INTERDISCIPLINARY
BIOLOGICAL
SCIENCES
PROGRAM

Updated September 16, 2025

Graduate Program Guide

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Land Acknowledgment:

Northwestern is a community of learners situated within a network of historical and contemporary relationships with Native American tribes, communities, parents, students, and alumni. It is also in close proximity to an urban Native American community in Chicago and near several tribes in the Midwest. The Northwestern campus sits on the traditional homelands of the people of the Council of Three Fires, the Ojibwe, Potawatomi, and Odawa as well as the Menominee, Miami and Ho-Chunk nations. It was also a site of trade, travel, gathering and healing for more than a dozen other Native tribes and is still home to over 100,000 tribal members in the state of Illinois.

It is within Northwestern's responsibility as an academic institution to disseminate knowledge about Native peoples and the institution's history with them. Northwestern works towards building relationships with Native American communities through academic pursuits, partnerships, historical recognitions, community service and enrollment efforts.

The Interdisciplinary Biological Sciences (IBiS) Graduate Program

The IBiS program, begun in 1993, was a natural extension of increasing collaboration by research faculty in cellular, molecular, and structural biology and a number of related disciplines. The primary mission of the IBiS program is to encourage the development of our Ph.D. students as independent, creative research scientists and teachers.

The IBiS graduate program brings together basic and applied sciences faculty from Northwestern University's Judd A. and Marjorie Weinberg College of Arts and Sciences and the Robert R. McCormick School of Engineering and Applied Sciences. Participants in the IBiS program include faculty in Molecular Biosciences, Biomedical Engineering, Chemical and Biological Engineering, Chemistry, Neurobiology, Anthropology, Civil and Environmental Engineering, and Mechanical Engineering. With approximately 55 preceptors in eight academic departments on the Evanston campus, the IBiS program readily allows students to cross departmental and disciplinary boundaries in choosing courses and faculty research advisors.

An important hallmark of the IBiS program is that our preceptors are deeply committed to helping students prepare for the career options that await them after the completion of the Ph.D. degree, such as further academic training, employment with a biotechnology or pharmaceutical company, teaching at the college level, scientific journalism, science policy and administration, or many other endeavors. As part of that preparation, IBiS organizes BioOpportunities, BioSurvival Skills, and Pathway to the Professoriate, all aimed at preparing our graduates for successful careers.

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IBiS REQUIREMENTS FOR THE Ph.D.

Summary by Year

The program requirements by quarter can be found on the IBiS website.

1st year: First three quarters – six courses with grades (2/quarter), three rotations, seminars, Rigor & Reproducibility course, Bioethics course
End of winter quarter – selection of thesis advisor
End of spring quarter – formal admission to the program

2nd year: Part 1 of qualifying exam, usually TA at least one quarter, research, seminars

3rd year: Part 2 of qualifying exam & admission to candidacy, usually TA at least one quarter and take at least one special topics course, research

4th year+: Annual reviews, research, take an additional special topics course if needed, permission to write, final exam

IBiS Program Requirements

1. Academic:
   - 6 IBiS or comparable elective courses by the end of spring quarter of year 1. Three of these courses must be Fundamentals in Biological Sciences, IBIS 411 & 412, and Statistics for Life Sciences, IBIS 432, and at least 1 other must be an IBiS (or DGP) core course; B grade or better.
   - 2 years of seminar series, IBIS 462, in years 1 and 2 (Molecular Biosciences or Neurobiology seminar series)
   - 2 quarters of training courses, IBIS 421 Rigor and Reproducibility in Research and IBIS 423 Ethics in Biological Research, in year 1
   - 2 quarters of special topics courses, IBIS 455; B grade or better.
2. Satisfactory performance (grade of B or better) in three laboratory rotations (IBIS 499)
3. Thesis advisor agreement with an IBiS preceptor by the end of the third quarter
4. Successful completion of part 1 of the qualifying examination before the end of fall quarter of the second year and part 2 before the end of fall quarter of the third year
5. Satisfactory performance in teaching assignments (varies with total graduate student enrollment and course needs; minimum two)
6. Annual reviews
7. Acceptance of at least one first-author data paper by the time of defense
8. Approval of dissertation
9. Successful completion of final examination
10. Seminar presentation of research

Miscellaneous IBiS Requirements

- Research group seminars
- IBiS retreat (attendance required in years 1 through 4)
- IBiS recruitment

SECTION 1 – ALL STUDENTS: IBiS REQUIREMENTS FOR THE Ph.D.

The Graduate School Requirements

1. Successful completion of at least 9 graded courses. A “B” average must be maintained in these courses
2. Approval of qualifying exam and prospectus
3. Dissertation according to TGS standards
4. Successful completion of final examination
5. Time to degree limited to nine years from initial registration
6. Fulfillment of TGS English proficiency requirement. See The Graduate School website for details regarding English Proficiency Testing for international students.
7. Registration every quarter including summer in order to receive a stipend

Please refer to The Graduate School website for further details about Ph.D. requirements.

If you have any questions, please ask the IBiS office.

MSTP/IBiS REQUIREMENTS FOR THE Ph.D.

The requirements for students joining IBiS from the Medical Scientist Training Program are similar to those of the non-MSTP/IBiS Ph.D. students. MSTP students should refer to Section 1 of the Program Guide for IBiS program requirements. The items on the list below address specific requirement differences of an MSTP/IBiS (M.D./Ph.D.) student. The program requirements by quarter can be found on the IBiS website.

IBiS Program Requirements

1. Academic:
   - 3 IBiS courses by the end of spring quarter of year 1: Fundamentals in Biological Sciences, IBIS 411 & 412, and Statistics for Life Sciences, IBIS 432
   - Ethics in Biological Research (IBIS 423) in year 1
2. Laboratory rotations not required
3. Thesis advisor determined prior to joining IBiS
4. Plan to take part 1 of the qualifying exam in fall of year 2
5. Plan to take part 2 of the qualifying exam in fall of year 3
6. Satisfactory performance in teaching assignments (varies with total graduate student enrollment and course needs; minimum one)

QSB/IBiS REQUIREMENTS FOR THE Ph.D.

The requirements for transfer students from the QSB master's program to the IBiS Ph.D. program are very similar to those of other IBiS students. QSB transfer students should refer to Section 1 of the Program Guide for IBiS program requirements. The items on the list below address specific requirement differences of QSB/IBiS students. The program requirements by quarter can be found on the IBiS website.

IBiS Program Requirements

Academic:

- Courses taken while a master's student in the Quantitative & Systems Biology (QSB) program may be counted towards the required coursework. However, a minimum of 3 core and/or elective courses must be taken during the first year.

If you have any questions, please ask the IBiS office.

IBiS COURSES AND TRAINING

Graduate Advisory Committee

Upon your arrival at Northwestern, you will be assigned a faculty advisor. Your advisor will help you to decide what classes you will take during your first year and will support you in the important task of choosing your rotation and thesis supervisors. Your advisor must approve all electives that you choose to take. The IBiS office will schedule three formal meetings between you and your advisor during your first year. You should also feel free to consult your advisor as the need arises during the course of the year. It is of particular importance that you contact your advisor if you are experiencing problems with any of your courses or with a rotation.

If a student wishes to switch their first-year faculty advisor, they should contact the Assistant Director of Graduate Studies to make this request.

The graduate advisory committee is also responsible for assigning your qualifying exam and thesis committees, and for ensuring that you have annual meetings with your thesis committee.

Courses

Please refer to the IBiS website for current course offerings.

All first-year students must take at least 4 IBiS (or DGP) core courses; the other 2 classes can be core or elective courses. The courses described below are graduate-level courses that provide a broad foundation in life science research. Students are required to earn a grade of B or better in each of the courses, and to complete the selected courses by the end of the first academic year. Any variation from these requirements, or others described below, requires the approval of the graduate advisory committee. Refer to the IBiS website for registration requirements.

Courses are subject to change each quarter, and up-to-date information can be found in CAESAR prior to each quarter. Additional classes either on the Evanston campus or Chicago campus may be appropriate as electives and must be approved by your advisor.

Students who enter the IBiS program with a master's degree may petition to opt out of up to two courses, assuming they took a similar graduate-level course. For consideration, courses must have been taken within the last three years prior to enrollment at Northwestern, and a grade of B or better must have been earned. The IBiS office will evaluate the student's graduate transcript and syllabi from the relevant courses, to determine equivalency to IBiS classes and make a determination.

