General University Information

President: L. Rafael Reif
Dean of Graduate School: Senior Associate Dean, Blanche Stanton
University website: http://web.mit.edu
School Type: Private
Setting: Urban
Total Faculty: 1,872
Total Graduate Faculty: 1,036
Total number of Students: 11,376
Total number of Graduate Students: 6,696

Department Information

Department Chairman: Prof. Robert van der Hilst, Head
Department Contact: Megan Jordan, Academic Program Administrator
Total full-time faculty: 39
Total number of full-time equivalent positions: 39
Full-Time Graduate Students: 140
Female Full-Time Graduate Students: 69
First-Year Graduate Students: 26
Female First-Year Students: 14
Total Post Doctorates: 64

Department Address
54-912
77 Massachusetts Avenue
Cambridge, MA 02139
Phone: (617) 253-3381
Fax: (617) 253-8298
E-mail: eaps-admissions@mit.edu
Website: http://eapsweb.mit.edu

ADMISSIONS

Admission Contact Information
Address admission inquiries to: Education Office, Department of Earth, Atmospheric, and Planetary Sciences, Room 54-912, MIT, 77 Massachusetts Avenue, Cambridge, MA 02139
Phone: (617) 253-3381
E-mail: eaps-admissions@mit.edu
Admissions website: http://eapsweb.mit.edu/graduate-admissions

Application deadlines
Fall admission:
U.S. students: January 5
Spring admission:
U.S. students: November 5
Int’l. students: January 5
Int’l. students: November 5

Application fee
U.S. students: $75
Int’l. students: $75

Admissions information
For Fall of 2018:
Number of applicants: 216
Number admitted: 31
Number enrolled: 20

Admission requirements
Bachelor’s degree requirements: A strong undergraduate emphasis in math and science is necessary. We have no minimum GPA requirement. All applications are reviewed.

GRE requirements
The GRE is required.
We set no minimum scores for the GRE and Advanced GRE tests. All applications are reviewed.

Subjective GRE requirements
The Subjective GRE is required.
GRE Physics or Chemistry subject test is required only for applicants to our Planetary Sciences program.

TOEFL requirements
The TOEFL exam is required for students from non-English-speaking countries.
PBT score: 577
iBT score: 100

Other admissions information
Additional requirements: IELTS is the preferred examination, rather than the TOEFL, and 7.0 is the minimum acceptable score. The GRE subject test in chemistry or physics is required for the planetary science program.
Undergraduate preparation assumed: An undergraduate degree should have strong emphasis on math and science. Specific preparation will depend on the area of study chosen.

TUITION

Tuition year 2017–18:
Full-time students: $25,760 per semester
Part-time students: $800 per credit
(12 units/course) Definition of "tuition waiver": all incoming doctoral students have their tuition fully paid through a fellowship or research assistantship.
Credit hours per semester to be considered full-time: 36
Deferred tuition plan:
Health insurance: Available at the cost of $3144 per year.
Other academic fees: $312 student life fee.
Academic term: Semester
Number of first-year students who received full tuition waivers: 14

Teaching Assistants, Research Assistants, and Fellowships
Number of first-year fellowship students: 19
Average stipend per academic year
Teaching Assistant: $29,367
Research Assistant: $28,683
Fellowship student: $28,683
All students accepted into our doctoral programs are provided with support that includes tuition, a stipend, and health insurance. These stipend numbers reflect a 9 month academic year. Students also commonly receive stipends over the summer

FINANCIAL AID

Loans
Loans are available for U.S. students.
Loans are not available for international students.
GAPSFAS application required: Yes
FAFSA application required: No
Table A—Faculty, Enrollments, and Degrees Granted

<table>
<thead>
<tr>
<th>Research Specialty</th>
<th>2017-18 Faculty</th>
<th>2016-17</th>
<th>No. of Degrees Granted</th>
<th>Faculty</th>
<th>Master’s</th>
<th>Doctorate</th>
<th>Master’s</th>
<th>Doctorate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Climate/Atmospheric Science</td>
<td>12</td>
<td>1</td>
<td>27</td>
<td></td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Geology/Geochemistry/Geobiology</td>
<td>12</td>
<td>1</td>
<td>20</td>
<td></td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Geophysics</td>
<td>10</td>
<td>3</td>
<td>10</td>
<td></td>
<td>3</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marine Science/Oceanography</td>
<td>9</td>
<td>–</td>
<td>71</td>
<td></td>
<td>–</td>
<td>–</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Planetary Science</td>
<td>9</td>
<td>2</td>
<td>10</td>
<td></td>
<td>1</td>
<td>3</td>
<td></td>
<td></td>
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<tr>
<td>Total</td>
<td>39</td>
<td>6</td>
<td>–</td>
<td>4</td>
<td>38</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Full-time Grad. Stud.</td>
<td>–</td>
<td>6</td>
<td>138</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td>First-year Grad. Stud.</td>
<td>–</td>
<td>4</td>
<td>26</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td></td>
</tr>
</tbody>
</table>

