I want to be a marine scientist!
Careers in Marine Science

WILLIAM & MARY
VIMS
VIRGINIA INSTITUTE OF MARINE SCIENCE
MARINE ADVISORY SERVICES

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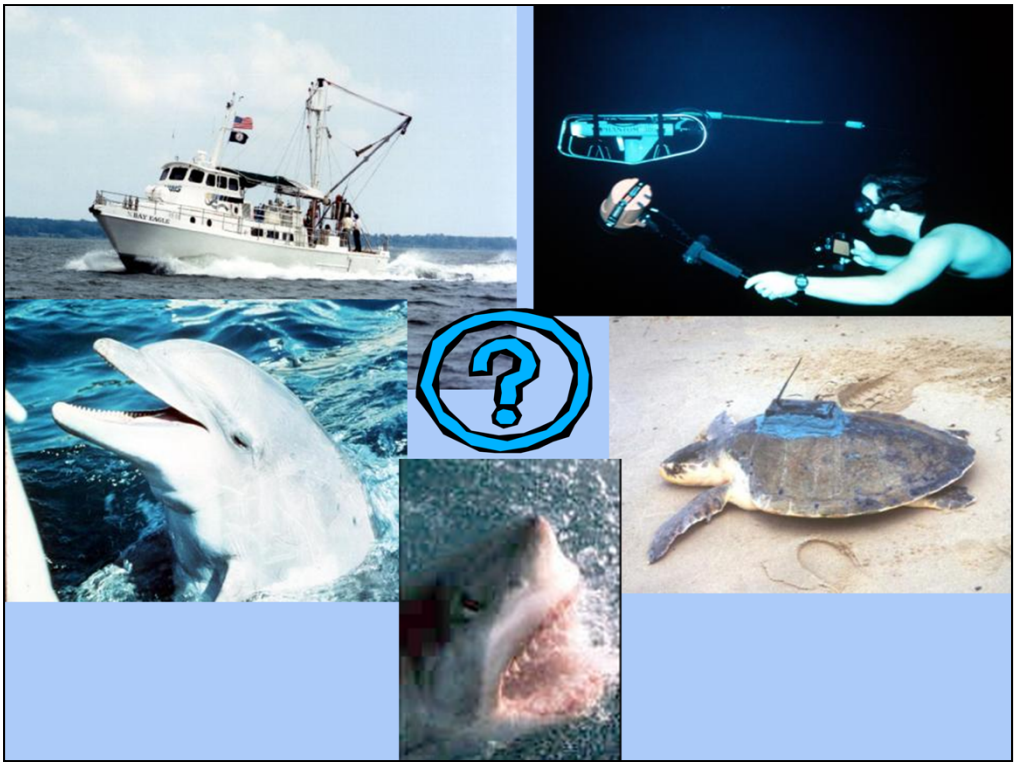
Welcome. Thanks for coming to CBNERR's Discovery Lab. I'm Lisa Lawrence and I'm a marine educator at VIMS. Tonight, I'm going to give you just glimpse of what it's like to be a marine scientist and tell you a little bit about what you need to do to become a marine scientist.

As you were coming into the discovery lab, you were given an assignment. You all get to be part of the VIMS – CSI team. There's been a mysterious fish kill in the York River and we need to figure out why. As you've walked around the lab, you've seen some of the equipment marine scientists use to do their work. As I talk about some of the difference marine science careers, I'll ask you to tell me about a piece of equipment that scientist may use to help us solve the fish kill mystery.

Since we have so many people, I'll ask you to raise your hand and I'll call on you. Please keep your answer to just tell me what piece of equipment you chose and how a scientist would use it to find out why the fish died. If you have more to share, or other questions, please save that for after the presentation and I'll be around to talk one-on-one.