SECTION 3 – ALL STUDENTS: COURSES & TRAINING

IBiS CORE COURSES
(*required courses)

IBIS 401 Molecular Biophysics
Protein structure; nucleic acids structure; forces that determine macromolecular structure; transport and diffusion; macromolecular assemblies; molecular machines and single molecule studies; x-ray crystallography; electron microscopy and image reconstruction; nuclear magnetic resonance; spectroscopy

IBIS 402 Molecular Biology of Human Disease
Topics include the genetic and molecular basis of human diseases focusing on age-associated degenerative diseases including cystic fibrosis, cancers, metabolic diseases and neurodegenerative diseases. We will examine mechanisms of protein quality control and the functional properties of the proteostasis network essential for the functional health of proteins and the events associated with protein aggregation and the formation of amyloids. The course is hypothesis based from the primary literature with oral presentations and short writing assignments.

IBIS 404 Principles and Methods in Systems Biology
Systems biologists use mathematical-based experimental analysis and modeling to study biological problems. Quantitative techniques and computational tools help investigators analyze heterogeneous complex data about molecular networks to uncover meaningful relationships about key components. These studies inspire a framework for understanding the activity of living states. Related principles about dynamic biological systems are the focus of the systems biology course.

IBIS 410 Quantitative Biology
Quantitative approach to molecular and cell biology, focused on developing an understanding of connections between biomolecule structure and dynamics, and behavior of cells. The course will also include review of topics from statistics of random variables and statistical data analysis relevant to biology and biophysics.

IBIS 411* Fundamentals in Biological Sciences: Biochemistry, Molecular Biology, and Genetics
Fundamental concepts in the areas of biochemistry, molecular biology, and genetics will be discussed. We will use both foundational discoveries and current advances to introduce concepts relevant to these fields. In addition, we will discuss the historical and modern approaches and logic used to address fundamental biological questions regarding these concepts. For each concept, we will end with a discussion of what outstanding questions remain and how to critically and rigorously address these questions using a variety of approaches.

IBIS 412* Fundamentals in Biological Sciences: Genomics, Cell Biology, and Developmental Biology
Fundamental concepts in the areas of genomics, cell biology, and developmental biology will be discussed. We will use both foundational discoveries and current advances to introduce concepts relevant to these fields. In addition, we will discuss the historical and modern approaches and logic used to address fundamental biological questions regarding these concepts. For each concept, we will end with a discussion of what outstanding questions remain and how to critically and rigorously address these questions using a variety of approaches.

IBIS 432* Statistics for Life Sciences
Statistics course with emphasis on the application of statistical methods and data analysis techniques to the life sciences. Topics include descriptive statistics, normal distribution, random variables, sampling distribution, confidence intervals, hypothesis tests, p-values and multiple correction, linear regression, model selection, diagnostics, logistic regression, contingency tables, resampling, clustering, dimension reduction, and genomics data analysis.

ELECTIVE COURSES
Students can tailor their curriculum to their specific interests by substituting up to two of the IBiS core courses with electives from Biological Sciences, Chemistry, Chemical & Biological Engineering, or other departments. These courses should be 300- or 400-level courses. IBiS electives that have already been approved for credit are listed in the current course offerings. If a student wishes to take a course that is not on the list of approved electives, they must seek approval prior to enrolling. All electives must be approved by the student's first year advisor and the chairperson of the graduate advisory committee.

SPECIAL TOPICS COURSES
Special topics courses are offered regularly for small groups of graduate students. The teaching faculty and topics change during each academic quarter. Each student takes a total of two special topics courses; these courses are typically taken after passing part one of their qualifying exam.

TRAINING COURSES
All students are required to take IBIS 421 Rigor & Reproducibility in Research and IBIS 423 Ethics in Biological Research in their first year. The ethics course must be refreshed every four years.

SEMINARS
Departmental Seminar
Students must register for the departmental seminar, IBIS 462, each quarter, excluding summer, during their first two years. All students are required to attend the Molecular Biosciences departmental seminar (Thursdays at 12:30pm) or the Neurobiology departmental seminar (Tuesdays during lunch hour or evenings).

Informal Seminar Programs
In addition to the formal seminar series, numerous informal seminar programs are offered within the University. These include special departmental seminars, symposia, laboratory group meetings, various journal clubs, and meetings of special interest groups, such as the Cell Biology Supergroup and the Biophysics Club. Participation in such activities is considered an important part of graduate training in IBiS.

Proficiency
The IBiS Program requires that all students demonstrate a basic proficiency in all areas of modern biology. This requirement is satisfied by successful completion of all the required graduate coursework with grades of B or better. In some circumstances, the graduate advisory committee, in consultation with the student, may require an individual student to take an additional course or be a teaching assistant for a specific course. Students are expected to read widely in the primary literature related to their area of research.

International students who did not complete their undergraduate education in an institution in which the language of instruction was English must demonstrate English proficiency before being able to serve as teaching assistants. Students need to have received a score of 26 or more on the speaking portion of the TOEFL internet-based test, a score of 65 or more on the Versant English test, or a score of at least 50 on the SPEAK test. Students with scores below these thresholds may be enrolled in Integrated Academic Skills and will need to retake the exam. The IBiS program will not subsidize the cost of any English-language exams.

Academic Integrity

Both the University and the IBiS graduate program take academic integrity very seriously. Cases of suspected academic dishonesty, including suspected plagiarism, will be referred directly to The Graduate School for follow-up, and may result in expulsion from the IBiS program. Among the most important goals of graduate education are maintaining an environment of academic integrity and instilling in students a lifelong commitment to the academic honesty that is fundamental to good scholarship. Standards of academic honesty are violated whenever a student engages in any action that jeopardizes the integrity of scholarly work. Such actions include, without limitation, cheating in the classroom or on examinations, including Ph.D. qualifying examinations; the intentional and deliberate misuse of data in order to draw conclusions that may not be warranted by the evidence; fabrication of data; omission or concealment of conflicting data for the purpose of misleading other scholars; use of another's words, ideas or creative productions without citation in either the text or in footnotes; paraphrasing or summarizing another's material in such a way as to misrepresent the author's intentions; and use of privileged material or unpublished work without permission. For more information, please refer to The Graduate School website.

Conflict Resolution

When conflicts occur between advisor and student, they should first try to resolve the issue themselves. If the conflict cannot be resolved or if the student needs help navigating the situation, there are multiple possible avenues of support within the program. The student may reach out to the chairperson of the graduate advisory committee, the program director, the associate director, the assistant director of graduate studies, their thesis committee chairperson, or another member of their committee. Additionally, if a student wishes to seek assistance from an independent party, they can contact the office of the Northwestern Ombudsperson for confidential advice. If the conflict cannot be resolved and a student wishes to explore the possibility of switching labs, the chair of the graduate advisory committee and the program director will help the student navigate that process.

If a conflict arises that falls under the purview of the collective bargaining agreement (CBA) between the University and NUGW-UE (the graduate student employee union), the matter must be handled consistent with the grievance and arbitration procedure contained in Article X of the CBA (see pp. 13-15 of the CBA for information on the informal and formal steps involved in this process).

Petitions and Appeals

The preceptors recognize that deviations from the program requirements may be warranted in certain cases. Students may submit petitions requesting a variation in the requirements whenever they believe that they can adequately justify their request. Minor variances from the requirements may be requested, in writing, of the chairperson of the graduate advisory committee. Substantial variances require a petition, in writing, to the director of the IBiS program.

Similarly, the student may appeal decisions made by the preceptors or IBiS administration. Such appeals should be justified in writing to the director of the IBiS program. The director will establish an appropriate impartial committee to make a recommendation to the IBiS preceptors, who will vote on the appeal. Alternatively, the student can appeal to The Graduate School's Associate Dean for Graduate Student and Postdoctoral Programs.

Additional resources may be found on The Graduate School website.

FIRST-YEAR STUDENTS

ORIENTATION

Typically, first-year students are expected to be available on the Evanston campus on September 1st. The first weeks at Northwestern University will include a number of orientation activities. The schedule of the activities is available from the IBiS office and changes from year to year. First-year students should plan to participate in the orientation activities listed below and are encouraged to participate in additional orientation events at Northwestern.

