Graduate Student Orientation

Department of Atmospheric Sciences, University of Utah

2019-2020

Contacts

- Nola Lucke, Administrative Manager
- Holly Moreno, Academic Coordinator
- Dr. John Horel, Department Chair
- Dr. Court Strong, Director of Undergraduate Studies

Contact Information

atmos-office@lists.utah.edu

801-581-6136 (Nola) 801-581-6137 (Holly)

801-581-7091 (John) 801-585-0049 (Court)

YOUR CONNECTIONS

Advisor & Research Group	Other Students & Faculty	Dept Office, Faculty, Staff
College/Epicenter CHPC	Graduate Office	Campus Services

BE INVOLVED!

Department Seminars

College Cohort Orientation Course

GCSC Seminars

AMS Student Chapter

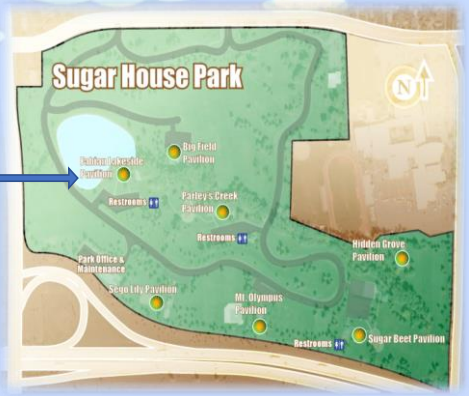
SkiWeather.com

Other Campus Groups

UNIVERSITY OF UTAH ATMOSPHERIC SCIENCES PICNIC!

FRIDAY, AUGUST 23
5:30 PM - 9:00 PM

Lakeside Pavilion,
Sugarhouse Park 2100 South
1330 East
Salt Lake City



RSVP by evite: http://bit.ly/2KCwvlb

•Who: Students, staff, faculty, alumni, family, and friends!
•What: Refreshments provided. Feel free to bring a side dish, but not required.
•Why: We haven't had a picnic in several years. We especially encourage our alumni and friends in the local community to come!

ATMOS 6910-11

- Discuss with your advisor whether to take for credit the elective course: *College of Mines and Earth Sciences Tools for Success in Graduate School and Beyond*
- *This is voluntary*
- This course is designed to introduce students to a wide range of resources available at the University of Utah that can contribute significantly to each student's ability to have a healthy, rewarding and successful academic career
- 2:00-2:50 PM Wed in 295 FASB. 1 unit
- Register for the above or register for the Dept Seminar (3:00-4:30 Wed, 295 FASB) or both if appropriate

Getting to know one another

- What factors contributed to your decision to come to the Department of Atmospheric Sciences at the University of Utah?
- How did you describe the Department's brand or identity? What about the brand or identity of the College of Mines and Earth Sciences, University of Utah, Salt Lake City, and Utah?
- Rank (1-low, 10 high) the relative importance of the attributes that you might obtain while you are a graduate student.
- What do you imagine you would like to be doing in 10 years?

Universal Skills for Geoscience Graduate Student Success in the Workforce

Geoscience Employers Workshop Results

Sharon Mosher, University of Texas at Austin
Jeff Ryan, University of South Florida

Sponsored by

National Science Foundation
WHERE DISCOVERIES BEGIN

Geoscience Employer Workshop
Oct. 2018

- **~52 participants representing broad spectrum of geoscience employers of PhD & MS students in Earth, Ocean & Atmospheric Sciences**
  - Industries, Non-profits, other organizations: Weather/climate, Energy/natural resources, Oceans/fisheries, Environment, Reinsurance/hazards
  - Government agencies – NASA, NOAA
  - Research labs & universities
  - Professional societies

- **Discuss & provide feedback to academia on skills & competencies needed by PhD & MS students for current and future workforce**
  - Build on results of Future of Undergraduate Geoscience Education initiative & National Academy & Council of Graduate Schools Graduate STEM reports
  - Define geoscience skills & competencies needed for MS & PhD graduates
  - Discuss methods for developing skills & competencies & employers role
  - Discuss balance between preparing for workforce, research and general educational goals
- **Determine next steps towards completing & implementing vision**
  - Role for Industry, Government Agencies, Universities & Professional Societies

Expectation of Employers

- **What employers expect?**
  - Writing and communication
  - Capacity for learning/adaptable
  - Systems approach
  - Programming, simulation, data skills, etc.
  - Problem solving & critical thinking
- **Employers will provide:**
  - Specialized job training as needed
    - In house or professional programs outside of the company
- **Workforce of the Future (10 years)**
  - Different programming languages
  - More data centric in all fields, changing algorithms and emphasis
  - Visualization and simulations

Image Via: acsundergrad.wordpress.com

What skills and competencies make PhD and MS graduates successful in the workplace today (and future)?
And what do they lack?