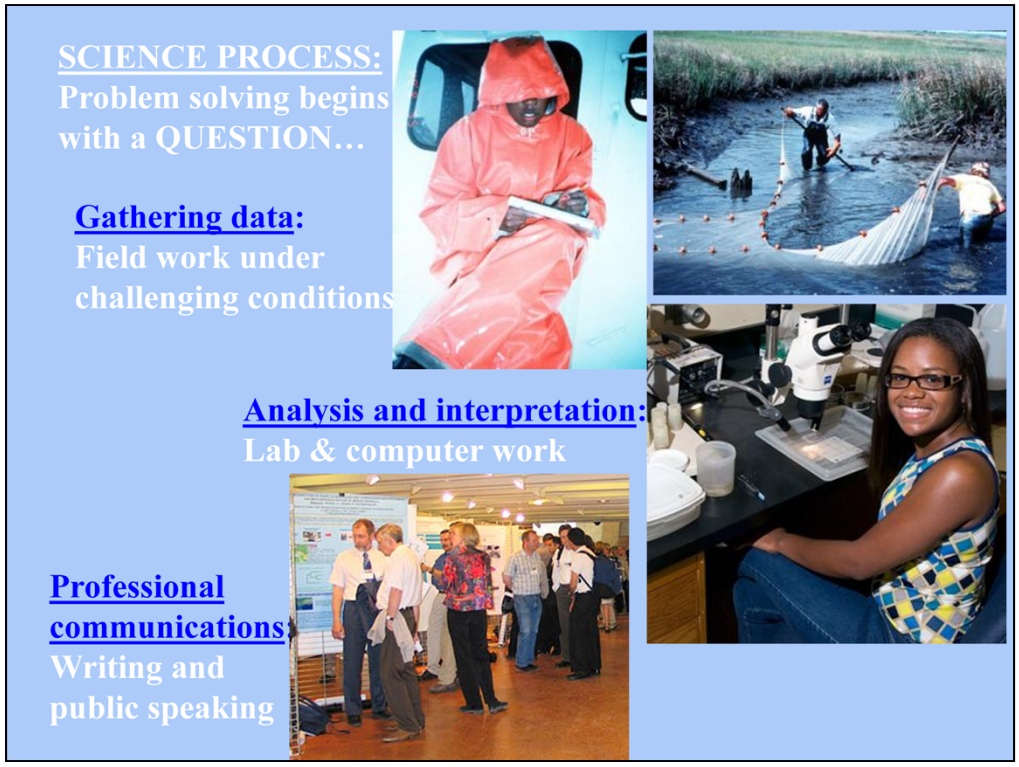
So what do you think it means to be a marine scientist? Raise your hand if you think it means training dolphins? A lot of young people think that if you're a marine scientist or marine biologist that means you'll train dolphins. Most marine scientists will never work with dolphins, BUT there are a lot of exciting things that marine scientists do and we'll talk about some of them tonight.

Many students, especially living here close to Chesapeake Bay, are interested in the ocean and would be like to have a job or career in marine science.

Besides being a dolphin trainer, when we ask most folks what they think marine scientists or oceanographers or marine biologists do, they…

describe marine scientists using boats/ships to do research at sea; using scuba diving and underwater equipment (like rovs); training dolphins, chasing sharks, or saving endangered species like sea turtles.

It's true, these activities are all facets of marine science. But they represent a pretty small part of the picture.



To understand what a marine scientist (or oceanographer) does, we have to first think of what all scientists do… We ask questions. Scientists want to understand the world around them. Figure out why things are the way they are, how things work.

