 1: Atomic Force and Magnetic Spectroscopy in Examining Cell Interior (Superfine Lab) (1:00-3:00, Chapman B46 – Contacts: Evan Nelson and Mike Falvo)

Work in lab

June 13: Tuesday

Work in lab 9-11:50

PD: Finding Funding – (12:00 p.m., Graduate Student Center, Cameron Avenue)

Work in lab

June 14: Wednesday

Work in lab

SEMINAR 2: Dr Kenneth Pearce, Pharmaceutical Science and Center For Integrated Chemical Biology and Drug Discovery UNC-CH, (11:30 a.m., 3002 Marsico)

Lunch with Professor Pearce (Noon, 3095 Genetic Medicine)

Work in lab

June 15: Thursday

Work in lab

June 16: Friday

Work in lab

Week 7: June 19 – June 23**SECTION IV: PROTEIN STRUCTURE & FUNCTION: 5 Lectures****June 19: Monday**

PD: The GRE Conversation – (12:00 p.m., Graduate Student Center, Cameron Avenue)

June 20: Tuesday

PD: Applying to Graduate School for Biomedical Sciences – (9:00 a.m., 6004 Marsico)

June 21: Wednesday

Lec 11. Speeding things up: how enzymes Work. (C Carter) (9:00 a.m., 3095 Genetic Medicine)

Seminar 3: Dr Sarah Woodson, Department of Chemistry and Biochemistry, Johns Hopkins University. (11:30 a.m., 3002 Marsico)

OPTIONAL PD: MD/Ph.D. Lunch – (12:00 p.m., 2004 Marsico)

Work in lab after lunch

June 22: Thursday

Work in lab

LAB 1: Isothermal Titration Calorimetry to Explore Biomolecular Interactions: Ashutosh Tripathy in MacInFac (1:00-3:00 p.m., 1124 Genome Sciences Bldg – Contact: Ashutosh Tripathy)

June 23: Friday

Lec 12. How Biological Motors Work: The Enzymology of Mechano-Chemical Energy Transduction (C Carter). (9:00 a.m., 3007 Genetic Medicine)

Work in lab

SPECIAL EVENT: Depart for Emerald Isle (4:00 p.m.)

June 24: Saturday

SPECIAL EVENT: Suffer through surf and rays on Emerald Isle.

6:00 p.m. Depart Islander for dinner at local restaurant. We will meet in front of the lobby.

June 25: Sunday

SPECIAL EVENT: Continue to suffer through surf and rays on Emerald Isle.

Week 8: June 26 – June 30**June 26: Monday**

Lec 13. URzymes and the Origin of Life (C Carter). (9:00 a.m., 3007 Genetic Medicine)

Work in lab after class session

June 27: Tuesday

Recitation 4 (9:30 a.m., 3007 Genetic Medicine) Posters and lec 9-13

PD: How to write a personal statement – (12:00 p.m., Graduate Student Center, Cameron Avenue)

Work in lab

June 28: Wednesday

SEMINAR 4: Dr John Sondek, Pharmacology Dept. UNC-CH, “Hetero-trimeric G-Proteins and the Role of Lipids in Signaling” (11:30 a.m., 3002 Marsico)

Lunch with Professor Sondek (Noon, 3095 Genetic Medicine)

Work in lab after lunch

June 29: Thursday

Recitation 5 (11:00 a.m., 3007 Genetic Medicine) posters

Work in lab

June 30: Friday

Work in lab

**Biophysical Society Summer Program:
Case Studies in the Physics of Life
June 30 – July 2**

6:00 – 8:00 PM Reunion BBQ (UNC FARM)

Students: please carpool

Alumni & Staff: Meet in Carolina Inn lobby at 6:30 to coordinate rides

Saturday July 1 and

SPECIAL EVENT: Biophysics Summer Course Reunion and Presentations (8:30AM-4:00PM, Carolina Inn)

- Breakfast at 8:30, session begins at 9:00
- Lunch at 12:05
- Dinner, 6 PM at Carolina Brewery

Student Poster Presentations: ****Each student is expected to present a poster based on their original work outlining background, rationale, methods, and any data.** It is anticipated that introductory figures will be used in the final symposium talk when all data and conclusions will be presented.