Table B—Separately Budgeted Research Expenditures by Source of Support

<table>
<thead>
<tr>
<th>Source of Support</th>
<th>Departmental Research</th>
<th>Physics-related Research</th>
</tr>
</thead>
<tbody>
<tr>
<td>Federal government</td>
<td>$13,874,100</td>
<td></td>
</tr>
<tr>
<td>State/local government</td>
<td>$520,279</td>
<td></td>
</tr>
<tr>
<td>Non-profit organizations</td>
<td>$1,387,410</td>
<td></td>
</tr>
<tr>
<td>Business and industry</td>
<td>$1,384,410</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>$173,426</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>$17,339,625</td>
<td></td>
</tr>
</tbody>
</table>

Table C—Separately Budgeted Research Expenditures by Research Specialty

<table>
<thead>
<tr>
<th>Research Specialty</th>
<th>No. of Grants</th>
<th>Expenditures ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Astronomy</td>
<td>2</td>
<td>$151,612</td>
</tr>
<tr>
<td>Climate/Atmospheric Science</td>
<td>27</td>
<td>$6,466,790</td>
</tr>
<tr>
<td>Geology/Geochemistry/Geobiology</td>
<td>33</td>
<td>$4,209,096</td>
</tr>
<tr>
<td>Geophysics</td>
<td>24</td>
<td>$2,745,759</td>
</tr>
<tr>
<td>Marine Science/Oceanography</td>
<td>2</td>
<td>$459,567</td>
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<tr>
<td>Planetary Science</td>
<td>21</td>
<td>$3,310,001</td>
</tr>
<tr>
<td>Total</td>
<td>109</td>
<td>$17,342,625</td>
</tr>
</tbody>
</table>

FACULTY

Professor

Binzel, Richard P., Ph.D., University of Texas, 1986. Astronomy. Planetary astronomy; collisional evolution of asteroids; physical parameters and surface features of the Pluto-Charon system.

Boyle, Edward A., Ph.D., Massachusetts Institute of Technology, 1976. Geology/Geochemistry, Marine Science/Oceanography. Paleooceanography and paleoclimatology; variability of the chemical composition of seawater; trace element chemistry of seawater, rivers, and estuaries.

Emanuel, Kerry A., Ph.D., Massachusetts Institute of Technology, 1981. Climate/Atmospheric Science. Relationship between cumulus convection and large-scale circulations; parametric representation of convection in large-scale weather forecast and climate models; the Hadley circulation; mesoscale dynamics of fronts and cyclones; tropical cyclone dynamics.

Ferrari, Raffaele, Ph.D., Scripps Institution of Oceanography, 2001. Climate/Atmospheric Science, Marine Science/Oceanography. Turbulence in the ocean and atmosphere using a combination of theory, models, and observations; role of the ocean on climate and on biological productivity.

Flierl, Glenn R., Ph.D., Harvard University, 1975. Climate/Atmospheric Science. Impacts of oceanic eddies upon the distribution of tracers and on the biology of the sea, including both transport and alterations in the reaction terms.

Follows, Michael, Ph.D., University of East Anglia, 1990. Climate/Atmospheric Science, Marine Science/Oceanography. Biogeochemical cycles of carbon and nutrients in the ocean. Use of numerical models to understand the combination of physical transport, chemical and biological processes that determine the distributions and fluxes of these elements in the ocean.

Grove, Timothy L., Ph.D., Harvard University, 1976. Geology/Geochemistry, Planetary Science. Igneous petrology; magma generation processes in island arc-continental settings and mid-ocean ridges; crystal growth and nucleation; phase transitions in minerals; diffusion in crystalline solids and silicate melts; thermal histories of geologic materials.