General Schedule

Orientation meeting held on first day
Appointment with IBiS academic advisor
IBiS scientific retreat held off campus
The Graduate School new student orientation
New international student orientation
Registration for courses

Pre-rotation Period

Rotations in the IBiS program are five weeks long; one rotation is held in the fall quarter, and two rotations are held in winter quarter. The fall rotation begins midway through the fall quarter, providing students with a multi-week pre-rotation period where they can explore labs and set up their fall rotation. In addition, students are required to participate in a number of important training activities during this period.

Required Activities

Faculty Research Presentations (FRPs)
Coding bootcamp (4 sessions)
Graduate School Success workshops (weekly)
Rigor and Reproducibility in Research (IBiS 421)

REGISTRATION

Courses usually carry one unit of credit. Full-time registration consists of either three or four units per quarter. See the current program requirements on the IBiS website for further details.

Typical Profile, Year 1

YEAR 1 – FALL QUARTER:

IBIS 499-0 Independent Study (1st laboratory rotation); **1 credit** – minimum grade: B
IBIS 462-0 Seminar in Biological Sciences (Molecular Biosciences or Neurobiology seminar series); **0 credits** – Satisfactory/Unsatisfactory
IBIS 421-0 Rigor & Reproducibility in Research; **0 credits** – Satisfactory/Unsatisfactory
IBIS 411-0 Fundamentals in Biological Sciences: Biochemistry, Molecular Biology, and Genetics**; 1 credit** – minimum grade: B

1 additional course
IBiS core course offered in fall; **1 credit** – minimum grade: B; *see current course offerings*
or **related elective** (requires graduate advisor approval); **1 credit** – minimum grade: B

YEAR 1 – WINTER QUARTER:

IBIS 499-0 Independent Study (2nd and 3rd laboratory rotations); **1 credit** – minimum grade: B
IBIS 462-0 Seminar in Biological Sciences (Molecular Biosciences or Neurobiology seminar series); **0 credits** – Satisfactory/Unsatisfactory
IBIS 412-0 Fundamentals in Biological Sciences: Genomics, Cell Biology, and Developmental Biology**; 1 credit** – minimum grade: B

1 additional course
IBiS core course offered in winter; **1 credit** – minimum grade: B;
or **related elective** (requires graduate advisor approval); **1 credit** – minimum grade: B

YEAR 1 – SPRING QUARTER:

IBIS 499-0 Independent Study (work in thesis lab); **1 credit** – minimum grade: B
IBIS 462-0 Seminar in Biological Sciences (Molecular Biosciences or Neurobiology seminar series); **0 credits** – Satisfactory/Unsatisfactory
IBIS 432-0 Statistics for Life Sciences; **1 credit** – minimum grade: B
IBIS 423-0 Ethics in Biological Research; **0 credits** – Satisfactory/Unsatisfactory

1 additional course
IBiS core course offered in spring; **1 credit** – minimum grade: B;
or **related elective** (requires graduate advisor approval); **1 credit** – minimum grade: B

YEAR 1 – SUMMER QUARTER:

YOU MUST REGISTER FOR TGS 500 EVERY SUMMER IN ORDER TO RECEIVE YOUR STIPEND

TGS 500-0 Advanced Doctoral Study; **0 credits** – no grade; **confers full-time status**

Online Registration

All students must register by the deadline communicated by TGS and the IBiS office or they may not be paid correctly.

1. **Go to https://www.caesar.northwestern.edu/.** If you have any login/access problems, please contact registration tech help at (847) 491-HELP (they can walk you through registering online), and if you have course questions, contact the IBiS office at (847) 491-4301 or ibis@northwestern.edu.
2. **Clear any holds.** Holds are indicated once you log in to CAESAR. You are responsible for clearing any holds before attempting to register. You will not be able to register with a hold on your student account. To clear a financial hold, please consult with the IBiS office.
3. **Obtain permission from the department offering the course for any restricted courses.** Permission can be obtained from the appropriate department. Obtaining permission before attempting to register will facilitate the process.

RESEARCH ROTATIONS

Each student conducts independent research in three different laboratories prior to selection of a thesis advisor. Rotations are five weeks long; one rotation is held in the fall quarter, and two back-to-back rotations are held in the winter quarter. This research complements the formal coursework taken during the first year and exposes the student to different research programs within IBiS. Research rotations also provide the advisors with an opportunity to evaluate the performance and research potential of each student. The evaluations of each student are a major factor in the decision concerning their formal admission to the IBiS program in June of the first academic year.

The most important function of the research rotation is to aid students and preceptors in establishing mutually agreeable student/thesis advisor partnerships. The preceptor and student discuss available research projects in the lab and decide on a rotation project. Rotation projects generally do not form the basis for a thesis project but provide valuable hands-on laboratory experience. By participating in the daily routine of the laboratory, students are able to judge how comfortable they feel in that laboratory environment. Meanwhile, preceptors use several criteria to judge whether a student will prove to be an asset to their laboratory. Among these are:

1. **Commitment.** Students should take each rotation seriously and show effort and commitment to the project and the rotation lab.
2. **Execution and documentation of experiments.** A research career depends on the clear and reliable execution of experiments that are often complicated. These experiments have to be fully documented in protocols and lab books.
3. **Interest.** A hallmark of independent investigators is that they are motivated by curiosity, driven by the “need to know.” Students are encouraged to seek out published information relating to their projects and to think critically about how their project relates to the overall scientific enterprise.
4. **Maturity.** Scientific research depends on effective communication among laboratory workers. Common sense, cooperation, and courtesy are essential qualities for the proper functioning of a research laboratory.

Selection of Rotations

The arrangements for independent research rotations are made directly between the student and the preceptor. The graduate advisory committee can help students in this important task, but the obligation of approaching individual preceptors lies with the student. Each preceptor may accommodate three rotation students if they are planning to recruit one IBiS student into their lab for thesis work. This rule is intended to distribute rotation students among labs to help ensure that all students will find a thesis lab. However, if a preceptor would like to recruit more than one thesis student in a given year, they can request permission from the IBiS director to take an additional rotation student (i.e. a total of 4 students). Each preceptor will accept the student for independent research on the basis of direct discussions with the student.

Students should approach as many preceptors as is necessary to select a rotation advisor. In cases in which students are unable to find a rotation within IBiS, rotations outside IBiS (*e.g.,* with faculty in the DGP) must be approved by the director of the IBiS program and the student’s academic advisor. Such requests are limited to spring quarter.

SECTION 6 – FIRST-YEAR STUDENTS: ROTATIONS

Since the first rotation does not begin until midway through the fall quarter, there is a weeks-long pre-rotation period for students to investigate labs and set up their first rotation. Arrangements for independent research advisors for rotation 1 are due Wednesday of the week before the rotation begins. Arrangements for rotations 2 and 3 are due by the last Friday of the fall quarter. **No formal commitments for rotations 2 and 3 can be made before the first rotation is complete.** Agreements made prior to this are not binding for either the student or the preceptor. The completed "Independent Research Advisor Agreement" should be submitted to the IBiS office by the deadline to formalize the agreement.

Students can gather information necessary to select independent research advisors in the following ways:

1. **Discussion with individual preceptors.** Discussions with the preceptors are essential in selecting an advisor. This is an opportunity to discuss in some depth the research projects available in the laboratory. Students should meet with all preceptors whose research programs are of possible interest to them. Such meetings do not constitute a formal agreement, and the student should therefore meet with multiple preceptors. These meetings should be initiated during the pre-rotation period in the fall quarter so that students can set up rotation 1, but students should feel free to continue to explore different possible thesis labs during the quarter, so that they can make decisions about rotations 2 and 3.
2. **Reading the literature.** A great deal can be learned about the research being pursued in each laboratory by reading recent papers describing that research. Reprints and preprints of recent manuscripts can be obtained online or from individual preceptors; the preceptor may also provide a short list of other recent research papers and review articles of particular interest.
3. **Faculty Research Presentations.** These short seminars presented by IBiS preceptors are held during the pre-rotation period in the fall quarter and provide an excellent forum for students to get to know the program preceptors and learn about the many exciting areas of research represented in IBiS. These seminars are also intended to help students identify laboratories in which they would like to rotate. *First-year students are expected to attend these seminars.*
4. **Discussion with graduate students and postdoctoral fellows**. First-year graduate students can learn a great deal from postdocs and students at more advanced levels in the program. They are usually eager to talk about their research and their experiences. The IBiS Student Organization conducts a graduate student seminar series wherein members describe their research accomplishments and goals to fellow students; this is an excellent source of information about individual research projects and the general laboratory environment.
5. **Annual IBiS retreat.** The annual IBiS retreat is held off campus. Students are introduced to preceptors and their research programs in short seminars and through informal discussions. Graduate students and postdoctoral research fellows participate in this retreat and are also a valuable source of information for incoming students.
6. **Research group seminars.** Most laboratories hold regular group meetings. Students may want to inquire about attending the meetings of a laboratory in which they may wish to rotate during a future quarter. Some research groups also participate in joint research seminars, such as the Cell Biology Supergroup and the Biophysics Club, which provide excellent opportunities to gather information.