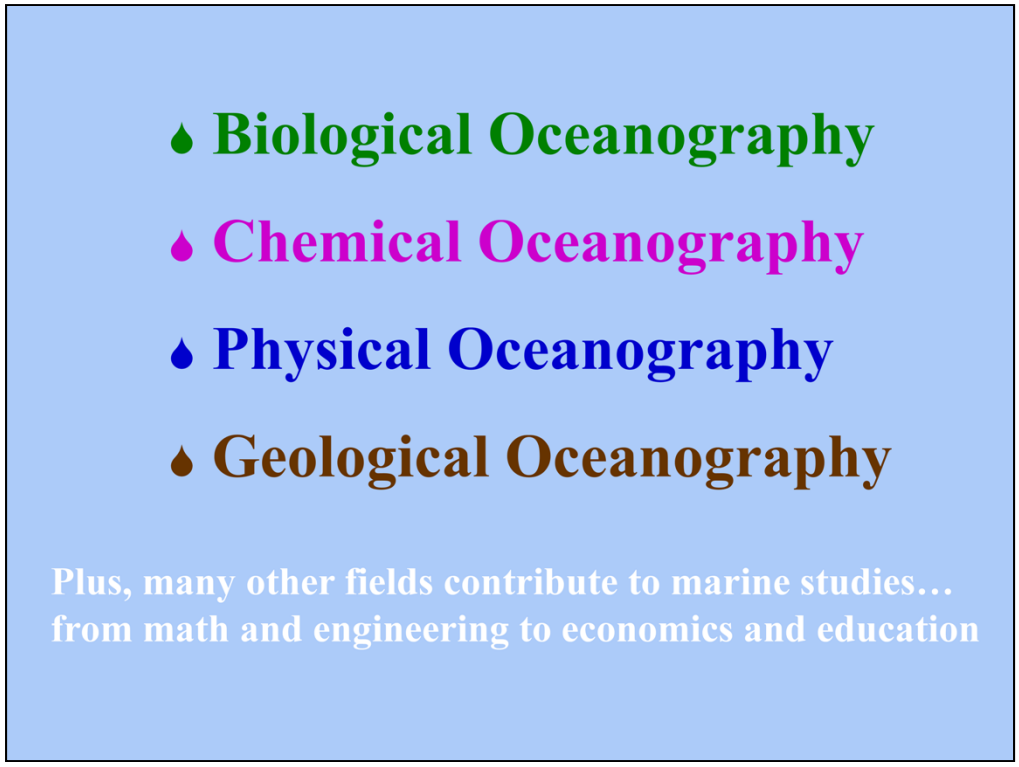
*It begins with a question, usually in the form of a hypothesis (educated guess).

*Data collection and/or experiments are conducted, sometimes under challenging conditions (cold and wet on a ship at sea, muddy up to your knees in a marsh)

*Further experiments, analysis and interpretation take place in the lab. Some researchers are in the field for only a few weeks each year & the rest of their time is spent indoors.

*Scientists communicate: scientific articles, posters and talks at professional conferences, internet and web presentations, teaching, grant writing

Just because a scientist is located here at VIMS, it doesn't necessarily mean he or she is studying only the Chesapeake Bay or even the Atlantic Ocean. VIMS scientists have research projects all around the world, in every part of the ocean. From the North Pole to the South Pole. East to West.



Marine/ocean science is broken into major subject areas called disciplines. (Side question: How many oceans are there? ONE!). The main disciplines are