Saturday's session will feature invited guest speakers, a panel discussion, and break out discussions.

Laura Bonifacio (Consultant)

Bill Clemons (Professor, Cal Tech)

Tom Kunkel (Distinguished Investigator, NIEHS)

TBN

Sunday July 2

Alumni Presentations

Week 9: July 3 – July 7**SECTION V: CELL MEMBRANE STRUCTURE AND FUNCTION: 5 Lectures****SECTION VI: MOTILITY: 3 lectures****July 3: Monday**

SEMINAR 5: Dr Silvia Cavagnero, Chemistry Department, Univ. of Wisconsin. “Protein Folding Mechanisms *In Vivo*” (11:30 a.m., 3002 Marsico)

Lunch with professor Cavagnero (Noon, 3095 Genetic Medicine)

July 4: Tuesday

Forth of July Holiday

July 5: Wednesday

Lec 14. The Lipid Bilayer: A Dynamic Self-Assembled Structure of Multiple Lipid Classes. (S Neher) (9:00 a.m., 3007 Genetic Medicine)

Work in lab in after class session

July 6: Thursday

Work in lab

July 7: Friday

Lec 15 Membrane Proteins. (S. Neher) (9:00 a.m., 3007 Genetic Medicine)

OPTIONAL PD: PREP Program Information Session (12:00 – 1:00 p.m., 2004 Marsico)

Work in lab

Week 10: July 10 - July 14**July 10: Monday**

Lec 16. Principles of Membrane Transport. (G Meissner) (9:00 a.m., 3007 Genetic Medicine)

Work in lab

July 11: Tuesday

PD: BBSP and Beyond (9:00 – 10:30 a.m., 6004 Marsico Hall)

Work in lab

July 12: Wednesday**July 13: Thursday**

Recitation 6 (11:00 a.m., 3007 Genetic Medicine) 14-16

Work in lab

July 14: Friday

OPTIONAL PD: School of Pharmacy Information Session (12:00 p.m., 6004 Marsico Hall)

Work in lab

Week 10: July 17 - July 21**July 17: Monday**

Seminar 6. Ernesto Fuentes, Iowa State University (11:30 a.m., 3002 Marsico).

Lunch with Professor Fuentes Noon, 3007 Genetic Medicine)

Work in lab

July 18: Tuesday

Recitation to critique personal statements (9:30 a.m., 3007 Genetic Medicine)

Work in lab

July 19: Wednesday

Recitation 7. Prepare for student symposium (TAs) (10:00 a.m., 3007 Genetic Medicine)
Personal Statements due to TA's.

Work in lab

July 20: Thursday

Recitation 8. Personal Statements returned to students for edits and group discussion. (3:30 p.m., 3007 Genetic Medicine)

Work in lab

July 21: Friday

Mock Interviews followed by Lunch (11:00 a.m.) You will be given a location for your interview.

Work in lab

Week 11: July 24 - July 28**July 24: Monday**

TAs: Symposium practice and lunch (8:30 a.m. – 12:00 p.m., 3007 Genetic Medicine)

TAs: Symposium practice and lunch (4:30 p.m. – 6:00 p.m., 3095 Genetic Medicine)

10:30 – 6:00 p.m. Exit Interviews with Course Evaluator (3009 Genetics Medicine)

July 25: Tuesday

Practice presentation

July 26: Wednesday

2017 Summer Undergraduate Symposium: Symposium including all undergraduate research program at UNC.

July 27: Thursday

2016 Biophysics Closing Symposium (9:30 am to 3:00 pm, Rizzo Center)

General Course Debriefing: all students, TAs, Jarstfer, Erie, and Lisa from UNC, and Ellen, Daniel, BPS staff Jarstfer, Erie, and TAs assign grades (3:00 pm-4:00 pm)

4:00-5:00: Jarstfer, Erie, and other reps conference (Rizzo Center)

5:30 pm: Farewell party, Rizzo Center

July 28: Friday

10:30-12:30: Meet with Mike Jarstfer and Dorothy Erie for exit interviews and grades (3009 Genetic Medicine or offices)

Reflect on your wonderful experience!

July 29: Saturday

Checkout

