**CALENDAR SPRING 2019**

This calendar is subject to change as seem fit by the instructor

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| Date |  | Lecture Topics | Assigned Readings and Videos | Activity |
| PART I: FUNDAMENTALS OF OCEANOGRAPHY |
| 14-Jan | M | Introduction to Course. Origin of the Oceans and a bit of history (Chapter 2) | ***Videos***: How big is the ocean? <https://ed.ted.com/lessons/how-big-is-the-ocean-scott-gass> Ocean Worlds <https://www.youtube.com/watch?time_continue=20&v=gw_bX0ZQOy0> Marine Provinces: <http://www.iupui.edu/~g115/mod05/lecture01.html> Marine Sediments: <http://www.iupui.edu/~g115/mod06/lecture01.html>  |  |
| 16-Jan | W | Continental Drift: A unifying theory of Plate tectonics | Atlas of the Underworld' reveals oceans and mountains lost to Earth's historyEarth and Plate Tectonics: <http://www.iupui.edu/~g115/mod04/lecture01.html> ***Video***: <https://ed.ted.com/lessons/the-pangaea-pop-up-michael-molina>  |  |
| 19-Jan | F | Physical-Chemical Properties of Water:* light transparency,
* high tension and heat capacity,
* water phases,
* water dissolving power,
* latent heat of melting and evaporation
 | Properties of Water: <http://www.iupui.edu/~g115/mod07/lecture01.html> Physical Ocean: <https://science.nasa.gov/earth-science/oceanography/physical-ocean>  | **Blog1: *Ocean heat capacity and climate regulation*****Q1** |
| 21-Jan | **M** | **MLK no class** |
| 23-Jan | W | Properties of Salt Water: * Salinity, pressure, density
* Vertical structure in the ocean
* Light in the sea
 | Sea change. Why is the ocean salty? <https://oceanservice.noaa.gov/facts/whysalty.html> Vertical structure: <http://oceanmotion.org/html/background/ocean-vertical-structure.htm>  |  |
| 25-Jan | F | Atmospheric Circulation: * Density of air and atmospheric pressure
* Solar radiation,
* Global atmospheric circulation and The effect of Coriolis
* Small Weather Patterns
 | Atmospheric Circulation: <http://www.iupui.edu/~g115/mod08/lecture01.html> Global Climate Zones <http://www.iupui.edu/~g115/mod09/lecture01.html> ***Videos***: <https://www.youtube.com/watch?v=7fd03fBRsuU>  <https://www.youtube.com/watch?v=xqM83_og1Fc>  <https://www.youtube.com/watch?v=PDEcAxfSYaI> What is the Coriolis Effect? <https://scijinks.gov/coriolis/> El Niño and La Niña <https://scijinks.gov/el-nino/>; <https://scijinks.gov/la-nina/> ; <http://oceanmotion.org/html/impact/el-nino.htm>  | **Q1** |
| 28-Jan | M | Continuation of Atmospheric Circulation | <https://youtu.be/UuGrBhK2c7U> ; <https://www.youtube.com/watch?v=6vgvTeuoDWY>  | **Blog2: How can changes in *coastal upwellings* affect marine ecosystems?** |
| 30-Jan | W | Ocean Circulation:* Ekman currents
* Major Ocean gyres
* Western Boundary Currents
* Equatorial currents
* Density-driven thermohaline circulation
* Upwelling/Downwelling
 | Ocean Circulation: <http://www.iupui.edu/~g115/mod10/lecture01.html> Ekman currents: <http://oceanmotion.org/html/background/ocean-in-motion.htm> Ocean gyres: <http://oceanmotion.org/html/background/wind-driven-surface.htm> Equatorial currents: <http://oceanmotion.org/html/background/equatorial-currents.htm> Western Boundary Currents: <http://oceanmotion.org/html/background/western-boundary-currents.htm> Gulf Stream <https://scijinks.gov/gulf-stream/>; <http://oceanmotion.org/html/background/rings.htm> Ocean conveyor belt: <http://oceanmotion.org/html/background/ocean-conveyor-belt.htm> Upwelling and Downwelling: <http://oceanmotion.org/html/background/upwelling-and-downwelling.htm>Why does the ocean get colder at depth? <https://oceanservice.noaa.gov/facts/coldocean.html>  |  |
| 1-Feb | F | Continuation of Ocean Circulation |  | **Q3** |
| 4-Feb | M | Waves and TsunamisTides:* Understanding the forces at work
* Combined influences of the Sun and Moon
* Tides in ocean basins
* Tides in the Gulf of Maine and Bay of Fundy