Rotation Reports

The research advisor assigns a letter grade based on the student's performance during the quarter; for the winter quarter the grades received in each of the two rotations are averaged. Part of this grade is the evaluation of a written report submitted by the student at the end of the quarter. Rotation reports are to be turned in to the advisor and a copy submitted to the IBiS office no later than the Monday after the rotation ends. The written research report, along with the research advisor's critique of the report, will be placed in the student's file and will contribute to the evaluation of the student for admission to the IBiS program.

The suggested format for the research report (single-spaced) is as follows:

a. **Background and significance.** Briefly sketch the background of the advisor's research and how the research performed in the rotation relates to the long-term objectives of the lab. Include relevant references.
b. **Experimental design and methods.** Describe the procedures performed and the biological materials used in the rotation.
c. **Results and Discussion.** Describe the results of all experiments. Use tables and figures to present data; include figure legends. Describe any problems or challenges encountered. Also discuss the interpretation of results and propose future research directions.
d. **References.** List all references cited in the text, including all authors and the full title of the publication. Use the reference format of the journal *Cell*.

Since the nature and timing of research varies in different disciplines, the structure of rotations may vary between labs; some students may be given an entire project to complete while others may simply be introduced to the general field and taught the major techniques that the lab uses. Therefore, while the above format can serve as a guide, students should ask their rotation advisor for their expectations for the format and length of the rotation report. If a student believes that a different report format would be better suited to summarize their accomplishments during their rotation, they may make modifications to the above format, as long as those modifications are acceptable to their rotation advisor.

Selection of a Thesis Advisor

The selection of a thesis advisor is the responsibility of the student and is mandatory for formal admission to the IBiS program. Students and faculty can begin to make formal thesis advisor commitments after the 3rd rotation is complete and it is expected that these arrangements will be made by the end of the winter quarter. **No formal commitments can be made until the 3rd rotation is complete.** Agreements made prior to this time are not binding for either the student or the preceptor.

Selection of a thesis advisor does not strictly require a prior rotation in the preceptor's laboratory. Likewise, a research rotation in a particular laboratory does not constitute a commitment on the part of either the student or the research advisor concerning a permanent thesis laboratory assignment. Any student is free to approach any IBiS preceptor concerning thesis advisor agreements.

If a student is deciding among multiple labs, they are encouraged to contact more than one preceptor to discuss the possibility of conducting thesis research in their laboratory; however, a single commitment must be initiated by returning a signed thesis advisor agreement to the IBiS program office. Final approval for all arrangements rests with the IBiS program director and the chairperson of the department in which the selected thesis advisor holds their primary appointment and is not formalized until the student is granted admission to the second year of the IBiS program. The same type of information described previously for research rotations also applies to the selection of an advisor. Remember that one-on-one discussions with preceptors are extremely important. Students are encouraged to explore all laboratories in the IBiS program in which they might like to perform independent thesis research.

Student who are in good standing may be granted permission by the graduate advisory committee to pursue a fourth rotation during the spring of the first year; students should reach out to their first-year advisor or to the chair of the advisory committee for help in navigating this process. Students may undertake this fourth rotation in an IBiS laboratory, or, with the approval of DGP leadership, in a DGP laboratory; the duration of the rotation will follow program guidelines (5 weeks for IBiS, 10 weeks for DGP). This requires the agreement of the fourth rotation advisor and does not represent a formal commitment for a thesis advisor agreement.

Selection of Research Clusters

Once students have identified a dissertation laboratory, they will also choose cross-campus research clusters in which to participate in order to facilitate collaboration and depth of training in their area of specialization. These clusters serve as foci for training activities (*e.g.*, symposia, poster sessions, journal clubs) and specialized coursework, and bring together students and faculty with common research interests from across Northwestern.

ADMISSION TO THE IBiS PROGRAM

Formal admission to IBiS is not granted until the student has adequately demonstrated scientific potential based on performance in coursework and effectiveness in independent research and secured a thesis advisor. Decisions concerning formal admission to the doctoral program are made in June of the first year. The preceptors evaluate each student's accomplishments during the first year. Minimal requirements for admission include six courses completed with grades of B or better, and the completion of three laboratory rotations. The grades for the rotations will be based on the student's performance. Each student's effectiveness in independent research will be judged on the basis of the evaluations by the first-year research advisors. The material evaluated in considering formal admission will include the research advisor's comments on the student's potential in the graduate program.

Students will be notified in writing during June of the first academic year of the decision concerning their formal admission to the doctoral program. Arrangements regarding thesis research are not considered final until the student is formally admitted to the IBiS doctoral program.

SECOND- AND THIRD-YEAR STUDENTS

THE QUALIFYING EXAMINATION

Before the end of fall quarter of the second year, each student should write and defend a thesis research proposal. Before the end of fall quarter of the third year, each student will present their research progress toward their thesis, and productivity and progress will be assessed. After successfully completing both parts of the exam, students will advance to candidacy.

Qualifying Exam Committee Membership

At the end of summer quarter of the first year, the chairperson of the graduate advisory committee determines the membership of each student's committee. The qualifying examination is administered by a faculty committee consisting of a chairperson, two members, and the advisor as an observer. At least three members of the qualifying exam committee, including the chairperson, must be IBiS preceptors and also members of the Northwestern Graduate Faculty. The committee chairperson must be someone other than the student's advisor. This qualifying exam committee will normally continue as the thesis committee to monitor the student's progress at formal annual reviews. A student and their advisor may request changes to the thesis committee from the chairperson of the graduate advisory committee.

It is the responsibility of the student to schedule each portion of the examination. The student should contact committee members to identify a suitable exam date and reserve a room if the meeting will be held in person. Although they sometimes take less time, all committee meetings should be scheduled for 2 hours.

Qualifying Exam Part 1: Proposed Thesis Project

For the first part of the qualifying exam, the student will write up and defend their proposed thesis project. The written proposal will be submitted to the members of the qualifying examination committee no later than two weeks before part 1 of the qualifying examination.

Research proposals follow guidelines similar to those of an NIH pre-doctoral fellowship application. The proposal should be typed, single-spaced, on standard-size (8½" x 11") paper with one-inch side, top and bottom margins and a font size not smaller than 11. It should be no more than 10 pages long (this limit does not include the title page, summary, references, or appendix). Be sure to reference all sections appropriately. Good proposals are clear, precise, and succinct. While IBiS thesis projects are generally organized around testing fundamental biological hypotheses, some projects will also involve additional valuable activities such as developing experimental and/or theoretical tools or observational studies that generate hypotheses (*e.g.*, synthetic biology tools, chemical biology tools, genetic screens, structural biology, computational modeling or simulations). In such cases, the proposal should include a plan either for utilizing the new tool to answer biological questions or for testing the hypotheses generated. All proposals must include an explicit statement of the impact of the proposed work on fundamental biological knowledge. Preliminary data generated by the student is not required but can be included if it exists. Alternatively, the research strategy and rationale for the proposed work can be justified by published data or by preliminary findings by others.

a. **Title page.** The title of the proposal and the student's name, as well as the date, time, and location of the exam should be printed on a separate cover page.
b. **Summary.** This should be a brief synopsis of the proposed research. It should include a statement of specific aims and objectives, the scientific background of the proposal, the methods or procedures to be used, and the potential significance of the research. Limit to one-half page.
c. **Specific aims.** Provide a clear, concise, point-by-point summary of the aims of the work proposed in the form of hypotheses to be tested. Limit to one page.
d. **Background and significance.** Discuss the essential background of the present proposal, critically evaluate existing knowledge, and specifically identify the gaps that the project is intended to fill. State the importance of the research described in this proposal by relating the specific aims to longer-term objectives. (two to three pages)
e. **Experimental design and methods.** Discuss in detail the experimental design and the procedures to be used to accomplish the specific aims of the project. Describe essential controls, analytical methods, and protocols to be used. In cases where a new tool is being developed, discuss essential validation and how this new tool will change the types of questions that can be asked. Also provide a tentative sequence or timetable for the investigation. Elaborate on any new methodology and its advantage over existing methodologies. Discuss potential difficulties and limitations of the proposed procedures, alternative hypotheses and backup approaches to achieve the aims. (approximately five pages)
f. **References.** List all references cited in the text according to their order of appearance, including all authors and the full title of the publication using proper citation practices.
g. **Appendix.** Extra diagrams or figures not included in the main text that are helpful to the examiners can be included as an appendix. The appendix should not exceed two pages.