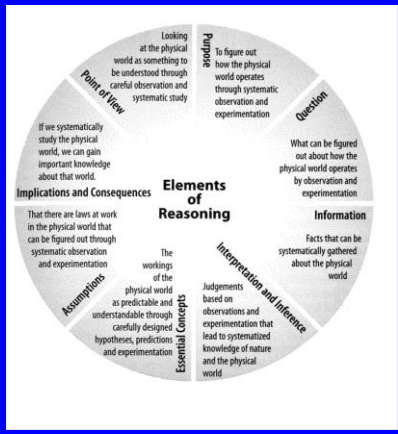
- **Need Expertise/Depth in core area → leads to judgment and confidence**
  - **Core technical skills in relevant area of expertise is absolutely necessary**
  - **Deep understanding of the fundamentals/ mechanics of the techniques/methods using in work**
  - **Having foundational skill set – good education in the geosciences**
    - **Breadth in core area, grounding across all sciences**
    - **Course background in their field – even if switched fields from undergrad to grad**
- **Graduates generally are coming with very strong technical skills**
  - **Knowledge in their field of geosciences**
  - **Research skills; field skills**

Most Important Skills – regardless of discipline

- **Problem solving & critical thinking**
  - Pragmatic critical thinking, logical thinking
  - Flexibility, open-mindedness
  - Defining problem and applying an appropriate solution
  - Establishing what is a sufficient solution vs. a precise and complete solution
  - Translating the problem to the -- so what?
    - Articulate importance of outcomes
    - What decisions will be made based on the work you are doing
  - Understanding the broader impacts of your research and how to communicate those impacts

- ***Independence in critical thinking, and problem development, execution and analysis skills***

Many graduates struggle with being able to define a problem and identifying how to apply the solution
(but could solve the problem)



- **Teamwork, Collaboration** ***(generally lack)*** 😔
  - **Ability to work with other scientists & other trained individuals towards your goal**
  - **Ability to get others to work together; deal with conflict**
  - **Valuing diversity of thought**
  - **Developing self-awareness & recognizing skills among ourselves & people around us**
  - **Evaluating expertise, knowing your own strengths**
  - **Being coachable; taking directions; leading**

- **Leadership -- in science, education, public policy/politics, business**

- **Communication** (common limiting factor)
  - written, verbal; external and internal

  Expressing technical work effectively to appropriate audiences

  - Technical writing & verbal communication
    - within specialty and other science & engineering fields
    - to non-technical audiences, management, pubic, press
  - Be able to convey complex material in a simple way
  - Express ideas logically
  - Be comfortable speaking with people when English is not their first language
  - *Be able to communicate societal and/or financial impacts*
  - **Skill in editing – evaluate critically & accept criticism**
    - Evaluate/recognize credible sources
  - **Listening Skills**
    - High sensitivity to audience – reading the room
    - Pay attention to what others say
    - Answer questions asked & logically

Research Skills

Currently need and increasingly important in the future – across employer spectrum

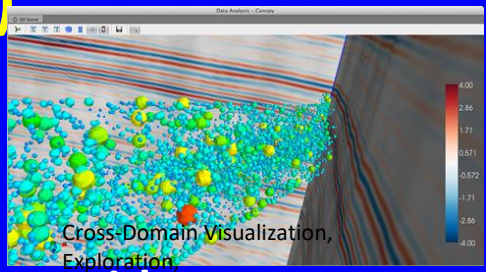
➢ **Data Management & Data Analytics**

- **Awareness of data analytics, the applications, and usage process** (Answers questions we have not framed yet)
- **Dealing with Big Data & Datasets**
- **Knowing how to examine datasets to draw conclusions about the information contained**

