Ph.D. Program Overview

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Director of (Under!)graduate Studies
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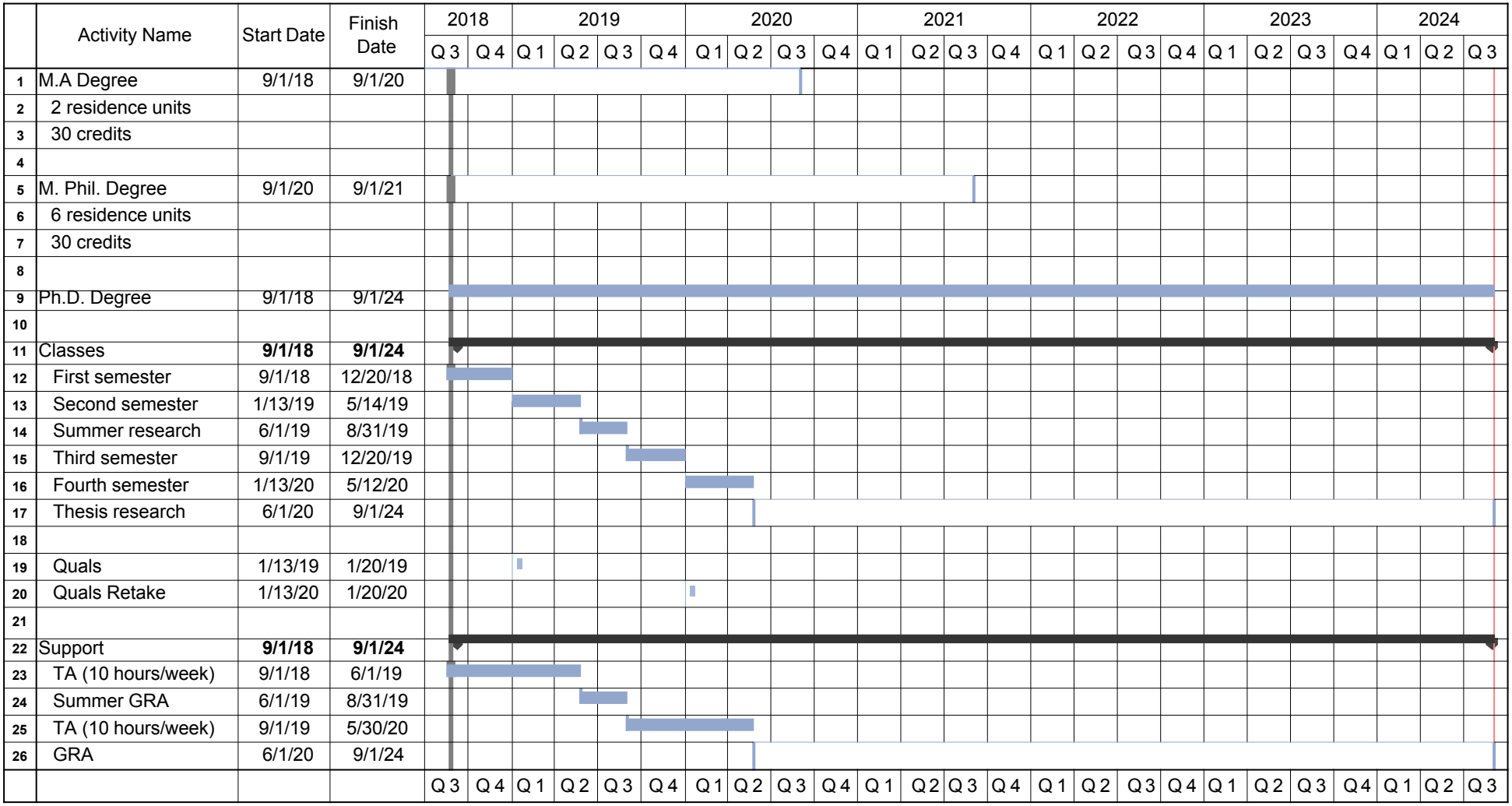
1. Welcome to the Physics Department of Columbia University.
2. Long and illustrious history, which you can enjoy and continue.
3. Will require effort and perserverance as you transition from learning what others know to creating knowledge.
4. Many people in the department are here to assist you, but you must be proactive.
5. Many details at http://www.columbia.edu/cu/physics/
6. Alberto Nicolis is the Director of Graduate Studies.