Biological Oceanography

Chemical Oceanography

Physical Oceanography

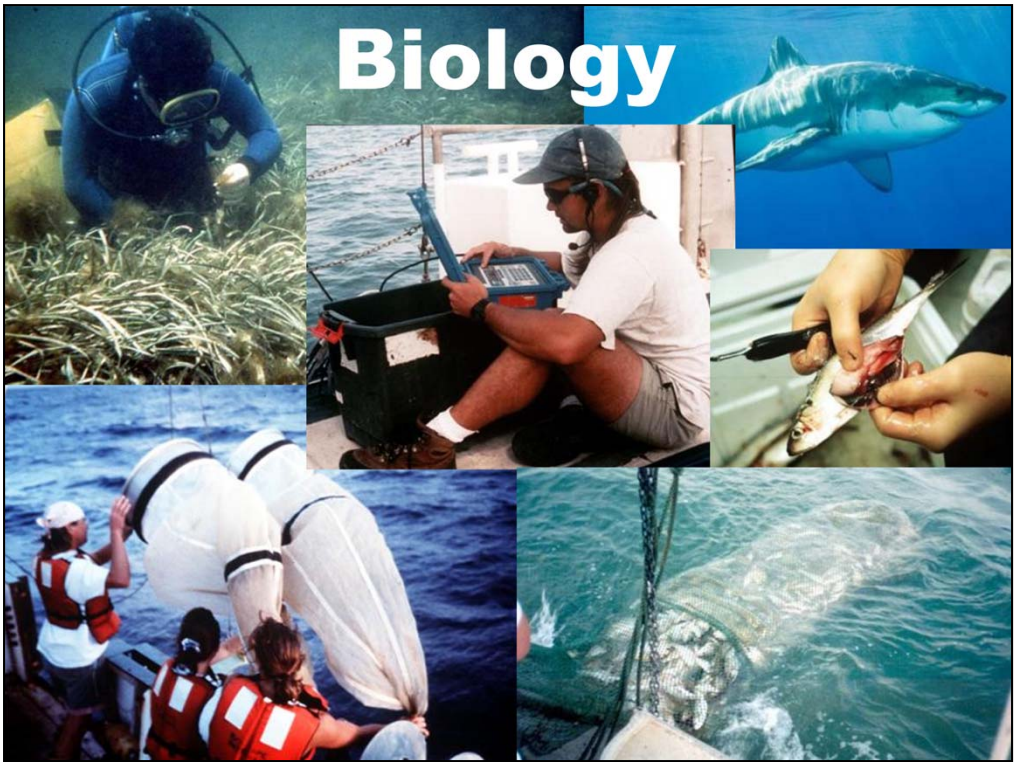
Geological Oceanography

But in reality, marine scientists have to know not just the subject area they specialize in but the other areas as well because they can all affect each other. That's why marine science is considered to be very Multi-disciplinary (covers many of the different subjects).

Each of these subjects is very complex, with lots of different aspects to study. We're going to look at each of these briefly today and see how they all connect.

Additional fields/careers draw from several of these basic disciplines.

Examples are: Environmental sciences; Ocean Engineering & technology; Ocean Economics; Ocean Policy & Law of the Sea; Marine education.



Let's look at major fields of ocean science:

Biological Oceanography: Covers any/all life forms in the ocean & the interactions of life with the chemical & physical surroundings, from bacteria to whales, single species or entire communities, ecosystems. Marine biology falls within this larger discipline.

Biological oceanographers might study:

*marine plants: seagrasses or seaweeds that form the base of the food web

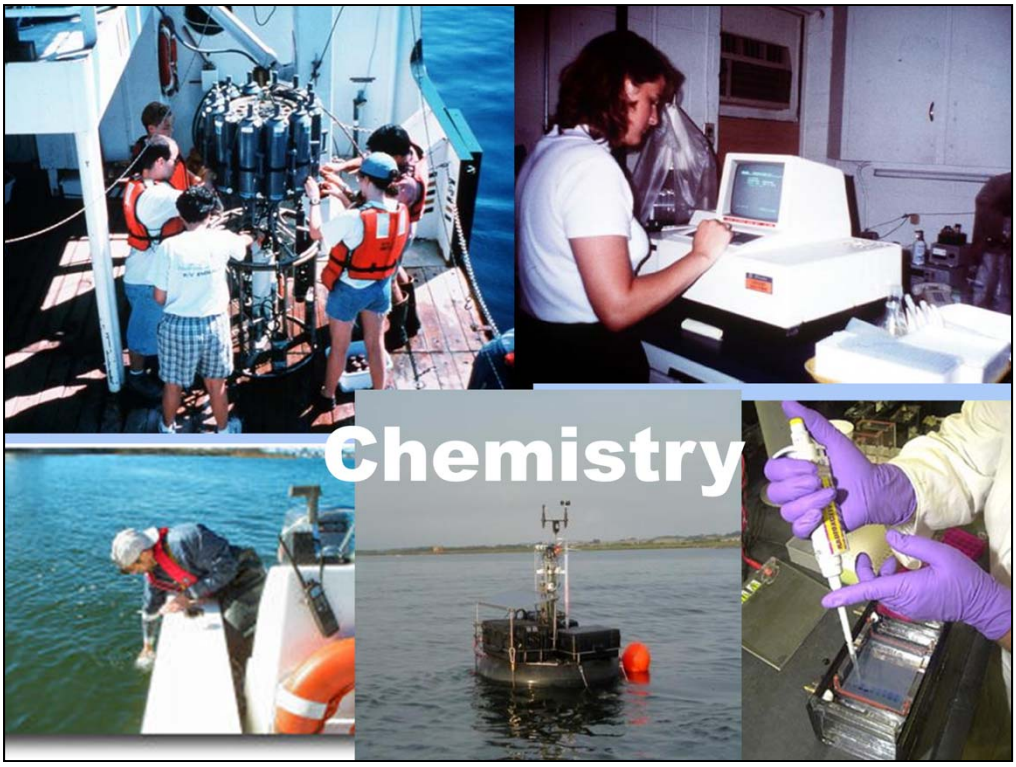
*marine animals: using sonic tag to follow large & mobile marine life (e.g. shark)