Evaluation Guidelines

The qualifying examination committee will evaluate the student's written proposal per the guidelines below. The proposal must be focused, rigorous, and feasible for a graduate student to complete within four years. In addition, the student should prepare a slide presentation that outlines their aims, including essential background information. At the start of the meeting, the student will be asked to leave the room so that the committee can discuss the proposal. The student will then be invited back into the room to begin their presentation.

<u>General guidelines</u>

- **Written proposal deadline:** two weeks prior to meeting
- **The project is focused.** Have clearly defined goals, hypotheses, specific aims and experiments that advance fundamental biological knowledge.
- **Present the literature.** Understand the background and details of the area of study.
- **Identify the critical unanswered questions** and design experiments that address these questions rather than providing incremental, superficial details.

Written proposal should contain

- rigorous approaches that lead to impactful conclusions.
- a clear impact on fundamental biological knowledge.
- specific aims and an explanation of why they matter.
- validation of proposed new methods.
- hypotheses which should be tested using appropriate controls.
- expected outcomes, alternative directions, different approaches.
- a timeline.

Discussion and questions

- ~45-minute slide presentation to the committee, include the timetable
- Be prepared to defend the proposal, and to demonstrate understanding of the background and details of the subject area.
- Alternative approaches or experiments should be considered.

The proposal defense focuses on the thesis research proposal as well as basic knowledge of modern biology. The student is expected to demonstrate proficiency in topics covered in the IBiS core courses and departmental seminars. A signed "Report of the Committee Conducting Part 1 of the Qualifying Examination" and a copy of the final thesis proposal must be provided to the IBiS office.

Qualifying Exam Part 2: Research Progress

The research progress portion of the qualifying exam consists of a presentation to the exam committee and discussion in response to questions from the committee.

One week before the meeting, the student should submit a 2-3 page progress report to their committee, consisting of:

a. **Overview.** Briefly describe the project and the specific aims.
b. **Progress.** For each aim, what progress has been made?
c. **Objectives.** For each aim, what still needs to be accomplished? If the aims have been revised, the revisions should be noted and an explanation should be provided.
d. **Timetable.** For the objectives listed, estimate the time to completion.

The student typically prepares a slide presentation of their data for the meeting. As in part 1, the student will be asked to leave the room briefly before the presentation begins.

Evaluation Guidelines

The qualifying examination committee will evaluate the student's productivity and progress toward the thesis. The committee needs to be convinced that enough work has been done, that the project is feasible, and that the proposed project can be accomplished within three more years.

Data

- High-quality experimental data with rigorous controls and clear interpretation

Oral Presentation

- ~45-minute slide presentation to the committee, include the timetable
- Discuss the details and expectations of the exam committee with the chairperson as the presentation is prepared.

If the project has changed substantially since the first part of the exam, it will be the student's responsibility to outline and defend the changes as well as demonstrate progress toward the goals of the new project. A signed "Report of the Committee Conducting Part 2 of the Qualifying Examination" must be submitted to the IBiS office.

Outcome of the Qualifying Exam

At the end of each part of the exam, the committee chairperson will summarize the committee's assessment of the student's performance, inform them of the outcome, and whether there are any conditions to be fulfilled. The student's advisor will then leave the meeting, giving the student the opportunity to express any concerns to their committee members that they might not feel comfortable discussing in their advisor's presence. In addition, the chairperson will provide a brief, confidential, summary of the discussion of the student's performance to the advisory committee chairperson.

Advancement to candidacy

Students must demonstrate satisfactory performance in all categories, and pass both parts of the qualifying exam, in order to be admitted to candidacy and remain in the program. The relevant forms must be signed by each of the committee members and returned, completed, to the IBiS office. These forms will be uploaded into the Graduate Student Progress system (GSP) so that the student has access to the feedback provided by the committee. A copy of the final proposal must also be provided to the IBiS office.

After the student has successfully completed both parts of the qualifying exam, the IBiS program will formally recommend the student to The Graduate School for admission to candidacy for the Ph.D.

Failure to advance to candidacy & the master's degree

Students whose performance in each of the three qualifying exam categories (advanced understanding of biology, research aptitude, and research accomplishment) is judged insufficient for advancement to candidacy but sufficient to merit consideration for a terminal master's degree may petition the program director for permission to write and defend a master's thesis. If the petition is granted, the thesis proposal must be rewritten in the format of a master's thesis and defended before a master's degree exam committee, which is usually reconstituted from the qualifying exam committee. The awarding of a terminal master's degree by IBiS should reflect significant achievement by the degree recipient. A terminal master's degree will be awarded by The Graduate School upon recommendation by the program director acting on the advice of the chairperson of the graduate advisory committee and the master's degree exam committee.

Students whose performance was not satisfactory in any one of the categories mentioned above are normally not eligible for a master's degree and are dismissed from the program. For example, a student who has demonstrated a good understanding of biology, but who did not perform satisfactory research in their thesis lab is not eligible for a master's degree.

A summary of minimal requirements for the master's degree is available from the IBiS office.

OTHER REQUIREMENTS

Individual Development Plan

Students should complete the IDP (with their advisor) in fall quarter of their second year, and update and share it with their committee members prior to every committee meeting during their time in IBiS. The IDP is designed to foster communication in a variety of areas to ensure that the student and advisor are discussing short- and long-term training goals, and that the student is receiving comprehensive guidance on how best to achieve these goals and make efficient progress toward earning their degree. Both research and training goals should be discussed, as well as the level of effort and commitment necessary to meet these goals. Training goals are expected to evolve over time.

Teaching Responsibilities

Many students will eventually pursue a career that involves both research and teaching. Experience as a teacher is therefore a valuable part of the training provided by the IBiS graduate program. Participation in teaching is beneficial for the student, even if they do not wish to pursue a career in teaching because it provides further expertise in the subject material of the course and enhances the student's verbal communication skills. Each student will participate in the teaching program beginning in the second year, regardless of the method of support of the student. The IBiS program currently requires two quarters of teaching for the Ph.D. degree. Teaching assignments require that the student work with the course instructor to organize and conduct quiz, discussion, and/or laboratory sections. Teaching assignments are arranged by the director of undergraduate laboratories. The TA requirements are usually met in year 2 and year 3.

UPPER-LEVEL STUDENTS

ANNUAL REVIEWS

After a student has passed the qualifying examination, the same committee will meet with the student annually until the student graduates. If desired by the student and advisor, changes to the membership of a student's committee can be made with the approval of the chairperson of the graduate advisory committee. The meetings provide an opportunity for the student to discuss their work with scientists from outside the student's laboratory. The meetings serve to assess the student's progress toward the Ph.D. degree, but are not intended to be examinations. Although they sometimes take less time, all committee meetings should be scheduled for 2 hours to ensure that students have sufficient time to receive detailed feedback.

At the end of each meeting, the student's advisor will leave the meeting first, giving the student the opportunity to express any concerns to their committee members that they might not feel comfortable discussing in their advisor's presence.

Annual review meetings should be held in the winter quarter for fourth-year students and in the spring quarter for students in their fifth year and beyond. Students are responsible for scheduling the annual meetings with their committee. The student's Individual Development Plan should be updated at the time of the annual review and shared with the committee a week in advance of each meeting.

In addition, the program requires that students prepare a 1-2 page progress report to share with the committee in advance of each meeting. This report will remind the committee of the major aims of the project and will help them gauge the student's progress, which should lead to useful feedback and advice.

The report should consist of:

a. **Project Overview.** Briefly describe the project and the specific aims.
b. **Progress.** For each aim, what progress has been made?
c. **Objectives.** For each aim, what still needs to be accomplished?
d. **Publications.** List publications authored that are related to your Ph.D. thesis.
e. **Timetable.** For the objectives above, estimate the time to completion.

