Graduate Student Handbook:

Field of Nutrition: Master's Program

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MASTER'S PROGRAM OVERVIEW ABOUT THE GRADUATE FIELD OF NUTRITION

Faculty in the Graduate Field of Nutrition study human nutrition at levels ranging from molecules to populations, drawing upon the chemical, biological, social, biomedical and population health sciences to understand the complex relationships among human health, nutritional status, food and lifestyle patterns, and social and institutional environments. Understanding these relationships includes the study of the metabolic regulation and function of nutrients, nutrient requirements throughout the life span, role of diet in disease etiology and management, nutritional quality of foods, and interventions and policies designed to promote nutritional health of individuals and populations.

In the Graduate Field of Nutrition graduate faculty research programs span disciplines and faculty work at the molecular or mechanistic level, at the whole person or whole animal level, or at the community or population level, including both U.S.-focused and global-focused programs. Many of our faculty have research programs that are broad and that bridge disciplinary approaches. While the graduate field as 4 concentrations, MS students choose tracks, as described below.

The Master's Program in Nutrition has four tracks, and the details of each of these tracks is provided below and <u>online</u>. The MS research-based degree is offered through the <u>Cornell Graduate School</u> in the <u>Graduate Field of Nutrition</u>. Information about the MS degree is provided <u>online</u> on the <u>GFN website</u>; this handbook is provided to orient entering students to this information and to provide an easy way to access information, including by providing links to online information. If you have any questions about this handbook please direct them to Graduate Student Services Assistant Ms. Doralee Knuppenburg

DIVERSITY AND INCLUSION VALUES

The Division of Nutritional Sciences (DNS) is committed to an inclusive environment that treats all individuals with fairness, dignity, and respect.

We celebrate and value diversity in race, ethnicity, religious and spiritual beliefs, gender identity and expression, sexual orientation, socioeconomic status, age, mental and physical ability, and country of origin. Our pedagogy, scholarship, and outreach are enriched and informed by the exchange of diverse perspectives and experiences. We uphold an environment free of racism, sexism, homophobia, transphobia, xenophobia, and systemic oppression in all its forms.

The members of the Division lead efforts to support diversity, equity, and inclusion in our community of scholarship and in our discipline. We engage with students, staff, and faculty to meet collective goals that are actionable and that reinforce our long-standing dedication to social justice. Our community is be strengthened by these efforts, which enhance the mission of the Division to improve nutrition and human health around the globe.



DEGREE AND PROGRAM INFORMATION

As a student in the Cornell University Graduate School, you have access to all the resources of the graduate school in addition to direct connections to the faculty in the Division of Nutritional Sciences (DNS). The Graduate Field of Nutrition is based in DNS and the position of Director of Graduate Studies in the GFN is held by a DNS faculty member. The Graduate School has a detailed policies governing graduate education at Cornell, as described in the <u>Code of Legislation of the Graduate School</u>. You are expected to be familiar with the Code as it pertains to your program and educational requirements and many of your questions will be answered by reading the code. They also maintain resources on their website that are up-to-date and helpful to students. Please familiarize yourself with these resources, which will be of great value to you as you navigate your degree at Cornell.

COURSE WORK FOR MASTER'S STUDENTS

Master's students are required to complete 60 credits, which includes both course credits and research credits.

The required courses are listed below, and the curriculum sheets for each track <u>are included in Appendix</u> <u>2</u>. As a graduate student, you may take classes in DNS or other departments. To view a complete list of available courses, visit the <u>course roster</u>.

First semester students

Course enrollment begins the week before classes begin; <u>information on enrollment</u> and other aspects of academic progress is available at the Graduate School website. Incoming MS nutrition students are automatically enrolled in GRAD 9012 with 12 credits and this will appear in Student Center. These credits are a place holder and will be adjusted at the end of the Add period to ensure you are enrolled in a minimum of 12 credits, which is the fulltime load for graduate students; students must ensure they remain enrolled in twelve or more credits after dropping courses. REMEMBER: The Add period ends before the Drop period and you cannot drop a class if you are at 12 credits. Students should consult the degree information and refer to the Curriculum sheet for their track (see Appendix 2) to inform course selection. Students may also consult faculty members, their research mentor and/or the Director of Graduate Studies to select courses for the first semester.

In the second half of every semester there is a pre-enroll period for the following semester. You will receive an email about the dates of pre-enroll. During the time between the pre-enroll period and start of the enrollment period, you cannot change your courses. However, changes can be made during the enrollment period, which opens prior to the start of the semester. Questions about the registration process should be directed to the Graduate Student Services Assistant, Ms. Doralee Knuppenburg.



Signing up for Research credits

The MS degree is a research-based degree and you must complete research credits; these credits contribute to the 60 total credits for the degree. When signing up for research credits it is optimal to enroll in NS 8990 for research (which has separate sections for each faculty member). You may sign up for 1-15 credits through Student Center. Generally, MS students enroll in at least 3 credits of research during their first 1-2 semesters, and more credits (e.g., 6-8 credits) in the summer and in later semesters. If you have questions about the mechanics of enrolling, please check with the Graduate Student Services Assistant, Ms. Doralee Knuppenburg..

Required Courses

Course requirements depend on the student's track and area of interest, but some classes are common across tracks and these are listed below. If you have had the clear equivalent of any of these courses in your prior training, please discuss this with your advisor, and if approved, you can replace that course with one that supports your training and career goals.

The required courses include the following:

NS 6310 (4 credits, fall) Micronutrients NS 6320 (4 credits, spring) Macronutrients NS 7030 (1 credit, spring and fall) Topics in Nutrition You must attend the seminar for 2 semesters and make one presentation. You do not need to register and/or attend NS7030 in the semester that you present. NS 6200 (3 credits, spring) Translational Research and Evidence-based Policy and Practice in Nutrition NS 8990 (variable credits) Master's Thesis Research BTRY6010 (4 credits, fall) Statistics I Students demonstrating statistical competence may substitute appropriate research design/methods course to further enhance quantitative skills (see electives)

Elective Courses¹

You will choose your elective courses based on your research interests and your research mentor's recommendation. These courses will help fulfill your minor requirements. Below are examples of elective courses. You also have the option of taking courses in other colleges in the university.