- **Data Acquisition --**Data collection – types of data, data sources – and credibility, available tools, how to access
- **Data Management & Analysis**
  - **Use data effectively & have proficiency at managing**
  - **Look at data from different perspectives (e.g. air, ground, etc.) & synthesize**
  - **Understand how to use various types of data; what tools to analyze, how to organize**
  - **Data Manipulation – adding, deleting & modifying data, retrieving data from dataset**
  - **Learn/develop new ways for data management & analysis & synthesis**

➢Data Management & Data Analytics (cont.)

- **Data Integration**
  - Merging information/data to solve problem
  - Integrating different types of data; synthesize
- **Data assimilation** – sequential updating of model forecast with new observations
- **Data quality** –understanding, evaluating, using data of different qualities
- **Visualization & Modeling --** Data simulation, display; ability to model & know limits of modeling; immersive Virtual Reality data exploration
- **Valuation:** how valuable is the data - monetizing
- **Other data science** - e.g., Machine Learning, AI, computer science, robotics – increasing in future

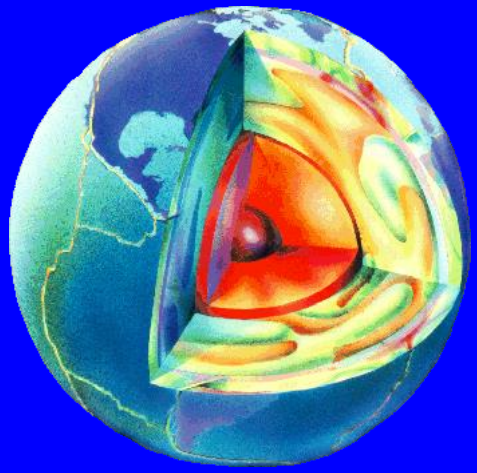


- **Computational skills**
  - More need for computational skills but within the ability to make observations
    - **Basic programming skills**
      - Scripted languages
    - **Coding** - able to code
      - Translate older code to newer codes and systems that are more effective
    - **Ability to analyze algorithms** (with increase in Machine Learning & AI)
    - **Keep up with transition from Supercomputing to Cloud computing**
      - Cloud data manipulation and storage for big data
    - **Modeling** – be able to develop, analyze and evaluate models
  - **Basics of statistics and math** [should have from undergrad]
    - **Statistics** - communicating certainty
    - **Higher math** - including calculus, differential equations, linear algebra

- *Embracing technology not only as users but as creators*
- *Willingness to step outside of the box to engage in genuine innovation*

- **Systems Thinking**
  - Need individuals that can look at the big picture of a system, go from big to small to solve the problem
  - Can view the whole system and drill down to details and limitation

- **Earth System Thinking**
  - Earth as a interactive system
  - Complex, non-linear, coupled system
  - Interaction between different processes



Important Concepts & Abilities

- Scientific process
  - Observe, characterize, understand, model, predict, verify
- Importance of simulation
- Good grasp of uncertainty
- Scalability of space and time
- Awareness of Risk and Impact
- Application driven questions

- Internal drive to do well
  - Overcome inherent risk aversion in adopting new technology to address major problems
  - Overcome prevalence of fear of failure
- Willingness to be a life-long learner – learn how to learn
- Societal Connection
  - Understand research needs a purpose

- Diverse and Adaptable skill set
  - specifics less important, but rather evolution potential

Additional Professional Skills

- **Project & Program Management** (generally lack)
  - Understanding budgets, project financials
  - Managing people, multidisciplinary projects
  - What factors are driving the decision-making process?
  - Manage time & resources
  - Know how to run a meeting (agenda, time management, relevance, etc.)
- **Time-value concepts – understand**
- **Business Skills** (need much better skills)
  - Economic, data-driven decision-making; risk, uncertainty
  - Innovation & entrepreneurship
  - Leadership, teambuilding, finances/budgeting, project management, problem solving
  - exposure to basics of business, operations, etc.