"Annual Review" forms must be filled out by the committee chair and signed by all committee members. Committees are asked to provide feedback on the student's overall performance over the past year and their progress towards their degree. A copy of the annual review form will be kept in each student's IBiS program file and will be uploaded into the Graduate Student Progress system (GSP) so that the student has access to the feedback provided by the committee. If a student feels unsure about their progress towards their degree or about what is required for them to graduate, they should reach out to their committee chair to request more detailed feedback. In cases where a student continues to feel that they are not receiving sufficient guidance, the student should contact the chair of the graduate advisory committee, who can advocate on their behalf.

DISSERTATION AND FINAL EXAMINATION

The advisor, the student, and the thesis committee together determine the appropriate time to write and submit the dissertation. Each student must complete an original research study and produce a dissertation that is acceptable to the final examination committee. Doctoral research usually begins in the spring quarter of the first academic year and continues uninterrupted until all the requirements for the Ph.D. degree have been met, and a satisfactory dissertation has been completed.

Requirements for the Ph.D.
All requirements for the Ph.D. degree must be met within nine years of initial registration in the doctoral program. A comprehensive list of the requirements can be found in sections 1 and 2 of the program guide. The graduation checklist on the IBiS website also contains procedural steps and links to required forms.

IBiS students are required to write and publish, with the guidance of their mentors, at least one first author, peer-reviewed paper in the primary literature describing their thesis research. Two co-first author papers are considered equivalent to one first author paper.

A single co-first author paper does not automatically satisfy the publication requirement, but co-first authorship can meet the requirement in some cases. Such approval is most likely in cases where there are only two co-first authors, the publication represents a major portion of the student's thesis work, and if the student's work could have formed the basis of a smaller first author paper. If a student believes that their co-first author paper should fulfill the publication requirement, they should explain their reasoning to their thesis committee in one of their annual review meetings. If the thesis committee agrees with the student, the committee may make an appeal to the director. This appeal should be made by filling out the "Co-first Author Exception" form. This form asks the committee chair to detail the reasons why they judge that the paper should meet the publication requirement; if valid reasons are given and each committee member signs the form, demonstrating unanimous support, a co-first author exception will be granted. For co-first author papers, it does not matter whether the student's name is listed first or second; these are considered equivalent contributions.

Final Examination Committee
The final examination committee is usually the same as the qualifying exam committee. Changes to the membership can be made with the approval of the chairperson of the graduate advisory committee. The same rules apply to the composition of the final exam and qualifying exam committees (see section 8 for details).

Permission to Write Meeting
Approximately three to six months before the expected final examination date, usually after work has been submitted that would satisfy the publication requirement, the student will schedule a "permission to write" meeting with the examination committee. Although it sometimes takes less time, the permission to write meeting should be scheduled for 2 hours. At least one week prior to the meeting, the student will submit an outline for a dissertation to the committee. The outline should provide a detailed breakdown of each chapter. To receive guidance on how detailed the outline should be and on how to prepare for the meeting, the student should consult with the committee chair.

SECTION 11 – UPPER-LEVEL STUDENTS: DISSERTATION & FINAL EXAM

At the "permission to write" meeting, the student will discuss the experimental results and defend the conclusions to be described in the dissertation. Generally, the student should review the major findings of their thesis (covering each experimental chapter), discuss any experiments still in progress that they are planning to include in the thesis (including the estimated timeline of completion), and inform the committee of the status of their first-author publication(s). If a first-author publication has not been submitted, the student should discuss in detail what remains to be completed before submission and the projected timeline. The committee will determine whether substantial alterations to the proposed dissertation outline are required and whether enough progress has been made to schedule the final exam. Where appropriate, contingencies regarding the outcomes of requested experiments should be agreed upon during this meeting and indicated on the "Permission to Write" form. At the conclusion of the meeting, the form should be signed by all committee members and then submitted to the IBiS office.

Once permission to write has been granted, the student may begin to write the dissertation and schedule the date of the final examination.

Final Examination

Two weeks prior to the final exam, the student will present the committee with the written dissertation. The dissertation should include an introductory chapter, which provides a thorough introduction of the field of study, one or more chapters that detail the scientific findings of the thesis, and a chapter at the end that summarizes the major findings, discusses their significance/how they have advanced the field, and proposes future directions. How the scientific findings are presented (e.g. how they are broken into chapters) can vary depending on the nature of the work presented, so students should consult with their advisor and their committee chair if they need guidance. A complete guide to dissertation formatting is available from The Graduate School and should be consulted for stylistic requirements. It is expected that the dissertation will be in a fully-edited and corrected form. The student's advisor must have read and approved the dissertation prior to its submission to the committee.

The final exam will include a discussion of the experimental results that have been completed since permission to write was granted, and an evaluation of the dissertation as a whole. Although it sometimes takes less time, the final exam should be scheduled for 2 hours. The specific format of the final exam may differ for each student. It is therefore recommended that the student meet with the committee chairperson beforehand to discuss any additional expectations for the exam. If the committee judges the dissertation to be satisfactory, the dissertation can be approved at this meeting, although final corrections, revisions, or editing may be requested. The committee's decision is recorded on the "Committee Report on Examination of Candidate for the Degree of Doctor of Philosophy" form. Possible outcomes are an unqualified pass, a conditional pass requiring no re-examination, a mandatory re-examination, or a failure to pass the exam. At the conclusion of the exam, the completed form must be signed by each committee member and returned to the IBiS program office.

In order to receive an unqualified pass, the publication requirement must be complete (i.e. the student's first author paper must be accepted for publication). However, an exception to this policy is possible and can be requested via the "Accepted Paper Exception" form.

This exception is most straightforward if the paper has been submitted, has gone through at least one round of review, and experiments for the revision are complete. In these cases, the student and advisor should share the manuscript draft, manuscript reviews, and author rebuttals with the thesis committee, so that they can judge whether the paper is likely to be accepted. If the advisor and committee certify that the paper has a high likelihood of acceptance without further experiments, they can indicate this on the form and submit it to the program director; in cases where these conditions are met and the committee unanimously supports granting this exception, it will be automatically approved. Other situations (for example cases where a paper has been submitted but a revised manuscript has not yet been re-submitted) will be considered for an exception on a case-by-case basis. In these cases, the committee chair should articulate why the committee deems that the exception should be granted on the form; the program director will then make a final determination.

Dissertation Submission

If the student receives an unqualified pass on the final exam, the student and their advisor must carefully proofread the dissertation. If a conditional pass is granted, all conditions must also be addressed and approved by the committee. Once proofread, both the student and the advisor must sign the "Certificate of Careful Editing" and submit it to the IBiS office. At this point, the dissertation may be submitted to The Graduate School.

The Graduate School has additional requirements for doctoral degree completion. Please note that the IBiS "Committee Report on Examination of Candidate for the Degree of Doctor of Philosophy" form replaces the TGS Final Exam form. However, the student should:

1. complete and submit the Application for a Degree form through GSP.
2. submit the dissertation via ProQuest. The dissertation must conform to all TGS formatting standards. Note that it is possible to delay the publication of the dissertation. This is a useful option if the dissertation contains sensitive data that will be included in patents or peer-reviewed journals in the near future.

Public Seminar

Once the student has passed, a public seminar can be scheduled, with committee approval. This is a formal seminar presented to IBiS program members and invited guests. The seminar must be arranged through the IBiS office and will typically take place on Fridays in the afternoon. The program staff will assist in advertising the public seminar. It is recommended that the arrangements be made at least 2 weeks prior to the presentation.

Offboarding

Once a student sets their planned graduation date, they should meet with their advisor to discuss whether they will remain in the lab following graduation (e.g. as a temporary worker to wrap up more experiments) and they should meet with the financial administrator in their department to discuss when they will receive their last paycheck and when their health insurance expires. Advance planning is essential to ensure a smooth transition.

Exit Interview

After the student has passed their final exam and before they leave Northwestern, they should schedule an exit interview with the IBiS office.

CAREER AND PROFESSIONAL DEVELOPMENT PROGRAMS/RESOURCES

The IBiS program is committed to providing its graduate students with the tools they need to embark on rewarding science careers after completing their training. To that end, IBiS organizes a comprehensive set of career and professional development programs for life scientist trainees, called BioProfessionals. Additional programming and resources are available through the Searle Center for Advancing Learning & Teaching, The Graduate School, and Northwestern Career Advancement.