The importance of tides | Waves and Tsunamis: <http://www.iupui.edu/~g115/mod11/lecture01.html> Tides:<http://www.iupui.edu/~g115/mod12/lecture01.html> <http://oceanmotion.org/html/background/tides.htm>; <https://scijinks.gov/tides/> | **Blog3: *The role of tides on shaping marine communities*** |
| 6-Feb | W | Ocean productivity:* Photosynthesis/Respiration
* Nutrients and limiting factors
* Biological Production: Phosphorus and Nitrogen cycles
* Biological pump
* Coastal upwellings

Winter convective mixing and seasonal vertical stratificationContinuation of Ocean ProductivityFactors controlling the distribution of marine organisms:* Distribution with depth
* Distribution with latitude
* Distributions with salinity and distance from shore
 | Biological pump: <https://www.us-ocb.org/biological-pump/>Energy and Productivity: <http://www.iupui.edu/~g115/mod16/lecture01.html> | Q4 |
| 8-Feb | **F** | **Review for Exam 1** |  | **Blog4: *Photosynthesis and algal blooms.*** |
| 11-Feb | **M** | **Exam 1 (from Intro to Ocean Productivity)** |
| PART II: DIVERSITY OF MARINE LIFE |
| 13-Feb | W | Primary producers: Major Groups of Phytoplankton: * Archaea
* Bacteria
* Eukaryotic phytoplankton
* Macroalgae (seaweeds)
* Seagrasses
 | What is phytoplankton? <https://oceanservice.noaa.gov/facts/phyto.html> ***Video***: The secret life of plankton <https://www.ted.com/talks/the_secret_life_of_plankton>  |  |
| 15-Feb | F | * Ecological challenges faced by phytoplankton: light and nutrients
* Harmful algal blooms and ‘red tides’
* Bioluminescence
 | Harmful algal blooms: <https://coastalscience.noaa.gov/research/stressor-impacts-mitigation> | Q5 |
| 18-Feb | **M** | **President’s Day Holiday** | **Blog5: *Sponges and antibiotics*** |
| 20-Feb | W | **Guest Speaker: Dr. Mindy Morales-Williams**Assistant ProfessorRubenstein School of Environment and Natural Resources | <https://www.vermontlimnology.com/>  |  |
| 22-Feb | F | Marine animal classifications based on: habitat use, development and common ancestry (tree of life)Choanoflagellates, Porifera and Flatworms | <https://animaldiversity.org/>  | Q6 |
| 25-Feb | M | Cnidaria and Ctenophora | <https://animaldiversity.org/> <http://marinebio.org/oceans/coral-reefs/>  | **Blog6: *Most dangerous jelly fish*.** |
| 27-Feb | W | Marine Annelids and Major groups of marine mollusks | <https://animaldiversity.org/>  |  |
| 1-Mar | F | Continuation of Major groups of marine mollusks | ***Video***: Octopuses: <https://youtu.be/VLkKiVIBxXU>  | Q7 |
| 4-Mar | M | Horseshoe crabs, sea spiders, and major groups of crustaceans | <https://animaldiversity.org/> ***Video***: Horseshoe crab blood <https://youtu.be/VgEbcQxFUu8>  | **Blog7: *Horseshoe crabs and their role in medicine*** |
| 6-Mar | W | Echinoderms and Tunicates | <https://animaldiversity.org/> ***Video***: Zombie sea starts <https://youtu.be/KrfcglOmBYw> | Q8 |
| 8-Mar | F | Hemichordates, Cephalochordates, Jawless Fishes: hagfishes and Lampreys |  <https://animaldiversity.org/> | **Blog8: *Biology and Conservation of Sharks!*** |
| 11-15 Mar | **M-F** | **Spring Recess** |
| 18-Mar | M | Cartilaginous Fishes: Elasmobranchs | <https://animaldiversity.org/>  | Q9 |
| 20-Mar | W | **Exam 2: from Phytoplankton to Jawless fish.** |  |  |
| 22-Mar | F | Cartilaginous Fishes: Elasmobranchs | <https://animaldiversity.org/> ***Video***: Why sharks are so awesome? <https://youtu.be/svlEfxTyJQE>  |  |
| 25-Mar | M | Major Groups of Bony Fish | <https://animaldiversity.org/> ***Video***: Electric fish <https://youtu.be/z0M7_HPSi14>  | **Blog9*: Biology and Conservation of Marine Reptiles!*** |
| 27-Mar | W | General Biology of Marine Fishes* Respiration
* Osmoregulation
* Movement
* Reproduction
* Migrations
* Deep fish adaptations
 | <https://animaldiversity.org/> ***Video***: Evolution of fish bodies <https://youtu.be/Cd-artSbpXc>  |  |
| 29-Mar | F | Marine Reptiles* Sea snakes
* Marine iguanas
* Saltwater crocodiles
* Sea turtles
 | <https://animaldiversity.org/> ***Video***: Sea turtle <https://youtu.be/t-KmQ6pGxg4>  | Q10 |