*study anatomy to determine biological relationships, breeding condition, health, etc.

*use special equipment like plankton nets to study smallest marine life like plankton

*they might study fisheries, tracking the populations of seafood species we depend upon

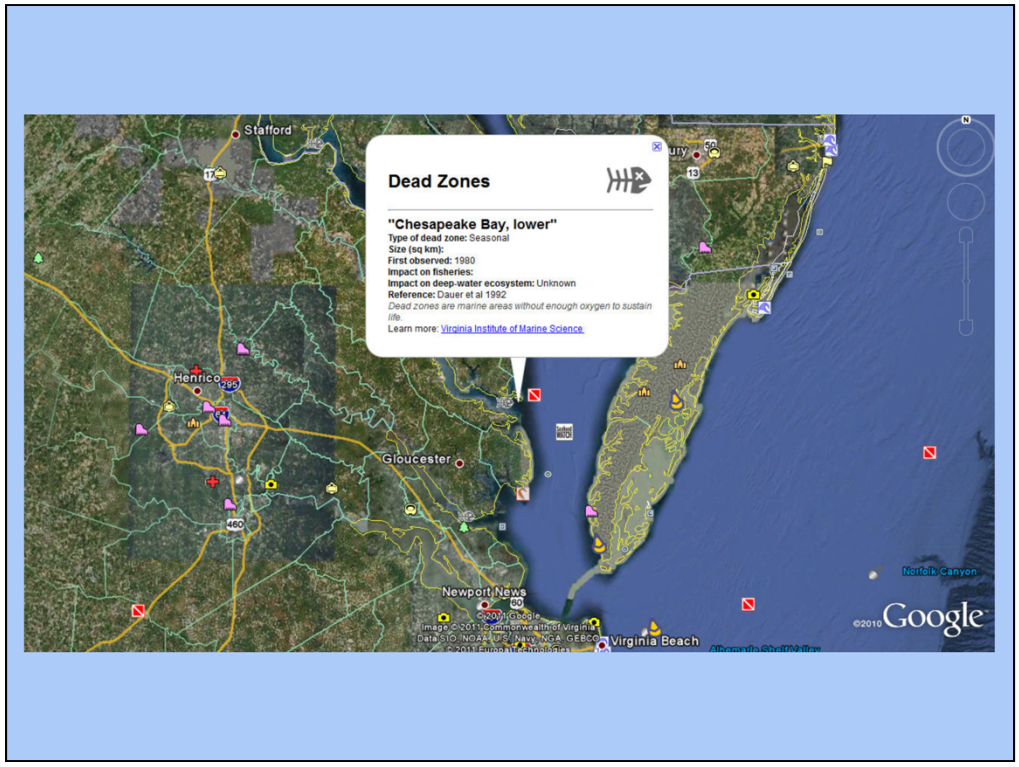
Dr. Emmett Duffy, a VIMS biological oceanographer, and Dr. Liz Canuel a VIMS physical oceanographers have teamed up with biologists, chemists and physicists at W&M for a biofuel research program. They're studying how to turn marine algae into fuel for our cars.