- **Ethics & Professionalism**
  - Integrity and its importance to science & research process
  - Understanding plagiarism, self-plagiarism
  - Proper attribution to original source
  - Rules for scientific citation and research
  - Knowing how to search for research

Boardeffect.com

- **Social dynamics** (generally lacking; limiting) 😔
  - **People skills** –interpersonal behavioral and cultural
    - Ability to work with people who are different & from different cultures
  - **Corporate skills** – culture clash: academia vs industry, government & business
    - Be able to distill everything down to making it relevant to the CEO or Manager
    - Time - value of money
    - Learning how to take direction – directed work

- **Organizational Management Skills**
  - **How to run a meeting (agenda, time management, relevance, etc.)**
    - **Students rotate to run lab meetings?**
  - **Give concise and organized communications to a group**
    - **AGU-style talks; elevator speeches**
  - **Exposure to a chain of command and business culture**
    - **Foreign in academic settings but need to explore**
  - **Time management for self and in interaction with colleagues**

What level of competency is needed?

PhD – Expert; MS – Mastery

- Expertise/depth in core area
- Critical thinking & problem solving

PhD & MS – Mastery

- Communication including written, verbal, external and internal
- Flexibility open-mindedness, collaboration, teamwork, networking

PhD – Mastery; MS – Proficiency/Mastery

- Coding, computer science/programming
- Statistics, data analysis, data display, data analytics
- Higher math including calculus, diff equations, linear algebra

What level of competency is needed?

PhD – Mastery; MS – Proficiency

- Systems thinking
- Breadth in core area, grounding across all sciences
- Project management
- Real-world career and applications awareness
- Scientific uncertainty

PhD – Mastery; MS – Aware

- Economics, data-driven decision making , risk, uncertainty, general business skills

PhD – Aware/Proficiency; MS – Aware

- Other data science, e.g., machine learning, computer science, robotics, blockchain, etc.

Need for Integration

- What distinguishes a PhD/strong researcher?
  - A deep technical dive into one subject
  - Ability to discover, own, and solve a problem independently
  - High level of creativity and innovation
  - Ability to create new knowledge
- Need to integrate these identified skills without losing the strong research emphasis
- Make many of the non-core research skills part of program culture

Professional Development

- Training on how to get a job
  - Resumes, applications, interviews,
  - Where to search
  - Knowledge of careers
  - Knowing options & how to leverage their skills or gain skills/knowledge
- Networking – how to do, what not to do, where to go/be
- Virtual presence/brand
  - Current presence on social media and how that effects hiring/career
  - Self marketing
    - Representing that extra expertise
- Interviewing skills
  - Can be learned
  - Do's and Don'ts
- Ability to move up & transition within organization (1st job not last)

Advice for Students

- **Be ready for dynamic job experiences**
  - Jobs/careers undergoing rapid change/growth
  - Be able to apply what you learned outside your field of expertise
  - Be able to talk to/work with people outside your field (e.g. physical oceanographer and biologist)
- **Show Interest in enterprise**
  - Step out of comfort zone, demonstrate enthusiasm
  - Getting something great done – *it is not having things perfect, it is about getting something great done*

STUDENT/ADVISOR RELATIONSHIP

- Completing your advanced degree will be hard work
- Discuss now with your advisor what is expected of you
  - When are you expected to be in the office during a normal week vs. academic breaks? Who do you tell when you will be absent?
  - Find out how your RA is being funded and how that might affect the research you are likely to work on
  - Don't assume what other students in the dept/college tell you is necessarily what you should be doing
- Faculty may choose to use a Collaboration Agreement to document those expectations (see handout)
- Faculty are expected to know and follow University policies: https://regulations.utah.edu/academics/6-316.php
- Student have rights and responsibilities too: https://regulations.utah.edu/academics/guides/students/studentRights.php

WHAT TO DO IF ISSUES ARISE?