Ph.D. Timeline

3-4 semesters of course work followed by 3-4 years of research.
Transition from student –› researcher –› independent researcher.



	Activity Name	Start Date	Finish Date
1	M.A Degree	9/1/18	9/1/20
2	2 residence units		
3	30 credits		
4			
5	M. Phil. Degree	9/1/20	9/1/21
6	6 residence units		
7	30 credits		
8			
9	Ph.D. Degree	9/1/18	9/1/24
10			
11	Classes	**9/1/18**	**9/1/24**
12	First semester	9/1/18	12/20/18
13	Second semester	1/13/19	5/14/19
14	Summer research	6/1/19	8/31/19
15	Third semester	9/1/19	12/20/19
16	Fourth semester	1/13/20	5/12/20
17	Thesis research	6/1/20	9/1/24
18			
19	Quals	1/13/19	1/20/19
20	Quals Retake	1/13/20	1/20/20
21			
22	Support	**9/1/18**	**9/1/24**
23	TA (10 hours/week)	9/1/18	6/1/19
24	Summer GRA	6/1/19	8/31/19
25	TA (10 hours/week)	9/1/19	5/30/20
26	GRA	6/1/20	9/1/24

Courses and Requirements

Core Courses (every year) 4.5 points each	2 Field Specific Courses 3 points each	Additional Courses (this year)	Additional Courses (not all taught every year)
Statistical Mechanics GR6036	Condensed Matter I GR6082	Particle Phenomenology GR6050 (Fall)	Exp. Methods for Nuclear, Particle, and Astrophysics GR6042
Quantum Mechanics I GR6037	Condensed Matter II GR8083 (not taught this year)	Physical Phenomena GR6099 (Spring)	Biological Physics GR6070
Quantum Mechanics II GR6038	Atomic Physics GR6060	Quantum Field Theory II GR8048 (Fall)	Solid State Physics 86081
Electromagnetic Theory GR6092	Quantum Field Theory I GR6047	Frontiers of Condensed Matter Physics GR6027 (Fall)	Advanced Statistical Mech. GR8036
Quantum Field Theory I GR6047	Particle Physics GR8069	General Relativity GR8040 (Spring)	Special Topics in Condensed Matter Physics GR8066
Classical Fields and Waves GR6094	Astrophysics I GR6011	Quantum Field Theory III/String Theory GR8049 (Spring)	Scientific Computing GR6080
(Only one of GR6047 and GR6094required)	Astrophysics II GR8012	Special Topics in Particle Physics GR8070 (tentatively Spring)	Advanced Scientific Computing GR8080
	Physical Cosmology GR6010 -> ASTRGR6005	Astrophysics III? (tentatively Spring)	
	Classical Fields and Waves GR6094		

Example Course Schedules (3 courses is a heavy load)

Research Field	First Semester	Second Semester	Third Semester	Additional Courses
Astrophysics/ Cosmology	QM I E&M	QM II Classical Fields (Astro I, GR, QFT I)	Stat. Mech. (Astro II, Cosmo)	Particle Phen.
Condensed Matter	QM I E&M	QM II (Classical Fields, QFT I) CM I	Stat. Mech CM II	Adv. Stat. Mech
Particle/Nuclear	QM I E&M	QM II QFT I	Stat. Mech Particle I QFT II	QFT III Particle Phen. Nuclear Phys.

Examinations for Ph.D.

Ph.D. Qualifying Exam:

1. Taken in January of first year
2. Covers undergraduate physics
3. Three written exams:

   Classical Physics: mechanics and electromagnetism
   Modern Physics: quantum mechanics and relativity
   General Physics: thermodynamics, optics and phenomenology

4. Oral examination to discuss problems from the three written tests and your research interests

Ph.D. Thesis Defense:

1. Presentation of your thesis work before a 5 member committee: four physics faculty and one members from outside the department.
2. Generally 2 hours long

Ph.D. Qualifying Exam

1. Our way of making sure your undergraduate physics education is complete. If you did poorly in an undergraduate course, say thermodynamics, you likely need to spend time studying this before the exam.

2. A review session will be taught this fall by a senior student - please attend.

3. Organizing study groups is also helpful - good way to review old exams.

4. Reviewing undergraduate physics from your current, more advanced perspective, can really solidify your understanding.

5. Exam is pass/fail. Determined by a meeting of the full faculty where written and oral qualifying exam scores and course performance are discussed.
   - Pass: complete courses and begin research
   - Fail: repeat entire exam following year. May be directed to particular courses
   - Conditional pass: repeat a specific section the following year
   - Second failure: requested to leave program

6. 70-80% pass the first time. Very nearly all pass second attempt. Failure rate < 2% of admitted students.