Nutritional Sciences

NS 3150 (3 credits, spring) Obesity (offered in alternate years; 2018, 2020, etc.) NS 3600 (3 credits, fall) Introduction to Epidemiology NS 4410 (4 credits, fall) Nutrition and Disease

¹ Undergraduate courses (course numbers in the 4000s or below) may be taken to support developing competency, but undergraduate classes do not contribute to the required 60 credits needed for the MS degree.



NS 6500 (3 credits, spring) Public Health Nutrition
NS 6140 (3 credits, fall) Topics in Maternal and Child Nutrition
NS 6190 (1 credit, fall and spring) Field Seminar
NS 6480 (3 credits, fall) Economics of Food and Malnutrition
NS 6520 (3 credits, spring) Epidemiology Foundations
NS 6580 (3 credits, offered in alternate years, even) Advanced Epidemiology: Theory and Practice
NS 6980 (1 credit, fall and spring). International Nutrition Seminar

Biometry/Statistical Sciences

BTRY6020 (4 credits, spring) Statistics II
BTRY 4140 (3 credits, fall) Applied Design (randomized designs)
BTRY 4110 (4 credits, spring) Categorical Data
BTRY 4270 (3 credits, fall and spring) Introduction to Survival Analysis
STSCI 4010 (4 credits, spring) Great Ideas in Statistics

Policy, Developmental Sociology and Sociology

PAM 6040 (3 credits, fall) Qualitative, Survey and Mixed Method Approaches to Policy Research
PAM 5300 (4 credits, spring) Cost Benefit Analysis
HD 6680 (3 credits, spring) Seminar in Translational Research: Bridging Research, Programs and Policies
DSOC 7500 (3 credits, spring) Food, Ecology and Agrarian Change
DSOC 6150 (3 credits, spring) Qualitative Research Methods
SOC 6310 (4 credits, spring) Qualitative Research Methods for Studying Science

<u>Other</u>

BIOMG 7510 (1 credit, spring) Ethical Issues and Professional Responsibilities **PAM 5520** (1.5 credits, fall) Health Care Services: Consumer and Ethical Perspectives

MASTER'S TRACKS

When you applied to the DNS Master's Program, you applied to a specific track. With approval of your Special Committee Chair and/or the Director of Graduate Studies if a committee has not yet been formed, a student can change their track. The only exception is the Dietetics track, which is only available to students who have completed the Cornell Dietetic Internship.

Dietetics Track: This track is only available to students who have <u>completed the Cornell Dietetic</u> Internship. This accelerated program continues directly from the 1-year DI with a summer and one year of additional research and coursework. The Master's Thesis is developed with the research advisor, i.e., the Chair of the student's Special Committee.

<u>Global Food Systems for Health</u>: This track focuses on the interrelationship among economics, food policy, and global food issues. The Master's Thesis is based on faculty research in global settings. Students may be required to travel for this research. The Master's Thesis is developed with the research advisor, i.e., the Chair of the student's Special Committee.



<u>Human Nutrition Evidence for Policy Making Track</u>: The emphasis of this track is the translation of evidence in nutrition. This course requires students to complete the WHO/Cochrane/Cornell Systematic Review Summer Institute. The Master's Thesis in this track is often based on a systematic review on a topic in nutrition. The Master's Thesis is developed with the research advisor, i.e., the Chair of the student's Special Committee.

<u>Individualized Track</u>: This track is designed for students working in the area of molecular nutrition. It is also an option for students to explore an area of interest under the direction of a faculty member in nutritional sciences where that area of interest does not fit into the DI, Evidence or Food Systems tracks. The Master's Thesis is developed with the research advisor, i.e., the Chair of the student's Special Committee.

ACADEMIC AND RESEARCH ADVISING

Choosing a committee chair/research mentor

It is very important for you to choose a chair/research mentor <u>by the end of your first semester</u>. You should review <u>faculty profiles</u> to find a faculty member who has research in an area of interest to you. We strongly encourage you to meet with potential committee members prior to inviting them to serve on your committee, to determine who will be the best fit for your research interests and goals, and whether their mentoring style is a good fit for you. If you have any questions about finding a chair, contact the Director of Graduate Studies by early November.

Special Committee

Your Special Committee will include two members representing your <u>major and a minor</u>: (1) your chair (research mentor) representing your major area of study and (2) one faculty member representing a minor area of study. A minor area of study refers to a minor in the Cornell Graduate School <u>Fields of</u> <u>Study</u>. Examples of minor fields selected by previous students are listed in the section titled, "Choosing a minor", in Appendix 1.

You will consult with your chair/research mentor to choose courses for your degree and the faculty member serving on your committee to represent a minor field of study will provide guidance on classes that fulfill the requirements of the minor.

The Special Committee must review your thesis and participate in your M Exam.

It is a graduate school requirement that Masters degree students must complete their special committee selection by the end of the second semester.

SUMMER EXPERIENCES

The summer between first and second year is dedicated to research. It is important for students to work with their chair/research mentor to set expectations and a timeline for summer work. The specific work hours and location will be decided by the chair/research mentor.



If a student wishes to leave campus for field work during the summer months, the trip must be approved by the chair/research mentor.

Students will enroll in research credits during the summer but will not be responsible for paying tuition.

TUITION

Master's students should expect to pay tuition for four semesters at Cornell. Master's students are not guaranteed teaching or research assistantships. If the Division's undergraduate teaching program has openings, then a Masters student may be offered the opportunity to serve as a teaching assistant (TA). *TAs will receive tuition assistance and be paid a stipend for the semester in which they serve as a TA.*

MASTER'S THESIS GUIDELINES

Graduate students will work with their chair/research mentor to develop a research project and write a thesis. It is important to choose a chair/research mentor by the end of the first semester to ensure there is adequate time to plan and work on the thesis.

The specifics of the research project and thesis will be decided upon by the Research Mentor and the Special Committee. In April of the first year, students and chairs/research mentors evaluate the academic progress of the student based on coursework and progress with the thesis project. You will receive an email request to complete this evaluation.

An MS thesis involves the completion of meaningful research that is completed with guidance and oversight and that may lead to a publication. Some advisors will require the MS student to write at least one publication-quality paper. Other students may focus on a thesis project that provides experience in discipline-specific methodologies, leading to a body of research that may not link directly to a publication. The format of a thesis can be as chapters or as a publication/paper option, and the Graduate Field of Nutrition approves the use of the <u>"paper option" for the thesis</u>.