Herring, Thomas A., Ph.D., Massachusetts Institute of Technology, 1983. Geophysics. Techniques of space geodesy, including very long baseline interferometry and the use of the Global Positioning System; surface deformations related to plate tectonics and plate boundary zones; effects of whole-Earth dynamics on the nutation series.

Marshall, John C., Ph.D., Imperial College, 1980. Climate/Atmospheric Science, Marine Science/Oceanography. Dynamics and causes of the general circulation of the atmosphere and ocean; thermocline theory; geostrophic eddies; global-scale ocean modeling.

Morgan, Dale, Ph.D., Massachusetts Institute of Technology, 1981. Geophysics. Rock physics; geoelectromagnetism; inverse methods; applied seismology; environmental geophysics.

Prinn, Ronald G., Ph.D., Massachusetts Institute of Technology, 1971. Climate/Atmospheric Science, Planetary Science. Chemical-dynamical models of the atmosphere; measurement and modeling of the long-lived gases involved in the greenhouse effect and ozone depletion; atmospheric chemistry of carbon and sulfur compounds; integrated global system modelling that couples atmospheric, oceanic, and terrestrial physics, chemistry, and biology.

Rizzoli, Paola M., Ph.D., Scripps Institution of Oceanography, 1978. Climate/Atmospheric Science, Marine Science/Oceanography. Numerical modeling of the ocean general circulation with specific emphasis on the tropical Atlantic ocean, tropical/subtropical interactions, tropical instability waves, and coupled ocean-atmosphere modes; assimilation of oceanographic data into ocean numerical models through ensemble approaches and optimal design of fixed and adaptive observational arrays; physical-chemical modeling of the Black Sea ecosystem.

Rothman, Daniel H., Ph.D., Stanford University, 1986. Climate/Atmospheric Science, Geology/Geochemistry, Geophysics. Dynamical organization of the past and present environment, including coevolution of life and the physical environment; dynamics of the carbon cycle; geological fluid mechanics; geomorphology.

Royden, Leigh H., Ph.D., Massachusetts Institute of Technology, 1982. Geology/Geochemistry, Geophysics. Regional geology and geophysics; plate tectonics; thermal effects of continental deformation; mechanics of large-scale continental deformation; lithospheric flexure; continental extensions and sedimentary basin formation; uplift and erosion in mountain belts.


Solomon, Susan, Ph.D., University of California, Berkeley, 1981. Climate/Atmospheric Science. Atmospheric chemistry and transport in the stratosphere and troposphere; climate change and its coupling to chemistry; comparative studies of environment and society.

Summons, Roger, Ph.D., University of New South Wales, 1972. Climate/Atmospheric Science, Geology/Geochemistry. Lipid chemistry of microbes; early biotic and environmental evolution; extinction and radiation events in earth history; biogeochemical fossils; petroleum; astrobiology.

van der Hilst, Robert D., Ph.D., Utrecht University, 1990. Geophysics. Seismic tomography; studies of the earth's structure with emphasis on mantle beneath convergent plate boundaries; tectonic evolution of subduction systems; mantle dynamics; structure and evolution of continental lithosphere; field studies with portable seismometers.

Weiss, Benjamin P., Ph.D., California Institute of Technology, 2003. Geology/Geochemistry, Geophysics, Planetary Science. Paleomagnetic studies of rocks from Mars, the moon, asteroids, and the earth; dynamo evolution, planetary histories and interiors; use and development of new magnetometry techniques.


Zuber, Maria T., Ph.D., Brown University, 1986. Geophysics, Planetary Science. Theoretical modeling of geophysical processes; analysis of altimetry, gravity, and tectonics to determine the structure and dynamics of the earth and solid planets; development and implementation of spacecraft laser and radio-tracking experiments.

**Associate Professor**

Bosak, Tanja, Ph.D., California Institute of Technology, 2004. Geology/Geochemistry. Microbial sediments throughout geologic time as indicators of biological processes and environmental conditions; morphological and chemical biosignatures; early earth; astrobiology.

Cahoy, Kerri, Ph.D., Stanford University, 2008. Climate/Atmospheric Science, Planetary Science. Planetary atmospheres; exoplanet atmospheres with optical direct imaging instruments (coronagraphs) onboard spacecraft; solar system planets with spacecraft radio occultation; Earth with GNSS radio occultation.