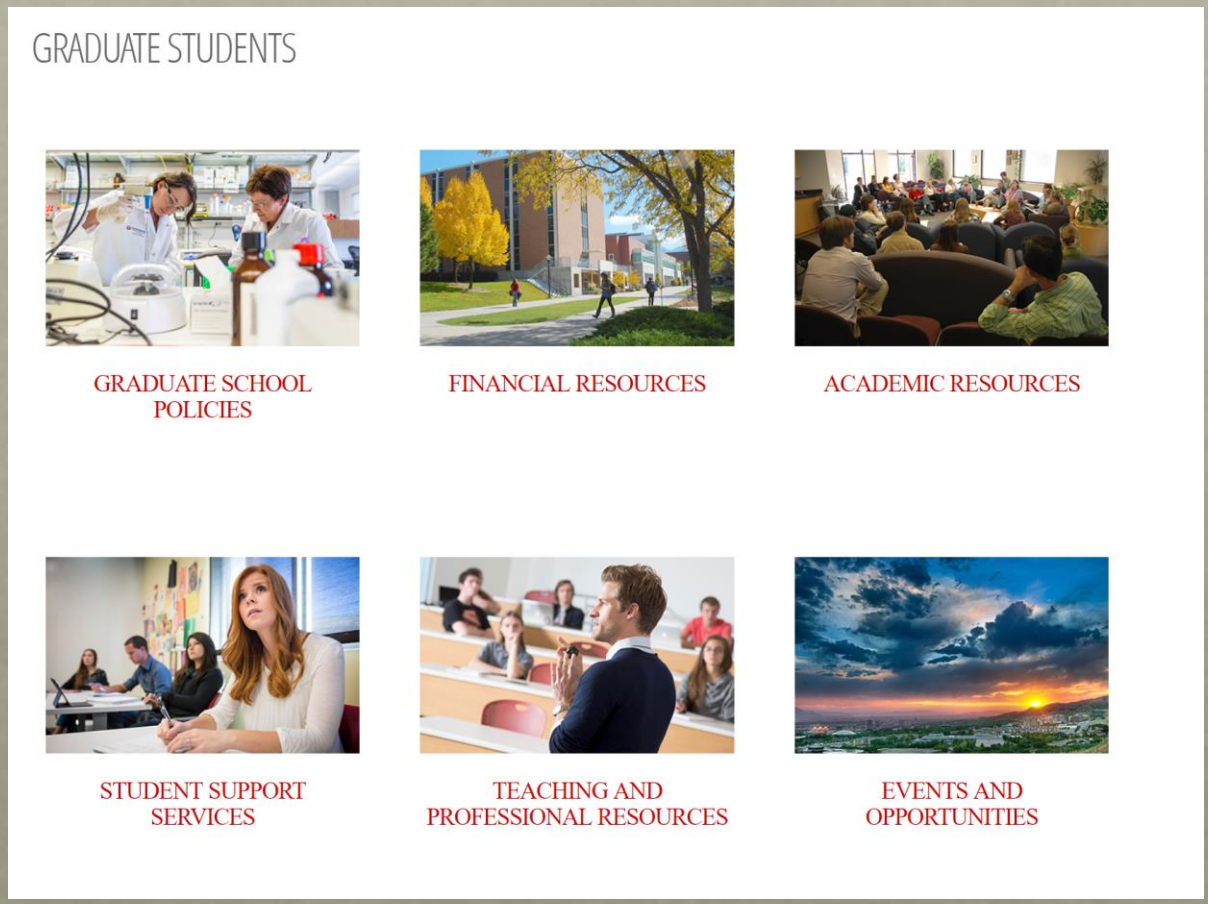
- The University is expected to be a safe environment
- Graduate school should be a positive, even if stressful, experience with minimal conflicts
- How to handle conflicts with advisor, other students, staff, instructors?
- Deal with problems as they develop as soon as possible, don't let them grow into even bigger issues
- Assess with whom you would be most comfortable discussing conflicts
  - that individual at an appropriate time/place?
  - Advisor, Dept. Chair, Director of Graduate Studies, Holly, Nola, Dean, Campus Service agencies?
  - Ask one of us regarding who to talk to- we may not know the answers, but can help find someone who can
- Expect to have timely discussion & resolution for you & others involved