After completing the Masters thesis, students will complete their <u>M Exam</u>, which is an oral exam about nutrition and the student's thesis topic. Each M Exam is different. Work with your chair/research mentor to ensure you are adequately prepared for the exam. This includes submitting the required paperwork **seven** days before the scheduled exam.

After the successful completion of the M Exam, students must submit the M Exam results and the final version of their Masters thesis. In order to officially graduate, students must submit everything before the designated date. This date varies from one year to the next, so you should check the graduate school's website on <u>understanding deadlines for your degree</u>.



GRADUATION AND CONFERRAL

Cornell has a graduation ceremony in December and May and offers graduation conferral in December, May and August. May is the large graduation ceremony and most students prefer to walk in the May graduation ceremony.

To meet the deadline for May conferral you must submit your final copy of your thesis, approved by your Special Committee, usually by the first week in May. This means your final daft will need to be submitted to your Special Committee by mid-March in most instances; this should be discussed well in advance with the Chair of the Special Committee.

If you cannot meet this deadline, you should discuss this with the Chair of your Special Committee and consider a plan to submit your thesis for the August conferral date (there is no tuition in the summer unless formal courses are taken). The graduate school typically allows students to participate in the May graduation ceremony in this instance.





IMPORTANT DATES AND DEADLINES

The Cornell MS program is a two-year program, beginning in August and ending in May. See below for important milestones.

The specific dates for May conferral change each year. Consult the Graduate School's <u>website</u> for specific dates.

First year	
November/December	Select Thesis Chair/Research mentor
March or earlier	Choose minor and select minor committee member
April	Complete Student Progress Review with chair/research mentor
Мау	Complete timeline for research project
	(Consult closely with chair/research mentor to create timeline)
Second year	
February/March	Schedule Master's Exam
	M Exam should be no more than 1 month before the end of classes
April	Complete Student Progress Review with chair/research mentor
4-6 weeks prior to M Exam	Provide committee with a final draft of Thesis
1 week prior to M Exam	Provide committee with FINAL draft of Thesis
At least 7 days prior to M Exam	Submit Schedule for <u>M exam form</u> to graduate school
At most 3 business days after M Exam	Submit <u>M exam Results form</u>
2 weeks after M Exam	Complete revisions recommended by committee, get final approval and submit thesis to the graduate school



GRADUATE STUDENT LIFE: NGSO

The purpose of NGSO (Nutrition Graduate Student Organization) is to promote camaraderie among the diverse graduate student body in the Division of Nutritional Sciences (DNS). All graduate students in the Graduate Field of Nutrition are automatically members and no registration is necessary. Broadly speaking, while all the graduate students in our Field are all interested in nutrition, we focus on very different things academically, at all scales ranging from individual cells to entire communities — and everything in between. Moreover, our sense of unity is physically challenged by the Division's sprawl across multiple buildings on campus. To overcome these challenges, the NGSO sponsors events throughout the year, providing opportunities for our graduate students to interact with one another, and with faculty and staff from across the Division. A second purpose of the NGSO is to act as a liaison between graduate students and the faculty and administration. For example, Division-wide faculty meetings always include a student representative from the NGSO. When necessary, NGSO also arranges meetings between the graduate students and faculty to address issues of concern for students that faculty can address, and vice versa. Finally, the NGSO strives to help new students in the Division make the transition into the program. The NGSO helps to plan and coordinate the orientation activities for prospective graduate students during the annual recruitment weekend. Additionally, all new students are invited to an annual NGSO-sponsored informal gathering to kick off the fall semester.

GRADUATE STUDENT LIFE

Life at Cornell varies for graduate students in Cornell's Division of Nutritional Sciences, but whether you are a parent or an international student or you worked for several years between degrees, one thing is certain: *there is a place for you here*. Instead of repeating information already provided in other parts of this handbook or other Cornell sources, we thought it would be best to paint you a chronological picture of what graduate student life may look like in the Division of Nutritional Sciences (DNS), provided by current Cornell graduate students.

FIRST YEAR:

As a first-year graduate student in DNS, you may initially spend some time familiarizing yourself with Cornell's beautiful campus. Places like Savage Hall, Martha Van Rensselaer Hall (or for short, "MVR"), the Human Metabolic Research Unit (HMRU) will probably become a second home to you since it's where most DNS students conduct their research. You may also participate in social events hosted by the Big Red Barn (just a 2 minute walk from Savage Hall) where you'll be able to meet graduate students from other departments at Cornell.

Outside of Cornell and in the Ithaca community, you may spend a Saturday evening getting to know people in your cohort over good food and drinks at Argos or Liquid State Brewing Company. It may be the first time you experience the leaves change color or snow fall on your commute to campus – whether it's



by taking the TCAT (the public transit system here) or by walking through Cascadilla Gorge which connects Downtown Ithaca to Collegetown and Cornell's campus.

You'll probably attend lab meetings of potential mentors you want to work with whose research topic interests you and go through several rotations until you find a good fit. You might also explore some courses from other fields that are of interest to you and that may eventually become your minor. As an MS student, your priorities during the first year are to decide which advisor you want to work with, finalize your minor and committee member, while balancing all of your research responsibilities and coursework.

You'll probably seek out advice from other DNS graduate students about best places to eat in Ithaca or classes worth taking or how to manage work-life balance. Hopefully, you'll also participate in social events hosted by the Nutrition Graduate Student Organization (NGSO) and maybe even volunteer for a board position at the beginning of your first or second year – where you'll have an opportunity to meet other graduate students outside of your research group. In your first year, you will probably feel lost and uncertain about the direction you're headed, but that's completely normal.

SECOND YEAR:

In your second year, you've probably gotten the hang of things – both academically and socially. The place you live at, whether it's an apartment or house or a shared space, is starting to feel more like home. You probably have gotten used to the unpredictable weather in Ithaca. You may have found some local spots both on and off-campus to study and work at, like Gimme Coffee at the intersection of Cayuga and Cascadilla.

You've probably interacted with other graduate students and faculty from different fields. In your second year as an MS student, your priority is scheduling your M exam and preparing your thesis / publication (if appropriate). All of this still comes with some uncertainty, but now the stress is more manageable. In your second year, you're most likely working on developing your professional identity and skills; and that may be by presenting in NS 7030, attending workshops through the Center for Teaching Innovation, mentoring and training undergraduate students in your lab or teaching assistantship, or becoming a board member of NGSO. You probably now have a solid network of people you know you can rely on and feel better prepared to complete your thesis.