7. Most students first attempt is in the first year. Postponement is allowed in cases of known gaps in undergraduate education.

Applying for Outside Fellowships

1. Your support is from teaching for the first two years, then research grants thereafter.
2. Fellowships help you by reducing teaching and, if they extend into your later years, they give you more flexibility in seeking a research sponsor.
3. Fellowships give the department more flexibility in hiring teaching fellows.
4. Being awarded a fellowship is further recognition of your potential in Physics.
5. We want everyone in the incoming class to apply for fellowships, if there are ones for which you are eligible.
6. The Graduate Committee will be helping you with this. There are also seminars given by GSAS to help you prepare your application.
7. Many of these have deadlines in the fall - need to move on this promptly.

Ethical Behavior

Columbia University is an academic community committed to fostering intellectual inquiry in a climate of academic freedom and integrity. Its members are expected to uphold these principles and exhibit tolerance and respect for others. Thus, the Graduate School condemns all forms of misconduct and works strenuously to assure that its students are accorded tolerance, dignity and respect. Any graduate student who believes that he or she is a victim of misconduct has recourse to the mediation and grievance procedures developed by the Graduate School. Students are encouraged to discuss problems, questions and grievances with anyone in a supervisory position, such as an advisor, director of graduate studies, department chair or appropriate dean or university administrator...

http://www.columbia.edu/cu/gsas/sub/policies/grievance/policy/index.html

Academic Integrity

Academic Honesty

Students should be aware that academic dishonesty (for example, plagiarism, cheating on an examination, or dishonesty in dealing with a faculty member or other University official) or the threat of violence or harassment are particularly serious offences and will be dealt with severely under Dean's Discipline. (GSAS Bulletin 87)

Each graduate student bears the responsibility to observe traditional canons of scholarly discourse, scientific research, and academic honesty. Students as well as faculty are expected to exhibit the high level of personal and academic integrity required of members of an academic community.

http://gsas.columbia.edu/academic-integrity

Good Academic Standing

To be considered in good academic standing, students must make satisfactory academic progress as determined by their department. Satisfactory progress for M.A. and Ph.D. candidates includes but is not limited to:

1. Acquiring an advisor
2. Maintaining consistent contact with the departmental DGS and sponsor
3. Meeting time-to-degree requirements for the M.A. and the M.Phil. degrees
4. Fulfilling the dissertation prospectus requirement (in the cases in which it applies)
5. Completing an annual dissertation progress report upon attaining the M.Phil degree
6. Completing degree requirements and maintaining superior quality of work
7. Maintaining a cumulative grade point average (GPA)* of at least 3.0
8. Holding no more than one mark of Incomplete at any given time
9. Fulfilling GSAS pedagogical requirements and responsibilities
10. Meeting other criteria specified by the department

http://gsas.columbia.edu/content/good-standing

Additional Information

1. The Graduate Student Seminar (GR6095) must be taken in the fall and spring of the first year.
2. For graduate quantum mechanics (GR6037-6038),and EM (GR6092) a placement test is offered.
3. Three courses, plus the Graduate Student Seminar is a full load. The graduate courses are time consuming.
4. The weekly colloquia (Monday 4:15-5:15 PM) offer a vital introduction to forefront research in physics and should be attended by all graduate students.
5. GR6047 and GR6094 appear as both core and field-specific courses. For one such course to fulfill both requirements, permission from the Director of Graduate Studies is needed.
6. During the fourth semester, a student must take at least two courses if they are not doing full-time research.
7. 6000 and 8000 level courses offered by Physics, Astronomy, Applied Physics, Electrical Engineering, Chemistry and Biology may be used as additional courses.
8. Determining which area of physics you want to do your research in is an important part of your first few semesters at Columbia. Take advantage of colloquia, seminars, etc. to become more knowledgeable about the details of particular research areas.

Summary

1. Much to learn in the next few years - graduate classes take time and research takes even more.
2. Strive to master the material. You are on the road to becoming a professional physicist and working to solidify the foundations of your physics knowledge now will pay off enormously.
3. Keep your mind open to new areas of physics that you may not have been exposed to. There are new areas opening up all the time.
4. Interact with the faculty - go to office hours!
5. Interact with your fellow students - different perspectives on how to think about physics can be extremely useful.