Cziczó, Daniel J., Ph.D., University of Chicago, 1999. Climate/Atmospheric Science. Chemical composition of atmospheric aerosols with an emphasis on their effect on cloud formation mechanisms, the Earth’s radiative budget, and meteoritic debris and launch vehicle emissions in the atmosphere.

Heald, Colette L., Ph.D., Harvard University, 2005. Climate/Atmospheric Science. Atmospheric chemistry and composition; biosphere-atmosphere interactions; global modeling; satellite observations.

Jagouz, Oliver, Ph.D., ETH Zurich, 2004. Geology/Geochemistry. Field-related studies of igneous processes; crust mantle interaction; formation and evolution of the oceanic and continental lithosphere.

Juanes, Ruben, Ph.D., University of California, Berkeley, 2003. Energy Sources & Environment, Geology/Geochemistry, Geophysics. Physics of multiphase flow in porous media; application of theoretical, computational and experimental research to energy and environment-driven geophysical problems, such as petroleum recovery, carbon sequestration, methane hydrates, and water infiltration in soil.

McGee, David, Ph.D., Columbia University, 2009. Climate/Atmospheric Science, Geology/Geochemistry. Reconstruction of past climates using cave, lake, and marine deposits; U-Th dating of cave and lacustrine carbonates; U-series investigations of marine sediments; constant flux proxies; records of past atmospheric circulation and hydrology.

O’Gorman, Paul, Ph.D., California Institute of Technology, 2004. Climate/Atmospheric Science. Large-scale circulation of the atmosphere; interactions of moisture and baroclinic eddies; effect of climate change on the hydrological cycle; turbulence closure theories.

Massachusetts

Perron, J. Taylor, Ph.D., University of California, Berkeley, 2006. Geology/Geochemistry, Planetary Science. Measurement and modeling of physical processes that shape the surfaces of planets; river networks; biotic effects on landscape evolution; volcanic cycling on Mars and Titan.

Selin, Noelle Eckley, Ph.D., Harvard University, 2007. Climate/Atmospheric Science. Atmospheric chemistry modeling; biogeochemical cycling of mercury (Hg); air pollution/climate interactions; air pollution health impacts; science-policy interactions.

Assistant Professor

Babbin, Andrew R., Ph.D., Princeton University, 2014. Climate/Atmospheric Science, Geology/Geochemistry. His research incorporates elements from field observations, numerical modeling and laboratory experiments to understand the environment and the fundamental controls on marine biogeochemistry.

Bergmann, Kristin, Ph.D., California Institute of Technology, 2014. Geology/Geochemistry. Marine carbonate deposition through time and how that informs our understanding of Earth’s past climate and seawater chemistry. Sedimentological observations to inform petrography and sequence stratigraphy. Use of carbonate clumped isotope thermometry and a variety of microanalytical techniques to probe the temperature and fluid composition of depositional environments and diagenetic events. Currently working in Svalbard, Oman, the Basin and Range and the mid-continent on the Neoproterozoic through end-Ordovician glaciation.

Cronin, Timothy W., Ph.D., Massachusetts Institute of Technology, 2014. Climate/Atmospheric Science. Cold air formation in warmer climates; self-aggregation of convection; diurnal cycle and island rainfall; boundary layer sensitivity; details about radiative-convective equilibrium; tropical cyclones in odd environments; Hadley circulation and eddies.

Fournier, Gregory, Ph.D., University of Connecticut, 2009. Other. Reconstructing events in the history of life has a long tradition in the geological and paleontological sciences. However, only with the recent advent of extensive genomic sequencing has molecular biology been able to look backward in time in the same way, using the record of events preserved within the genomes of existing organisms. My research attempts to integrate these methods in order to investigate important questions in evolution: reconstructing ancestral protein sequences and determining the functional roles of proteins existing in organisms early in the history of life.

Minchew, Brent, Ph.D., California Institute of Technology, 2016. Geophysics. Dynamics of extant glaciers, with an emphasis on the mechanics of glacier beds, ice-ocean interactions, and ice rheology.

Péc, Mateá, Ph.D., University of Basel, 2012. Geology/Geochemistry. Experimental rock deformation; structural geology; igneous petrology.