It's important to note that this depiction of graduate student life in DNS is *not the same* for every student since each student brings their own unique perspectives and experiences to the program. While there are certain requisites and milestones expected from the program and the graduate school, you as a graduate student ultimately get to choose the type of experience on and off-campus that work best for you and your goals. There will be periods of growth and disappointment, but you are well-supported; everyone, including DNS faculty and peers, want to see you succeed personally and professionally.

For related information on graduate student life, please refer to the following Appendices:



- Appendix 1: Advice from Current Graduate Students
- Appendix 4: Cornell Resources for Graduate Students
- Appendix 5: Things to Do in Ithaca

Graduate School Resources

The Office of Academic and Student Affairs works with graduate faculty and graduate students on academic policy and programs, academic integrity and misconduct, responsible conduct of research, petitions requesting exceptions to graduate school policy as outlines in the Graduate Faculty's Code of Legislation, and academic progress and students status. The office also offers academic, writing and professional development programs, including proposal/thesis/dissertation writing boot camp, the Productive Writer email (Sign Up), Graduate Write-Ins, Productive Writing workshops, Fellowship Application Writing Workshops and Fellowship Listserv Tips, Productive Fellowship Writer Mailing List, Writing and Publishing Workshop Series, Three Minute Thesis Competition, and the Advising Guide for Research Students.

The Office of Inclusion and Student Engagement (OISE) supports an inclusive and welcoming environment for all graduate and postdoctoral scholars, but especially for those from marginalized communities and/or backgrounds historically excluded from and underrepresented in the academy. OISE supports systemic change and promotes a climate of diversity, belonging, equity, engagement, and achievement, which are integral components of graduate and postdoctoral education. OISE supports scholar success through recruitment, diversity fellowships, mentoring, professional, leadership, and community development programming, and ongoing support.

Recognizing that health and academic performance are intimately linked, the <u>Office of Graduate Student</u> <u>Life</u> is a source of information, support, and advocacy that creates a more student-centered graduate student life experience. In addition to being a first point of contact for students who are struggling or experiencing any form of distress, the Office of Graduate Student Life serves as a coordinating hub with campus-partners that focus on promoting a healthy and holistic student experience. More information on available support is available: <u>Help and Support: Graduate School</u>, <u>Faculty Resources</u>, <u>Facul</u>



GRADUATE SCHOOL CONTACTS

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OTHER IMPORTANT INFORMATION

BUILDING SECURITY AND KEYS

Weill Hall: access to information about access to Weill Hall can be found on the following web page: https://blogs.cornell.edu/whfs/about-our-team/access-to-weill/

Savage / Kinzelberg and MVR: Send Cathy Long a request for a key (cel3@cornell.edu) and she will notify MVR facilities to have the key ordered.

Biotechnology Building: Requests for keys are obtained by filling out the form below.

Key Control / Authorization Record Uzer Affiliation: Biotechnology Building
I. Authorization To Issue Keys:
Department: Biotech / Molecular Biology & Genetics / Microbiology / Nutrition
I Authorize to be issued Biotech (LAST NAME) (FIRST NAME) Building Access to the following areas:
Supervising Professor Or Manager Signature :
Date://
II. Receipt Of Keys:
I acknowledge receipt of the following keys:
ID #
I understand that:
a. key(s) are not to be loaned or given to others.
b. key(s) are not to be duplicated. c. key(s) are to be immediately returned to a Biotech Facilities Manager upon
termination of my affiliation with the department listed above.
d. that there is a \$5.00 per key replacement fee.
Applicant: Date: _/ _/



APPENDIX

APPENDIX 1: ADVICE FROM CURRENT GRADUATE STUDENTS

Anonymous Advice from a Fellow Cornell Grad

Perfection is overrated. "Good enough" has to do it in some areas of life, whether it be house cleaning and cooking or keeping in touch with distant friendships or being a perfect partner/parent/child or picking perfect language for what you are writing or designing your project. Choose options where you have the chance to learn and grow but you will also have a chance to complete them (with some pretense of timeliness) and sleep. Learn to say no if you aren't already skilled at it. If you are, learn to say yes. Try different conferences to network beyond who your advisor can connect you to. Don't forget to eat, actual real food. When you do, take a vacation and get someone else to hand you food to eat. Signed: Anonymous

A. FINDING A MENTOR:

- 1. Finding a mentor that you can connect with on a professional and personal level may help in fostering a productive and constructive relationship throughout your training.
- 2. Talk to potential mentors' current students regarding their mentoring styles and consider this along with what you know about the kind of mentoring that works best for your learning. You can also ask what the work/life balance is like and if you are expected to be on campus a certain number of hours per week.
- 3. Remember that when talking with potential mentors, you are interviewing them just as much as they are interviewing you! It should be a mutual good fit.
- 4. Sometimes graduate students find themselves torn between two potential advisors. Just know that even though you decide to commit to one as your committee chair, it does not mean that the other faculty member can't support you. You can still build a professional and personal mentorship with this individual even though you will not work in their lab.
- 5. For MS students, it is important to select a mentor by the end of the first semester, so that you have plenty of time to do your research within the two-year timeframe. For students in the Dietetics track, the timeline is even shorter, and you should pick your mentor by the beginning of the summer before your final year.

B. FORMING A COMMITTEE:

- 1. When selecting a minor/committee member, you may want to think about particular types of expertise that you would like represented at your two exams and committee meetings.
- 2. It may be helpful to have committee members with different academic ranks (e.g. assistant professor, associate professor) since those professors who have served in a lot of committees could provide insight to the whole process.
- 3. You should consider choosing committee members with skills and expertise you can gain that would be helpful in your career goals post graduate studies and not only because their work is relevant to your current research topic.



- 4. You should also consider what the individual is like as a person and what type of interpersonal dynamic they will create at the exams!
- 5. Have a close working relationship with most (if not all) of your minor/committee members. You learn so much from them and they are there to help round out your expertise.
- 6. If you need to extend your deadline to form a committee, you can fill out a petition.