Computer Support

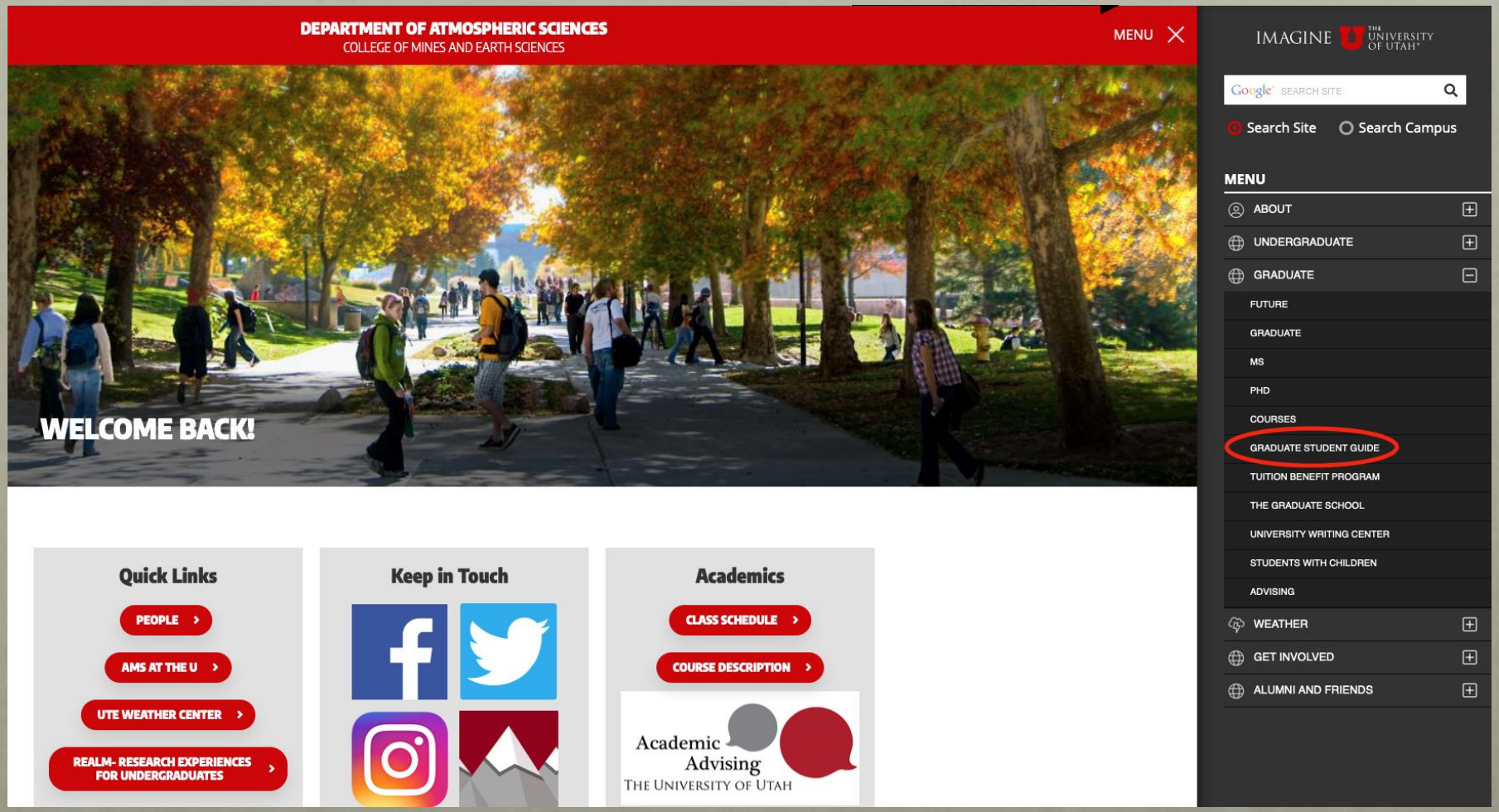
- Desktop administration is handled by the Center for High Performance Computing (CHPC)
- Any software and hardware issues can be dealt with by emailing help@chpc.utah.edu
- Printers are set up through CHPC as well
- Home directories are backed up daily
- Faculty data directories are backed up quarterly on request
- CHPC seminar series are very beneficial:
- https://www.chpc.utah.edu/presentations/Fall2019CHPCPresentationSchedule.php

GRADUATE SCHOOL

- https://gradschool.utah.edu/graduate-students/



Graduate Student Guide



https://atmos.utah.edu/_resources/documents/graduate_students/Graduate%20Student%20Guide5.7.19.pdf