BioProfessionals
To foster the career development of graduate students training in the life sciences at Northwestern University, the IBiS Graduate Program organizes BioProfessionals, which includes BioOpportunities, BioSurvival Skills, and Pathway to the Professoriate.

BioOpportunities regularly invites alumni and other professionals to talk about the variety of careers available in areas such as biotechnology, science communication, intellectual property, consulting, *etc.*, to those with Ph.D.s in the life sciences. BioSurvival Skills is a series of workshops on topics such as presentation skills, grant and CV writing, networking, and job hunting. Pathway to the Professoriate focusses on issues important for successful academic careers including choosing a postdoc, applying for faculty positions, startup package negotiations, and the tenure process.

Searle Center for Advancing Learning & Teaching
The Searle Center for Advancing Learning & Teaching is a valuable resource for students interested in improving their teaching skills in preparation for an academic career. IBiS supports teaching development opportunities for advanced graduate students in collaboration with the Searle Center and the Program in Biological Sciences by opening course sections for students to co-teach, such as a biology-related Freshman Seminar or BIOL SCI 164 Genetics and Evolution. Since the IBiS Program is only able to guarantee a few teaching spots each year, students need to apply to IBiS for these opportunities.

The Graduate School
The Graduate School's Career & Professional Development program is a collaborative effort with faculty and staff across the campus to offer a comprehensive series of events that contribute to the professional development of graduate students.

Northwestern Career Advancement
Northwestern Career Advancement (NCA) provides comprehensive career services to all life sciences graduate students considering non-academic as well as academic careers. Career counselors assist students with career decision-making by helping them explore and re-clarify interests, values, and skills through one-on-one counseling meetings and career assessments.

IBiS LinkedIn Group
The program manages an IBiS Grads and Alumni Group on LinkedIn that is a useful resource for students who are searching for jobs as they approach graduation, or for internships during their time in the program. Students are allowed to join this group upon their formal admission to the graduate program, in June of the first year.

RESEARCH CENTERS AND TRAINING PROGRAMS

Centers

IBiS preceptors participate in many research centers at Northwestern University. These centers provide additional training opportunities for IBiS students through conferences, symposia, and workshops. The list below includes some of the centers with which our preceptors and students are currently involved.

CENTER FOR CELL AND DEVELOPMENTAL SYSTEMS BIOLOGY

Curt Horvath, Director

The goal of the Center for Cell and Developmental Systems Biology is to provide the ability for Center labs to embark on new directions for research and provide the organizational and material support to make those visions a reality. In addition, the Center provides support for collaborations between labs within CDSB, with their colleagues at Northwestern University, with their counterparts in the region, and around the world. Its mission is to make the fundamental new discoveries that expand knowledge and provide the basis for medical therapies.

CENTER FOR REPRODUCTIVE SCIENCE

Francesca Duncan and J. Julie Kim, Co-Directors

Established in 1987 in recognition of Northwestern's strength in reproductive biology, the Center for Reproductive Science (CRS) is an interdisciplinary collaboration of medical and science scholars at the forefront of reproductive research, medicine, and technology. The Center's mission is to enhance and enable research in reproductive science and medicine across disciplines, to apply state-of-the-art research and technologies to human reproductive health, and to train the next generation of research, clinical, and thought leaders in our field.

CENTER FOR STRUCTURAL BIOLOGY

Alfonso Mondragón, Director

The mission of the Center for Structural Biology is to foster leading-edge research in this exciting interdisciplinary field. Center researchers carry out fundamental studies on the structures, dynamics, actions, and interactions of important biological macromolecules. The Center's research space fosters collaborative and interdisciplinary research through open, interconnected laboratories and shared space for instrumentation. Center researchers have access to state-of-the-art major instrumentation, including a 600 MHz NMR facility and a beamline for macromolecular crystallography at the Advanced Photon Source (at nearby Argonne National Laboratory), which is the most powerful X-ray source in the world.

ROBERT H. LURIE CANCER CENTER

Kathleen Green, Associate Director for Basic Sciences Research

The Robert H. Lurie Comprehensive Cancer Center is a National Cancer Institute-designated Center with programs in basic and clinical sciences. The IBiS preceptors participate in the four basic science programs of Cancer Epigenetics and Nuclear Dynamics; Tumor Environment and Metastasis; Membranes, Organelles and Metabolism; and Cancer and Physical Sciences. Through its grants program, the Center funds research projects, the purchase of equipment, and graduate student travel to national meetings.

The Center also supports the operations of shared facilities for transgenic mice, two-dimensional gel electrophoresis, oligonucleotide synthesis, histology, cell imaging, tissue culture supplies, and DNA and protein sequence analysis. Another important function of the Center is education. The Center hosts two annual symposia, one on basic science and one on clinical oncology, which bring scientists from around the world to speak at Northwestern. In addition, Cancer Center laboratories present their work at a yearly poster session.

Training Programs

Training programs that have recently supported IBiS students include:

- Biotechnology Predoctoral Training Program
- Molecular Biophysics Training Program
- Chemistry of Life Processes Predoctoral Training Program
- Carcinogenesis Training Program
- Training Program in Reproductive Science, Medicine, and Technology
- Training Grant in Circadian and Sleep Research
- Physical Genomics Training Program
- Synthesizing Biology Across Scales Training Program
- Medical Scientist Training Program (M.D./Ph.D. Program)

GENERAL PROGRAM INFORMATION

IBiS Program Office

The IBiS program office will assist you during your graduate education. Contact the office for any curricular or registration questions. Financial questions regarding payroll, paycheck, registration holds, *etc.*, are best directed to the financial assistant(s) of your department. The Molecular Biosciences and Neurobiology departments' financial office is Life Sciences Financial Services (LSFS). The Chemistry, ChBE, and BME departments have their own financial assistants. If you are unsure where to go for help, check with the IBiS program office.

The IBiS program office should receive originals of any academic paperwork (rotation agreements, thesis advisor agreement, annual reviews, *etc.*) to be put into your file. You should inform the office of any academic changes (lab, thesis committee members, *etc.*) While you are a student, please make sure that the IBiS program office has your current contact information. Every quarter, the IBiS program office distributes the latest NU contact information. When you graduate, stay in touch, providing us with your most recent contact information, so we can add you to our alumni database. In addition, if you did not join the LinkedIn IBiS Grads and Alumni Group during your time in the program, we encourage you to join upon graduation so that the program can track career outcomes.

Financial Information

- The stipend for 2025-26 is $46,356 for 12 months.
- IBiS stipend and tuition support for first-year students is for 9 months, September 1-May 31. Further support is contingent upon formal admission to the IBiS program.
- The payday is the last working day of every month. Pay statements are available in myHR two days prior to each paycheck date. You can access myHR through Human Resources from both work and home. To view your direct deposit statement, log in and click the "Pay" link.
- Questions regarding your pay can be addressed to the financial assistant of your department. For the Molecular Biosciences and Neurobiology departments, inquiries can be made of the Life Sciences Financial Services staff in room 2-150 Hogan during regular business hours (8:30 a.m. - 5:00 p.m.)

Health and Dental Insurance Benefit Overview

Northwestern University requires all full-time students to maintain health insurance that meets the University's standards. This requirement is designed to protect students from extraordinary medical expenses that could result from an injury or illness. For those students who do not have minimally acceptable health insurance through an outside source, the University has currently contracted with the Aetna Student Health insurance plan.

All students must enroll in this plan or indicate they have equivalent health insurance through another source.

The Graduate School pays the health, dental and vision insurance premiums for the student plan offered by Northwestern University in full. Yearly coverage runs from September 1st – August 31st.

Detailed information regarding Northwestern's health program through Aetna can be found on the Aetna website. You will also find insurance information for TGS students on the Student Health Insurance website.

IBiS is not responsible for your enrollment in an insurance plan or your premium payment. You are responsible for ensuring you are properly enrolled in a health and dental insurance plan and paying any premiums in a timely manner.

Student Grants

The following internal grants are available to students to support their training:

The IBiS Travel Award enables students to present their work at research meetings, conferences and symposia. Awardees will acknowledge the IBiS Travel Award in their posters or oral presentations. In addition, awardees are required to submit an abstract for talk consideration at the IBiS retreat in the fall and are asked to present at a poster session during the IBiS recruitment visit in the spring. Travel Award applications must be submitted no later than one month before the planned conference travel.