C. CHOOSING A MINOR:

- 1. Start exploring your options during your first semester or early on since your minor member will also require some courses. Classes for minors without any specified required courses can be negotiated with your minor committee member.
- 2. Know that it is okay to schedule meetings with faculty for the purpose of learning more about their work, what minors they can be mentors for, and whether the individual would help you to develop any skills or expertise in which you are interested.
- 3. There are several considerations in selecting a minor: 1) One consideration is to pick a minor that support your research topic in terms of subject matter; there may also be the added benefit that some minor members related to your research may collaborate on your research and have laboratory equipment/expertise that would strengthen your dissertation but is/are not currently available for you to utilize; and 2) another consideration is to pick a minor that correspond with areas of expertise that you wish to acquire for future jobs
- 4. Your committee chair may give you some suggestions of minors that students in their research group typically choose. Examples of minors that previous students have chosen include epidemiology, immunology, genomics, applied economics, social research methods, public affairs, public policy, BMCB (biochemistry, cell and molecular biology), computational biology, physiology.

D. TYPICAL COURSEWORK:

- 1. Plan accordingly with coursework because many graduate courses are not offered regularly due to professors' schedules/lack of enrollment numbers.
- 2. Once you form your committee and pick your minors you will have a better idea of what classes you need to take in order to fulfill your major and minor requirements. You can take courses S/U, for a grade, or audit, as long as your committee is okay with it.
- 3. By the time you present in NS 7030, you may have already chosen your committee. Inevitably, there will be someone in the Division that you would've liked to work with, but who couldn't be on your committee, didn't represent one of your preferred minors, came to Cornell after your committee was chosen, etc. Use 7030 as an opportunity to work with these individuals and to expand your mentoring team beyond your committee or use this as an experience to work with potential committee members.
- 4. You can present in NS7030 without enrolling for the semester (i.e., you present during one class but do not attend the other classes). This is especially helpful if you have a class conflict but would like to get your presentation checked off the list.



E. RESOURCES

1. Conferences

- 1. It'll be helpful to talk to your mentor and other students in your research group to get a better idea of other conferences that are specific to your area of research. Some examples of conferences include:
 - 1. Food and Nutrition Conference and Expo
 - 2. International Congress of Nutrition
 - 3. Folic Acid, Vitamin B12, and One Carbon Metabolism FASEB Science Research Conference
 - 4. ENDO Endocrine Society annual meeting
 - 5. Socidedad Latinoamericana de Nutrición (SLAN)
 - 6. Obesity Week The Obesity Society Annual Meeting
 - 7. International Conference on Global Food Security
 - 8. Agriculture, Nutrition, and Health (ANH) Academy Week
 - 9. Micronutrient Forum
- 2. It may be worth the time to figure out in advance when the conferences you're interested in attending or presenting at will take place so you can plan accordingly. Most abstracts for posters or oral presentations at these conferences may have early deadlines.

2. Writing

a. A great writing support for international students: <u>ELSO</u> (English Language Support Office) offers free writing tutoring services, courses that help students to start writing research papers, as well as courses to help students complete their thesis/dissertation (highly recommended).

3. Faculty & peer support

- a. If you have questions or concerns, or just want a sounding board, it can be useful to chat with the DGS (currently Barb Strupp), or with someone in Grad School Student services, such as Janna Lamey.
- b. If you have questions, don't hesitate to reach out to faculty or fellow grad students. Older grad students in particular have experienced many of the same things you have/will and are willing to offer helpful advice (as others did for them). Remember, we are all in this together and no one should have to figure things out on their own (nor are they expected to!)

4. Research & Teaching Resources

- a. Consider attending workshops/trainings from the following campus resources:
 - 1. <u>Cornell's Center for Teaching Innovation (CTI)</u> if you're interested in gaining skills relevant to teaching, you may find their workshops helpful



- 2. <u>Cornell's Statistical Consulting Unit (CSCU)</u> if you want extra assistance on statistics, a statistical software like R, and data analysis, attend a scheduled workshop at CSCU or set up a consulting appointment
- 3. <u>Cornell Institute for Social and Economic Research (CISER)</u> provides remote computing resources for research and consultancy services for data management, acquisition, storage, reproducibility, etc. and holds workshops on both qualitative and quantitative software packages
- 4. <u>Qualitative and Interpretive Research Institute (QUIRI)</u> hosts seminars for faculty and students interested in qualitative research and the social sciences
- 5. <u>Cornell University Library</u> each library offers a variety of workshops for you to choose from. For example, if you are interested in identifying the best reference manager (software that is used to generate bibliographies, citations for papers, and generally keep track of all of the literature you find/read/are sent to read) such as Endnote, Mendeley, or Zotero, Mann Library occasionally has workshops that walk you through how to use each of them.
- b. Websites for Cornell trainings (e.g. BBP, IRB, Animal handling, etc.) that you may also find useful:
 - 1. CULearn: https://culearn.adminapps.cornell.edu
 - 2. IACUC/animal trainings: <u>https://www.iacuc.cornell.edu/training/</u>
- c. The Cornell Graduate School also hosts plenty and a variety of professional development events. You should be receiving weekly emails from them every Monday!
- d. Consider applying to other opportunities from other universities. For example, Syracuse University hosts a <u>Summer Institute for Qualitative and Multi-Method Research</u> in June which requires an application due usually by November/December of the preceding year and is a competitive process.

H. NON-ACADEMIC ADVICE:

1. Getting Social:

- 1. Consider joining a working group on campus! Not only could you use that space to bounce ideas off of students from other fields, but you may also develop friendships along the way!
- 2. Tell Grads It's Friday (TGIF): Come to the Big Red Barn on Fridays at 4 p.m. for \$1 beers and the opportunity to chat with fellow grads within and outside of our field! It may seem a bit trivial, but the community built and informal conversations that come along with these have and I'm sure will continue to shape my graduate experience.
- 3. "It wasn't until I started exploring the surrounding community and attended community events that Ithaca started feeling more like home. It may feel like a small town to those who come from larger places, but its size belies all that it has to offer beautiful hiking, community sports clubs, festivals, a variety of theaters showing new and old movies, plays, singers and comedians, shopping on the Commons, an amazing assortment of restaurants (many of which participate in 'restaurant weeks' throughout the year where you can try their fare at a discounted price), First Friday events, free concerts, and much more.



4. Cornell outdoors education has a lot of amazing opportunities for students (climbing, camping, kayaking, etc.). The Cornell Outings Club is an excellent listserv for anyone who wants to find people to go do things outside with.