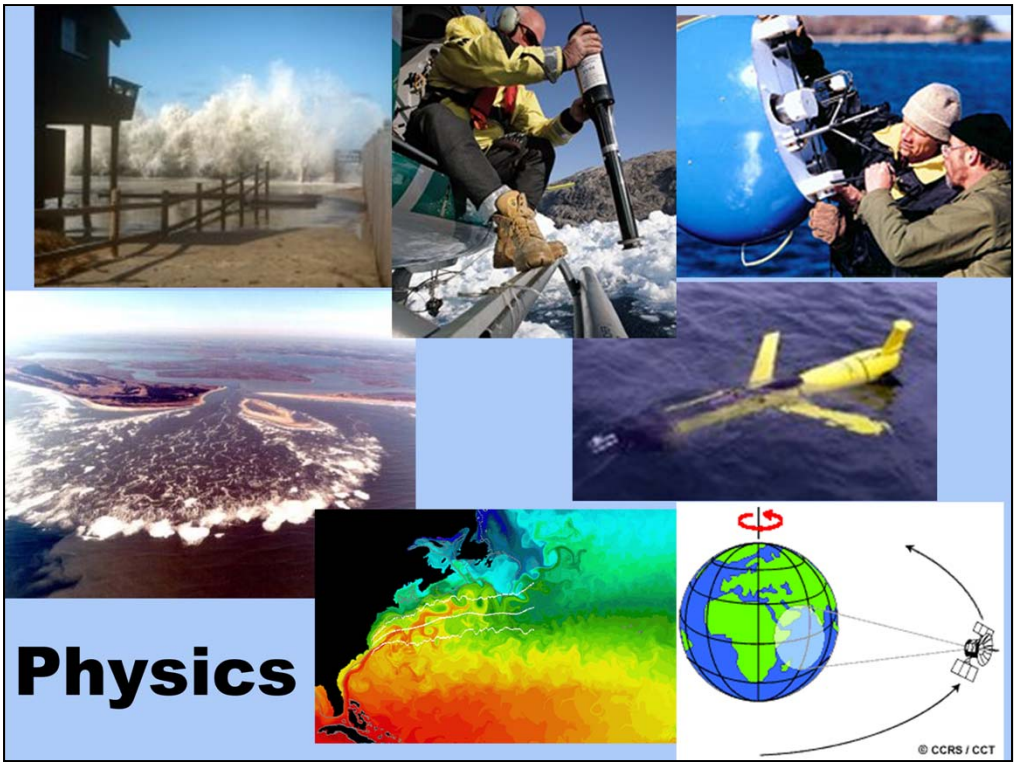
Chemical oceanographers study the seawater itself and how it varies from the surface to deep ocean, with seasons and in different locations on the globe. They are also interested in how seawater chemistry interacts with living organisms, with geology and physical properties of water. They may study the affects of both natural and man-made chemicals on the ocean environment.

Several water samples might be taken at the same time using this Rosette array, this is a large collection device deployed from large vessels at sea. Smaller samples might be taken by hand from a small boat, like this one in the Elizabeth River. For continuous, automated collection of water chemistry data time series: instrumented buoys and satellites have been developed.

Water analyses use several different kinds of laboratory instruments and you have to be very careful and precise. Water samples might be used to changes in salinity of the water or oxygen levels – both important to the survival of Bay marine life. Chemists might also be looking for chemicals that might be harmful to marine or humans eating them, or even chemicals from sealife that might someday be used as medicines.



Dr. Bob Diaz research on Dead Zones (areas in the water of little to no oxygen where organisms cannot survive) has made it into Google Earth's Ocean Layer.