DEPARTMENTAL RESEARCH SPECIALTIES AND STAFF

Theoretical
Climate/Atmospheric Science. Dynamics of the atmosphere and ocean; climate dynamics and modeling; theory of monsoons; coupled ocean-atmosphere models; chemical dynamical models of the atmosphere; inverse methods applied to global trace gas cycles; climatic effects of changes in carbon dioxide concentrations and solar constant; dynamics of planetary atmospheres; data assimilation and adaptive sampling; predictability and ensemble forecasting; mesoscale dynamics of fronts and cyclones; dynamics of tropical intraseasonal oscillations and tropical cyclones; modeling planetary atmospheres.


Geophysics. Numerical models of nonlinear dynamical systems; fluid dynamics; theoretical models of rock physics; numerical methods for seismology; mantle dynamics; geodesy. Hager, Herring, Juanes, Morgan, Rothman, Royden, van der Hilst, Weiss, Zuber.

Marine Science/Oceanography. Dynamics of thermohaline circulation of the ocean, numerical modeling of ocean-climate interactions, and analysis of oceanic data; modeling of the physics, chemistry, and biology of strongly nonlinear eddies and meandering jets; interactions between waves and vortices. Boyle, Emanuel, Ferrari, Flierl, Follows, Marshall, Rizzoli, Rothman.

Planetary Science. Numerical experiments and theoretical studies of geophysical fluid dynamics; origins and evolution of planetary jet-stream wind profiles; solar system dynamics; long-term evolution of orbits and spins of planets and satellites; chaotic behavior; dynamics of planetary rings; planetary history, planetary gravity, and magnetic fields; geochemical and geophysical studies of meteorites, atmospheres, and interiors of exoplanets. Binzel, Cahoy, Cziczo, Grove, Perron, Prinn, Seager, Weiss, Wisdom, Zuber.

Experimental
Climate/Atmospheric Science. Ocean general circulation, paleo-oceanography, and paleo-climatolgy; abrupt climate change; development and application of trace element, organic geochemical, and stable isotopic techniques in oceanography and paleoclimatology; decadal-to-millennial scale climate change; origin of organic-rich sediment sequences in the marine environment; marine nitrogen cycle; acoustic tomography; hydro-meteorology and hydroclimatology; global measurements of radiatively and chemically important trace gases; climate diagnostic studies; El Niño Southern Oscillation phenomenon; diagnostic studies of the general circulation; satellite observations of planetary atmospheres. Boyle, Cronin, Cziczo, Emanuel, Ferrari, Flierl, Follows, Heald, Marshall, McGee, O’Gorman, Prinn, Rizzoli, Rothman, Seager, Selin, Solomon, Summons.

Geology/Geochemistry. Rift magmatism, origin, and evolution of continental lithosphere using radiogenic isotopes, earth history, active tectonics, structural geology, metamorphic and igneous petrology, geochronology, and numerical simulations of depositional systems; magma generation processes in arcs, ocean ridges, ocean islands, and large igneous processes; mineralogy of the mantle and mantle processes controlling mantle geochemistry; mechanics and thermal effects of continental deformation, sediment transport by currents and waves, interpretation of ancient sedimentary environments, process geomorphology, debris-flow rheology, tectonic geomorphology, environmental monitoring of natural terrestrial and marine ecosystems, and the role of climate in the evolution of orogenic systems; petroleum systems; lipids of cultured microbes and microbial consortia; molecular signatures of hydrothermal ecosystems; signals of biochemical change through time. Babbin, Bergmann, Bosak, Boyle, Fournier, Grove, Jagoutz, McGee, Ono, Péc, Perron, Rothman, Royden, Summons, Weiss.

Geophysics. Application of rock mechanics to tectonic problems; mantle dynamics; numerical modeling of solid-state convection; space geodesy; plate tectonics; seismology; geodetic observation of surface deformation; thermal structure of oceanic lithosphere in the vicinity of hot-spot volcanoes; rock physics; environmental geophysics; seismic tomography for characterization of the earth’s crust and petroleum reservoirs; tectonic


Planetary Science. Collisional of asteroids; planetary atmospheric dynamics; Kuiper belt; stellar occultations at optical and infrared wavelengths; geodesy; radar and radio studies of physical properties of planets; the Pluto-Charon system; origins and evolution of eddy features (e.g., Jupiter’s Great Red Spot); models of planetary lithosphere deformation and the physics of volcanism; development and implementation of space-based laser ranging systems; planetary paleomagnetism and geomagnetism; astrobiology and planetary history; extrasolar planets. Binzel, Cahoy, Cziczo, Grove, Perron, Prinn, Seager, Weiss, Wisdom, Zuber.