2. Finding Housing

- a. I would recommend finding (and in some cases, potentially spending a little extra money on) a space in which you can truly feel 'at home'. We work long hours, so coming back to somewhere you can really relax, feel comfortable, and unwind is worth the money.
- b. Cornell has lots of resources for learning about how, where, and what to look for in housing: <u>https://gradschool.cornell.edu/admissions/admitted-students/living-inithaca/housing/</u>.
- c. Most longer-term (1 year) rental opportunities in Ithaca can be found on Craigslist, and sublets are often best found through Cornell Housing Facebook groups, you can get a great deal if you're only going to be in Ithaca for a semester. For normal rentals, don't delay; most leases are signed by October or November a year before the lease starts!

3. Support for Families

- a. Cornell offers childcare grants as well as resources for partners (e.g. employment workshops and partner/spouse happy hours at the Big Red Barn): https://studentswithfamilies.cornell.edu/.
- b. Graduate students are entitled to paid parental leave when they have or adopt a baby: <u>https://gradschool.cornell.edu/policies/maternity-and-paternity-options-parental-accommodation/</u>



APPENDIX 2 – CURRICULUM SHEETS FOR THE VARIOUS TRACKS

Individualized Track Year 1							
Fall Course Number/Name	Credits	Spring Course Number/Name	Summer				
NS 6310: Micronutrients	4	NS 6320: Macronutrients	4	NS 8990: Master's Thesis and Research			
BTRY 6010: Statistics I	4						
NS 7030: Nutrition topics ²	1	NS 7030: Nutrition topics ²	1				
NS 8990: Master's Thesis and Research (minimum)	3	NS 8990: Master's Thesis and Research (minimum)	3				
Electives or research credits – see list	6	Electives or research credits – see list					
Total	18	Total	al 15				
		Year 2					
NS 7030: Nutrition topics ² (present)	0	NS 6200: Translational Research and Evidence-based Policy and Practice in Nutrition	2				
NS 8990: Master's Thesis and Research (minimum)	6	NS 8990: Master's Thesis and Research (minimum)	6				
Electives or research credits – see list	5-6	Electives or research credits – see list	2-4				
Total	15	Total	12				



Global Food Systems Track Year 1							
Fall Course Number/Name	Credits	Spring Course Number/Name	Credits	Summer			
NS6310: Micronutrients	4	NS6320: Macronutrients	4	NS 8990: Master's Thesis and Research			
BTRY6010: Statistics I	4			WHO/Cochrane/Cornell Summer Institute			
NS7030: Nutrition topics	1	NS7030: Nutrition topics	1				
		NS6520: Epidemiology foundations	3				
NS6450: Sustainable Global Food Systems	3	NS6480: Economics of food and malnutrition	3				
Food systems journal club	2	Food systems journal club ²	2				
Electives or research credits – see list	3	Electives or research credits – see list	3				
Total	18	Total	15				
		Year 2					
NS 7030: Nutrition topics ² (present)	0	NS 6200: Translational Research and Evidence-based Policy and Practice in Nutrition	2				
Electives or research credits – see list	5-6	Electives or research credits – see list	2-4				
Total	15	Total	12				



Track in Human Nutrition Evidence for Policy Making Year 1						
Fall Course number/name	Credits	Spring Course	Credits	Summer		
		number/name				
NS 6310: Micronutrients	4	NS 6320: Macronutrients	4	NS 8990: Master's Thesis and		
				Research—advance		
				preparation for Summer		
				Institute and thesis topic		
BIRY 6010: Statistics I	4			WHO/Cochrane/Cornell		
	4		1	Summer Institute		
NS 7030: Nutrition topics	1	NS 7030: Nutrition topics				
NS 8990: Master's Thesis and	3	NS 8990: Master's Thesis and	4-6			
	12		9_11			
	12	BTRY 6020: Statistics II	4			
		NS 6520: Epidemiology	3			
		Foundations				
Elective – see list	4-6					
Track Subtotal	4-6	Track Subtotal	7			
Total	16-18	Total	16-18			
		Year 2				
Fall Course number/name		Spring Course number/name		Summer		
NS 7030: Nutrition topics ²	0	NS 6200: Translational	2			
(present)		Research and Evidence-based				
		Policy and Practice in				
		Nutrition				
NS 8990: Research/Project	4-6	NS 8990: Research/Project	6-8			
Core Subtotal	4-6	Core Subtotal	8-10			
NS 6140: Topics in Maternal	3	Elective – see list	4-6			
and Child Nutrition, OR						
NS 3150: Obesity and the						
Regulation of Body Weight						
NS 6580: Advanced	3					
Epidemiology Theory and						
Practice (includes data						
analysis hands-on project)						
Track Subtotal	6	Track Subtotal	4-6			
Total	10-12	Total	14			



Modified Core MS & Dietetics Track Course Plan Year 1					
Fall		Sp	oring		Summer
NS 6250 Nutrition in Action (Dietetics track requirement)	3§	Clinical dietetics su practice (693 hours Track requirement	pervised s; Dietetics)	NA	GRAD 9016 (6 cr) Research project (includes 180 hours of community nutrition supervised practice plus additional research related to pilot community nutrition research project)
NS 6350 Intro to Community Nutrition Research (Dietetics track requirement)	3	Management diete supervised practice hours; Dietetics Tra requirement)	etics e (250 ack	NA	Complete registration exam to become RD
NS 5550 Leadership in Dietetics	2				
(Dietetics track requirement)					
Community Dietetics Supervised Practice (348 hours; dietetics track requirement))	NA				
Total credits	8			0	6
		Year 2		<u> </u>	
NS 6310 Micronutrients	4 [§]	NS 6320 Macronut	rients	4	
BTRY 6010 Statistics IA	4	NS 6520 Epidemiol	ogy	3	
NS 6140* Topics in Maternal and Child Nutrition (Modified Core Requirement) <i>OR</i> NS 6400* Social Science Theories in Nutrition (Modified Core Requirement)	3	NS 6200 Translatio Research and Evide based Policy and P Nutrition ^{§§}	nal ence- ractice in	2	
Electives	3-5	NS 8999 Dietetics F Publishing	Research &	2	
NS 8990 – MS thesis research	2	Electives OR NS 3150* Obesity	3		

Modified Core MS & Dietetics Track Course Plan Year 1						
NS 7030 Nutrition Topics**	1	NS 7030 Nutrition Topics**	1			
NS 6190 Field Seminar 1 NS 6190 Field Seminar 1						
Total credits	18- 20		14- 16			

*MS Dietetics tract requires completion of 2 of the following 3 courses: NS 6140, NS 6400 (both in fall), or NS 3150 (in spring). Substitutions are allowed with approval of the MS Committee Chair/research mentor and the DGS.