Path to Graduation

M.S. Degree

- Core Courses
- Supervisory Committee
- Program of Study
- Comprehensive Exam
- Apply for Graduation
- M.S. Defense
- Final Thesis Approval

Ph.D. Degree

- Supervisory Committee
- Program of Study
- Doctoral Qualifying Exam
- Apply for Graduation
- Ph.D. Defense
- Final Thesis Approval

Core Courses

M.S. Degree

ATMOS 6010:
Fundamentals of Dynamic Meteorology

ATMOS 6020:
Fundamentals of Physical Meteorology

ATMOS 6030:
Climate Dynamics

ATMOS 7810:
Graduate Seminar (Take for 2 semesters for credit)

ATMOS 6910-011:
Graduate Student Orientation (Take first semester as elective)

Other electives recommended by advisor and committee

Ph.D. Degree

May have similarities to M.S. Degree but courses approved by the supervisory committee

(9 credits of electives required)

Supervisory Committee

M.S. Degree

3 members total
2 members must be regular faculty (tenure or tenure track) in the Department*
Due before the end of the Fall semester of the first year
Talk to your advisor and due it soon

Ph.D. Degree

5 members total
3 members must be regular faculty (tenure or tenure track)*
At least 1 member must be from outside the department
If outside member is not from the University of Utah, then a CV must be sent to Holly
Due before the end of the Fall semester of first year

*Research faculty may serve as supervisory committee chair with Graduate School approval if the majority of your committee is still considered regular faculty (tenure or tenure track).

Comprehensive Exam

- Consists of Core Course Grades, Written Research Prospectus, and Oral Presentation
- Potential Outcomes
  - **Pass with Distinction** – move directly to Ph.D. program (may also complete M.S. if desired)
  - **Pass** – may apply to Ph.D. program through CODA after M.S. completed
  - **Fail** – potential dismissal from program

Written Research Prospectus

- Thesis Proposal (~3000 words) Includes:
  - Background/Significance
  - Questions/Hypotheses to be Addressed
  - Research Plan/Methodology
  - Preliminary Results (optional)
- Will be graded by the Supervisory Committee members
- Due the last day of classes of Spring Semester (April 23, 2020)

Oral Research Prospectus

- 30-Minute Presentation to the Entire Faculty
  - 20 minutes for presentation
  - 10 minutes for questions
- Will be graded by all faculty in attendance
- Will be scheduled for May 8 and 9, 2020

Written Research Prospectus Preparation

- Fall Semester
  - Become familiar with the research projects in your group
  - Discuss research project options with advisor
  - Discuss informally with your committee members
  - Complete a literature review to identify outstanding questions andor hypotheses
  - Consider w your advisor taking the graduate elective programming course

Written Research Prospectus Preparation

- Spring Semester
  - Participate in Special Topics course taught by Dr. John Horel
  - Set weekly deadlines and stick to them
  - Meet with your advisor often to get feedback and guidance

Program of Study

M.S. Degree

- Minimum of 30 total credit hours
- Minimum of 6 hours of thesis research
- Minimum of 9 hours of electives
- Must maintain a 3.0 or higher GPA
- At least 24 hours must be completed in residence at the University of Utah

Ph.D. Degree

- Minimum of three full years of approved graduate work
- Minimum of 14 hours of thesis research
- Minimum of 9 hours of electives
- Must maintain a 3.0 or higher GPA
- At least one year must be completed in residence at the University of Utah

Travel and Purchasing

- For purchases, travel, and conferences, talk to your advisor first to see what is possible to do
- Before making any purchases and planning travel, talk to Holly or Nol
- Option: Set up Employee-Funded Retirement Account: https://www.hr.utah.edu/benefits/retirement.php
- Address Changes/Department Directory: submit updates to atmos-office@lists.utah.edu

BE PROACTIVE

- Take responsibility for your education and career development
- Take full advantage of the many opportunities to learn
- Ask questions if you are not sure what you should be doing to complete your research and degree
- Respond to email requests from Nola and Holly promptly

Questions?

- Any questions?
- If you think of questions after orientation, feel free to email atmos-office@lists.utah.edu with any inquiries or concerns.