The Rappaport Award for Research Excellence recognizes scientific achievement of advanced graduate students in the biological sciences.

The IBiS Career Support Grant assists with the costs of dependent-child care for IBIS graduate students who are attending learned society meetings, academic conferences, workshops, and other scientific activities related to their research projects, as well as professional development events.

IBiS pays for students to attend coding workshops run by NUIT (up to $30/year per student). If a student wishes to attend a workshop that requires payment, they should email the IBiS Associate Director to get details about how to register and pay for the workshops.

Other Degree Programs or For-Credit Coursework

Enrollment in any formal degree program (J.D., M.B.A., *etc.*) or participation in for-credit coursework outside of the IBiS curriculum requires prior approval from the program director and your advisor. Requests will be considered on an individual basis and are not automatically granted.

Outside Employment

Outside employment of any type is not allowed without permission. Permission can be granted by the program director for advanced students only when the employment directly helps the professional development of the student, and when the student's advisor supports this exception. To request permission the student should email the director with

details about their requested employment (employer, dates, approximate number of hours per week, and how it benefits their professional development), and supply proof that their advisor supports their request (e.g. forward an email or have the advisor reach out to the director themselves). Employment is limited to 15 hours per week and must not interfere with the ability of the student to make adequate progress towards their degree. In cases where students are requesting to work more than 10 hours a week, the time period is more than one month, or compensation is $600 or more, students must also seek approval from The Graduate School, by submitting a TGS permission to work request. If students engage in compensated outside work without following the proper procedures to seek approval, this will be considered a violation of academic integrity. In these cases, the students will be reported to TGS and may be placed on academic probation.

Stipend Supplements

Stipend supplements are generally not permitted, with the exception of extramural funding as described below. Any other supplement to a stipend must be approved by the program director, your advisor, and The Graduate School.

IBiS students who receive prestigious extramural awards (as determined by the IBiS program, *e.g.*, NSF, NRSA, AHA) will receive a one-time achievement bonus that is equivalent to 10% of the first year's stipend (tuition excluded).

Facilities

A lounge is available for student use. It is located on the sixth floor of the Hogan building, Room 6-150, and contains computers and printers for the use of all IBiS students.

IBiS student mailboxes are located in the Molecular Biosciences (MBS) mailroom, in Hogan 2-108. Mail for first year students will be placed in shared mailboxes, arranged in alphabetical groupings (A-D, E-H, etc.). Students who join MBS labs will be given an individual mailbox in the MBS mailroom after their first year. Students who join labs in other departments can either request a mailbox from their department administrators or can continue to receive mail in the shared mailboxes in Hogan 2-108.

25Live is the system used to reserve rooms around campus. If you need a room that is not listed on 25Live please reach out to the IBiS office staff.

IBiS Student Organization

IBiS students come from various backgrounds, participate in unique combinations of rotations and interdisciplinary coursework, and carry out thesis work on fundamental problems in the life and biomedical sciences using a broad range of interdisciplinary cutting-edge approaches. The IBiS Student Organization (ISO) provides a forum through which IBiS students can learn from one another, and benefit from each other's expertise, throughout their PhD studies and beyond.

The ISO sponsors a graduate student series that allows students to present their thesis research in an informal "work in progress" format without faculty present, in order to get input and feedback from their peers. The ISO also sponsors regular social events to promote interactions outside the lab, not only among IBiS students, but also graduate students and faculty from other departments. The organization also sponsors the yearly Excellence in Leadership and Engagement Award which recognizes student(s) who are dedicated to outreach.

Diversity in Biological Sciences Council

The Diversity in Biological Sciences (DiBS) Council was established to serve graduate students within the IBiS program. Specifically, DiBS aims to cultivate a lasting network and community of students that encompasses all groups, including BIPOC, LGBTQ+ individuals, international students, and all other groups within IBiS, by advocating for the student population through community building, providing professional development, connecting with other graduate programs, and contributing to recruitment. DiBS is led by a board of four graduate students in addition to council members who play critical roles in facilitating candid discussions and advocating for a positive campus environment. Recurring events hosted by DiBS and available to all graduate students include quarterly coffee chats, financial workshops, book discussions involving STEM, alumni connections, and career workshops highlighting academic and non-academic career paths. DiBS works alongside the ISO to enhance all IBiS students' graduate careers.

Community Engagement Committee (CEC)

As an interdisciplinary graduate program, IBiS is uniquely situated to serve all students on a variety of career trajectories and, in doing so, shape the future generation of leaders in the scientific community. The CEC will function as a student-focused committee to foster a healthy and equitable training environment driven by student ideas and concerns. Through these efforts, the committee will prioritize empowering all students to pursue their professional goals as their authentic selves, ultimately enriching the broader scientific community.

GENERAL UNIVERSITY INFORMATION

Academic Calendar
Please refer to the academic calendar on the Registrar's webpage.

ID Card/Wildcard
The Wildcard gives you access to all University facilities (*e.g.,* the libraries, the Sports and Aquatic Center, *etc.*) and identifies you as a member of the Northwestern University community. The Wildcard office is located in the Norris University Center on the underground level. It is open from 8:30 a.m. - 5:00 p.m., Monday through Friday. The phone number is 7-NUID (847-467-6843).

Parking Permits
If you plan to park on campus, you will need a parking permit, which can be obtained from Parking Services, located at 1841 Sheridan Road, between 8:00 a.m. - 4:00 p.m., Monday through Friday. You will need a valid Wildcard, driver's license, vehicle registration and proof of address. Less expensive parking is also available at Ryan Field. Please check with the parking office for current fees.

Payroll and Taxes
Stipends are automatically deposited to your bank account on the last day of each month. For questions about your paycheck, contact the Financial Assistant of your department. See the Human Resources FAQ, the TGS Tax FAQs, or contact the IRS for answers to specific tax questions.

Social Security Card
International students without a social security card should obtain one as soon as possible, typically in mid-October. The nearest Social Security office is located at 2116 Green Bay Road, Evanston. To apply for a card, you will need to obtain a letter from the IBiS office. Please visit the Office of International Student and Scholar Services for further requirements.

Student Leave of Absence Policy
Please refer to The Graduate School website for further information on student leaves of absence.

The following is the leave of absence policy available to all IBiS students in good standing:

- Parental leave for birth or adoption of a child – 12 weeks with pay
- Family leave to attend to a sick family member (child, spouse, parent) – 6 weeks with pay
- Medical leave – up to 2 quarters with pay
- General leave of absence – up to one year without pay

Except in the case of a one-year leave of absence, additional leave may be negotiated between a student and their advisor.

Student Counseling Services

Free and confidential counseling services are available to all students from Counseling and Psychological Services (CAPS). If you need CAPS services, call (847) 491-2151.

Tech Support: Email and NetID

New students will receive NetID and email account information upon acceptance of the offer of admission. Your NetID will be used to access the University student services system (CAESAR), your email, and many other University web sites. Information regarding NUIT Support is available via the NUIT website. For more information, contact 1-HELP (847-491-4357), or visit the NUIT Support Center in the University (Main) Library.

U-Pass Transit Card

The U-Pass is a discounted fare card that can be used on all Chicago Transit Authority transportation (the “L” and CTA buses). It is available for a fee of $125 for each quarter that you choose to opt in. See the U-Pass FAQs for details.

IBiS Staff and Faculty Committees

The administrative staff of IBiS is a valuable resource for information on stipends, taxes, registration, teaching, and program activities. A partial listing of the staff is found below; many are located on the second floor of the Hogan building.

Sarah Cowles	IBiS Associate Director	(847) 467-0451	sarah.cowles@northwestern.edu
Bethany Sorman	IBiS Assistant DGS	(847) 491-4301	bethany-sorman@northwestern.edu
Sadie Wignall	IBiS Director	(847) 467-0386	s-wignall@northwestern.edu
Ginger Gilmore	LSFS Business Admin.	(847) 491-5764	g-gilmore@northwestern.edu

Graduate Advisory Committee

Xiaomin Bao (Chair)	(847) 491-3082	xiaomin.bao@northwestern.edu
Shelby Blythe	(847) 491-4062	shelby.blythe@northwestern.edu
Chris Petersen	(847) 467-3553	christian-p-petersen@northwestern.edu
Reza Vafabakhsh	(847) 467-0435	reza.vafabakhsh@northwestern.edu