§ credits

^Those students demonstrating statistical competence would substitute appropriate research design/methods course to further enhance quantitative skills; a list of courses will be provided. ** attend two semesters, present one semester

§§includes nutrition status indicators, dietary assessment methods, food composition, anthropometry, biological markers as well as broader study design introduction

Approximately **48 credits of coursework** are completed in the MS in Dietetics tract and 1475 hours of supervised practice are completed as part of the accredited Cornell Dietetic Internship learning plan. Because interns are In Absentia for the bulk of the supervised practice hours in clinical and management rotation, no formal credit is assigned to this part of the DI relative to the MS-Dietetics tract. Because interns have not applied yet for the MS Dietetics Tract in the fall, no formal credit is assigned to the community nutrition supervised practice. Formal credit for the supervised practice in research is included through 8 hours of NS 8990 in the summer session. However, noteworthy is that the other MS tracts require 12 more credits of formal coursework and do not include supervised practice.

In the **first year** required courses are listed first, comprising 8 credits for the year. Next are the supervised dietetics practice hours that are required as part of the accredited Cornell Dietetic Internship learning plan.

In the **second year**, required modified core courses are listed first, comprising 11-13 credits/semester. Electives, research/project credits, and one seminar presentation comprise the remaining credits.





APPENDIX 3 – GUIDELINES FOR NS 7030 SEMINAR

The NS 7030 seminar is designed to:

- A. Develop an understanding of the breadth of nutrition research which has been exploding over the last decade as more and more scientific methods and points of view are applied to nutrition. Nutrition research now ranges from the sub-molecular to policy sciences, includes qualitative and quantitative methods, and is applied with varied points of view from many disciplines.
- B. Develop the capacity to critically evaluate published studies in each of these diverse areas that comprise nutritional research.
- C. Develop the capacity to present nutritional research to a general audience. The background of the faculty and student audience of NS7030 is so broad that the only common denominator is undergraduate chemistry and biology. This common denominator is also that of many audiences that nutritional scientists and practitioners will later wish to impress and influence, including audiences of the National Academy of Sciences and the Institute of Medicine.

POLICIES FOR NS 7030: Please refer to these notes before giving your seminar

- 1. NS 7030 is offered as S/U grade ONLY. Credit will be given as follows:
 - Attendance at the seminar is required of all new graduate students during their first semester.
 - Master's students must attend NS 7030 for a total of 2 semesters, and make 1 presentation.
 - **Doctoral students** may meet the attendance and presentation requirements for NS7030 in one of two ways:
 - (a) 3 NS 7030 presentations and 5 semesters of NS 7030 attendance OR

(b) 2 NS 7030 presentations, 4 semesters of NS 7030 attendance, and successful completion of the one-semester course, NS 7040 - Grant Writing, taken preferably in the second year of graduate study. (In this option, doctoral students may substitute the grant writing course for 1 presentation and 1 semester of attendance of 7030.)

Thus, the presentations are to be given AFTER the first semester of attendance. An unsatisfactory presentation will not be counted towards fulfilling these requirements. If the student has completed a M.S. at Cornell, the 7030 seminars for the M.S. will be counted towards the total needed for the Ph.D.

 The intention of the 7030 seminar is to offer DNS graduate students the opportunity to learn and practice giving professional seminars to an audience with knowledge at the level of a B.S. in Biological Sciences. In addition, students are expected to learn through seminar discussions how to



critically evaluate published studies in the many diverse areas of inquiry that comprise nutritional research.

- 3. Students are required to read each article that will be presented and come to class prepared to ask a question of the speaker. If there is a lull in the questioning, a student may be called on to ask a question.
- 4. Students should fill out an assessment form on Canvas following each seminar. Attendance will be deemed satisfactory if it encompasses the whole of the presentation and the student's assessment form is submitted following each presentation. If a student is unable to attend all the required presentations (e.g., due to illness), he/she should discuss the situation with Prof. Strupp. These absences must be made up by writing a critical review of the article that was presented at the missed class period.
- 5. There are exceptional circumstances when the student may wish to complete one semester of attendance over two semesters (e.g., due to travel necessitated by their dissertation research). These arrangements must be agreed upon in writing before the end of September for the Fall semester and before the end of February for the Spring semester.
- 6. The seminar speaker should present a recent paper selected from a peer reviewed journal. Students are encouraged to select papers for presentation within an area of expertise of a faculty member, either within or outside DNS, who will attend the seminar presentation and serve as the student's mentor for the presentation. The mentor must be a member of the Graduate Field of Nutrition. Students should consult a faculty mentor well in advance of the presentation date. It is generally recommended that the mentor be someone other than your thesis committee chairperson, but this is not mandatory. These seminars are not examinations of a student's competence in subject matter, but are designed to be a learning experience in presenting research findings. For beginning students, the faculty mentor is expected to give advice on the choice of papers to be presented and on the format and content of the presentation.
- 7. Speakers should submit a signed faculty approval form to the course administrator, at least <u>THREE</u> <u>WEEKS</u> before the date of the seminar along with a copy of the article. The article will be posted on the NS 7030 website in Canvas. The presenter should send the course administrator a pdf of the article to be presented, and a PDF of the slides that will be presented, which will be posted for canvas.



APPENDIX 4 - CORNELL RESOURCES FOR GRADUATE STUDENTS

Cornell Graduate School

- <u>Admissions</u>
- Financial Support
- Diversity and Inclusion
- <u>Career and Professional Development</u>
- Graduate Student Communities
- Graduate Student Perks and Discounts

Mann Library Resources

- Mann Library
- <u>Consultation Services</u>
- Evidence Synthesis Service for Systematic Reviews
- Disciplinary Science Team

Center for Teaching Innovation Graduate Student Resources and Training

- <u>Center for Teaching Innovation</u>
- TA Resources
- TA Online Orientation
- Workshops and Webinars
- Graduate Student Training Programs
- Graduate Student GET SET program

Student Disability Services

• <u>Student Disability Services</u>

Mental Health Resources

- Cornell Health Mental Health Care
- <u>24/7 Phone Consultation</u>
- EARS peer counseling
- HEAL peer to peer support in Mandarin



APPENDIX 5 - THINGS TO DO IN ITHACA

Things to do in Ithaca

Arts and Culture:

- Ithaca Farmers Market
- John Hartell Gallery
- <u>Museum of the Earth</u>
- <u>Ithaca College Theater</u>
- Ithaca Commons
- <u>Cornell University Schwartz Center for Performing Arts</u>
- <u>Cornell University- Herbert F. Johnson Museum of Art</u>

Local Festivals

- <u>Apple Harvest Festival</u>
- Ithaca Festival
- Gallery Night
- <u>Summer concert Series</u>
- Winter Lights and Bites
- <u>Chowder Cook off</u>
- Chili Cook off

Vineyards and Wine Tasting and Cideries:

- <u>General link to Cayuga Lake wineries and Cideries</u>
- Cayuga Lake Wine Trail
- <u>Seneca Lake Wine Trail</u>
- <u>Keuka Lake Wine Trail</u>

Local State Parks, Waterfalls and Walks

- Fillmore Glen
- Buttermilk Falls
- Robert H. Treman State Park
- <u>Taughannock Falls State Park</u>
- Black Diamond Trail
- Ithaca Falls

Local Fruit Picking and Farms;



- Indian Creek Farm
- Little tree Orchards
- Grisamore Farms
- Halls' Hill Blueberry Farm
- Hillberry Farms

Cornell Campus to Campus Bus Service – Trips to New York City

• Campus to Camus Bus

Nearby Airports

- Ithaca International Airport
- Elmira Airport
- <u>Syracuse Airport</u>
- <u>Rochester Airport</u>
- Buffalo Airport

Ithaca Restaurants:

- Ithaca Bakery
- Purity Ice Cream
- Moosewood Restaurant
- Ithaca Beer Company
- MIX Kitchen and Bar
- Mia Tapas Bar and Restaurant
- <u>Agava</u>
- Saigon Kitchen
- Taste of Thai
- The Heights Café and grill
- Hound and Mare
- The Greenhouse Café and Cocktail Lounge
- <u>The Rook</u>
- <u>Tamarind</u>
- <u>Allechant</u>
- Bickering Twins Restaurant & Tequila Bar
- <u>Thompson and Bleeker</u>
- Franco's;
- <u>Kilpatrick's Publick House</u>
- <u>Kimchi</u>
- <u>Spicy Asian</u>
- <u>Hawi</u>





<u>New Delhi's Diamonds</u>

APPENDIX 6 - CORE RESOURCES AVAILABLE TO DNS GRADUATE STUDENTS

Departmental Equipment:

Sable Systems Promethion Metabolic Screening System (16 individual units) used to quantify mouse movement, food/water intake, metabolism, and substrate (carbohydrate and lipid) utilization. LightCycler 480 II Real-Time PCR (qPCR) is required for performing quantitative real-time PCR. BioRad MyCycler Thermal Cycler gradient-enabled thermal cycler used for conducting PCR.

NanoDrop 200C UV-Vis Spectrophotometer is required to precisely measure nucleic acids (DNA and RNA) and protein concentrations. This is a critical step for many downstream molecular biology applications such as PCR, molecular cloning, ELISA, western blotting, and others.

BeckmanCoulter Optima L-90K Ultracentrifuge is utilized for separation of subcellular fractions by high-speed centrifugation.

EMD Millipore Simplicity Ultrapure Water System distills and deionizes water. Ions in water often interfere with biochemical assays.

Sorvall RC-5C Plus Centrifuge is used for phase separation by centrifugation (fundamental for RNA, DNA, and protein extraction protocols).

Beckman Coulter Scintillation Counter is used for measuring radiolabeled tracers for cell growth and DNA synthesis assays.

Tecan Spectrafluor Plus Microplate Reader is used for conducting biochemical, enzymatic and ELISA assays for measurement of reactive oxygen species, apoptosis, and other enzymatic activities in cells/tissues. These assays could be colorimetric, fluorescent or luminescent. This plate reader capable of performing all three types of measurements.

Agilent Seahorse XFe24 Analyzer measures the rate of change of dissolved oxygen and pH in the media immediately surrounding living cells cultured in multi-well plates.

Nexcelom Celigo Imaging Cytometer for high-throughput brightfield and fluorescent cell imaging of either live or fixed cells cultured in multi-well plates.

Protein Simple FluorChem E System detects chemiluminescence from Western Blots over a 5-log dynamic range using a high-resolution charge couple device (CCD) sensor

Shimadzu TQ8030 GC/MS-MS is a triple-quadrupole gas chromatograph/mass spectrometer capable of fragmenting analyzed masses for improved signal-to-noise and sensitivity in stable isotope tracer experiments and metabolomics measurements.

Leica CM1950 Cryostat is used for sectioning tissue.

Shared Resources Facilities and Research Interest Groups

Facilities:

<u>Cornell Institute of Biotechnology</u>—an umbrella for several campus-wide shared facilities including:



Bioinformatics facility: cloud computing and data storage

Flow Cytometry Facility: cell sorting and analysis

Genomics Facility: Sanger and "next-generation" sequencing and sample prep/QC

<u>Imaging Facility</u>: confocal microscopy, high-resolution X-ray Computed Tomography, high-resolution ultrasound, laser capture microdissection

<u>Proteomics and Metabolomics Facility</u>: targeted and non-targeted metabolomics, proteomics, useroperated HPLC and HPLC-MS

Human Metabolic Research Unit (HMRU): infrastructure for investigators in the Division of Nutritional Sciences who conduct research involving human participants

Stem Cell and Transgenic Facility: design and production of transgenic mouse models

<u>Animal Telemetry/Surgery Core</u>: provides research labs with a resource for assistance with mouse surgical procedures

<u>Transcriptional Regulation & Expression Facility</u>: provides end-to-end genomics profiling services including RNAseq, small RNA sequencing, and ATACseq

Interest groups:

<u>Center for Vertebrate Genomics (VERGE)</u>: enhancement of research and education in vertebrate genetics and functional genomics at Cornell

<u>Cornell Stem Cell Program</u>: part of NYStem program fostering cross-disciplinary collaborations among laboratories studying stem cells

<u>Comparative Cancer Biology Program</u>: facilitates comprehensive interdisciplinary training and rigorous hypothesis-driven research in comparative cancer biology

<u>Cornell Center for Immunology</u>: builds synergistic collaborations to enhance research capacity and scientific discovery in immunologic sciences

<u>Cornell Neurotech Collaboration</u>: developing technologies and powerful new tools needed to reveal the inner workings of the brain, with a particular focus on how individual brain cells and complex neural circuits interact at the speed of though