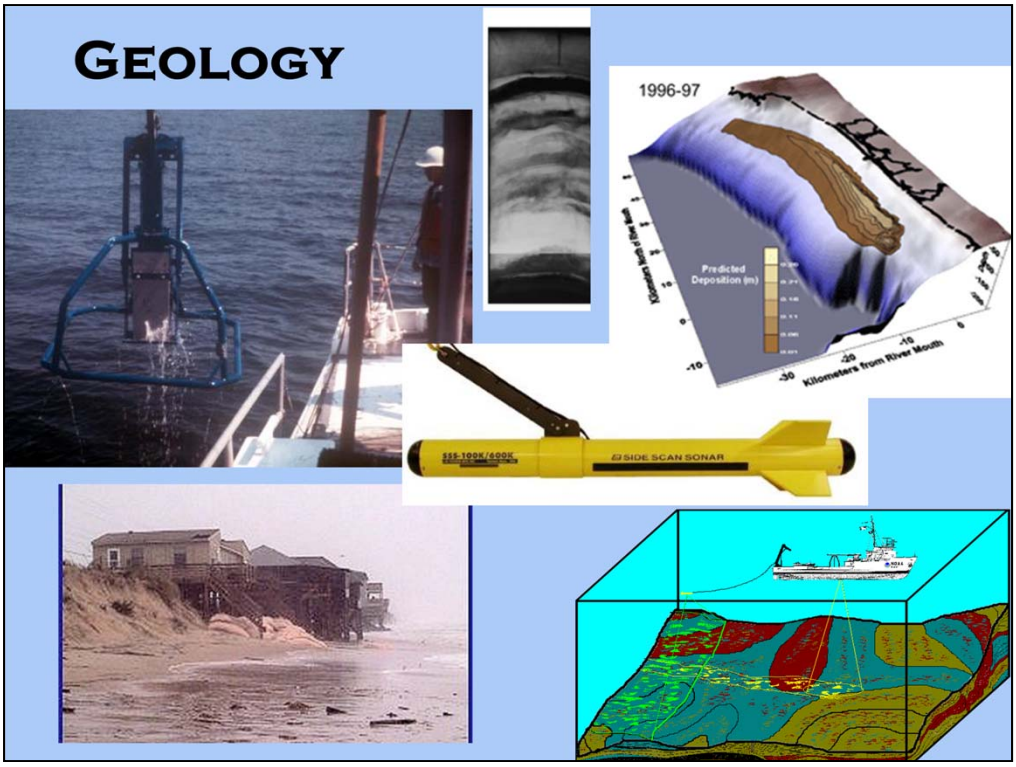
Physical oceanographers study how waves, tides and storms form, and how they move water around. Their work on sediment transport can be important in understanding why inlets or harbors fill with sand. They might study how sound or light travel underwater, that's important for marine life like whales and dolphins, and for the military, too.

Oceanographers measurements of the temperature and density of ocean waters lead to the discovery of a worldwide circulation of ocean water. And, we are just now beginning to understand the ocean's important role in global climate control.

Physical oceanographers collect data at sea, but they have been at the forefront in developing engineering solutions for gathering data using fixed shoreline stations, floating buoys, gliders (AUV) and satellites. They use math, engineering and computer skills to invent ways to study the ocean 24/7.

Physical oceanographers at VIMS are working on developing and refining storm surge prediction models to be more accurate. They want to be able to give local governments and planning organizations street level data on when and where flooding will occur from storms.

How many of you live in low lying areas that are prone to flooding? This is a picture from my driveway during Ernesto. As you may guess, I did not make it in to work that day. Right now, we never know exactly if our roads will be submerged, we just have to go outside and look to see how high the tide gets. But with their new model predictions, we'll have a better idea of when our areas will be flooded.



Geological oceanographers may study: the formation of ocean basins; what the sediments are made of and where they come from; how marine life interact with the seafloor, how geology affects the ocean's chemistry. Some specialize in how the seafloor is moved around by the water, that includes shoreline erosion. Other marine geologists may specialize in the history of life in the oceans (paleontologists) or the history of human activity in the sea (archeologists).

Marine geologists sample on different scales:

A box grab or core takes a sample from a single spot on the seafloor to look at sediments and marine life at a particular location. An x-ray of a core shows both sediments and marine life living in the seafloor.

Geologists can also study large areas of the seafloor using equipment like the side scan sonar: revealing seafloor spreading and undersea volcanoes; mapping seafloor and coastal features important in navigation, national security, even archeology.