| 1-Apr | M | Major groups of Marine Birds | <https://animaldiversity.org/> ***Video***: Penguins: popularity, peril and poop <https://youtu.be/kGhknFzrnXg>  | **Blog10: *Biology and Conservation of Penguins*** |
| 3-Apr | W | Marine Mammals: polar bears, sea otters, and sirenians* Distribution, Habitat
* Adaptations for an aquatic life style
* Behavior
 | <https://animaldiversity.org/>  |  |
| 5-Apr | F | Marine Mammals: seals * Distribution, Habitat
* Adaptations for an aquatic life style
* Behavior
* Deep diving
 | <https://animaldiversity.org/>  | Q11 |
| 8-Apr | M | Marine mammals: whales, porpoises, and dolphins* Adaptations for an aquatic life style
* Distribution, Habitat and Behavior
* Deep diving
* Echolocation
* Migrations
 | <https://animaldiversity.org/> ***Video***: Why do whales sing? | **Blog11: *Biology and Conservation of Whales*** |
| 10-Apr | W | Continuation |  |  |
| PART III: THREATS TO MARINE ORGANISMS, COMMUNITIES, AND ECOSYSTEMS |
| 12-Apr |  | Marine Ecosystems: Intertidal Zone, Estuaries, Salt Marshes, and Mangroves Forests | Coastal waters: <http://www.iupui.edu/~g115/mod14/lecture01.html> Mangroves: <https://ocean.si.edu/ocean-life/plants-algae/mangroves> Intertidal shores: <https://www.nps.gov/subjects/oceans/intertidal.htm> | **Blog12: *Coral Reefs: climate change and diseases*** |
| 15-Apr | M | **Exam 3: Sharks to Whales** |   |  |
| 17-Apr | W | Biology and Conservation of Coral Reefs Hydrothermal vent communities | **NPR:** <https://www.sciencefriday.com/segments/what-is-the-future-of-coral-reefs-in-warming-ocean-waters/> **Movie: Chasing Coral (in Netflix)** |  |
| 19-Apr | F | Threats to marine organisms: Invasive Species, Climate Change, Sea levels, Ocean acidification, and Diseases,  | Melting Ice Sheets: <http://oceanmotion.org/html/impact/ice-sheets.htm> Antarctica is melting: <https://www.nytimes.com/2018/06/13/climate/antarctica-ice-melting-faster.html> ***Video***: A vanishing island off the Louisiana coast <https://youtu.be/qbW6KBI3Z2g> ***Video***:The oceans are suffocating <https://www.livescience.com/61338-ocean-losing-oxygen.html?utm_source=notification>  | Q12 |
| 22-Apr | **M** | **Guest Speaker****Dr. J. Ellen Marsden****Professor, Wildlife & Fisheries Biology Program** | <http://www.uvm.edu/rsenr/emarsden/>  | **Blog13: *Global Threats to Ocean life (select one): Climate Change, Sea levels, Ocean acidification, and Diseases*** |
| 24-Apr | **W** | Threats to marine organisms: Invasive Species, Climate Change, Sea levels, Ocean acidification, and Diseases,  | ***Video***: Understanding overfishing <https://ed.ted.com/featured/Vs2D6GfT>; <https://youtu.be/WNdR808jMSA> Shark Finning: <https://ocean.si.edu/ocean-life/sharks-rays/shark-finning-sharks-turned-prey> Lion Fish: <https://www.fisheries.noaa.gov/feature-story/impacts-invasive-lionfish>  |  |
| 26-Apr | **F** | **Guest Speaker Dr. Jonathan P. Doubek, GLEON-**Postdoctoral AssociateRubenstein Ecosystem Science Laboratory | <https://www.uvm.edu/rsenr/profiles/jonathan-doubek>  | Q13 |
| 29-Apr | **M** | Threats to marine organisms: Pollution* Nutrient enrichment
* Coastal eutrophication
* Shipping
* Oil pollution
* Plastics

Noise Continuation of Pollution  | How Radioactive are our oceans? <http://ourradioactiveocean.org/> <http://www.whoi.edu/cmer> ***Video***: The complicated journey of marine pollution <https://ed.ted.com/featured/hiGIPdFs> ***Video***: What really happens to the plastic you throw away <https://youtu.be/_6xlNyWPpB8> ***Video***: Noise <https://www.youtube.com/watch?v=t0DHEldqfIc> <https://www.ted.com/talks/triona_mcgrath_how_pollution_is_changing_the_ocean_s_chemistry>  | **Blog14: *Global Threats to Ocean life (select one): overfishing, illegal trade, invasive species, and whaling*** |
| 1-May | W | Threats to marine organisms: Pollution* Nutrient enrichment
* Coastal eutrophication
* Shipping
* Oil pollution
* Plastics

Noise Continuation of Pollution Final thoughts |  |  |
| 3-May | F | Exam Review and Final Thoughts |  | Q14 |
| 9-May |  | **Final Exam (Whales to last lecture)** |