This is something some of you may have seen.

The data here in from the '50s is from the Mauna Loa measurements, the top of a volcano.

And this is CO2 concentration, parts per million in the atmosphere.

But if you dig into the ice-- we're going to be doing a lot of that here in Boston over the next three months.

But if you dig deeper into the ice, in the cores, you go back in time, and it's a beautiful thing.

The ice as you go down is ancient atmosphere.

That's cool-- because there's little bubbles.

Remember, we talked about the half life of carbon-14 that's trapped from a living thing breathing it in.

Well, you can trap directly the little bubbles of atmosphere in the ice, and that's what happens.

And that's why we know what CO2 levels-- we're going back almost a million years here.

It's 800,000 years of data.

And this is a graph that I think many of you have seen.

It's going up, a lot.

And here it is.

Now, this is just zooming in on the last 50 or so-- this is just the data, the Mauna Loa data.

And The reason is because here we also have another kind of data.

So there's a lot of attention paid on CO2, and there should be.

There is a lot less attention paid to what that is doing to our oceans.

And this is a reaction that we will talk about more when we talk about acidification.

So when we talk about acids and bases, which is coming up later-- later being Wednesday and next week-- we'll talk more about this.

But I just want to tell you that when you have CO_2 in the atmosphere going up, then you also have CO_2 in the ocean going up.

So the CO_2 in the ocean-- the CO_2 in the atmosphere is getting absorbed by the ocean.

So what?

No, it's a lot of what, because what happens is the CO_2 in the ocean-- the more CO_2 in the ocean-- is making the ocean more acidic.

So if you just write this number down-- because it's so astonishing.

Past 200 years, the ocean has become 30% more acidic.

Now that is the fastest-known change in the ocean chemistry in 50 million years.

That's a big and very sudden change.

So the ocean is absorbing about 22 million tons per day of CO_2.

And that number is going up.

Why does that matter?

Maybe it will do to the oceans what it's doing to the atmosphere and making things a little warmer.

No, it's doing more, because when it acidifies, then it has a direct impact on things like this, which is a pteropod.

You look at the food chain of the ocean-- there are three things at the bottom.

That's one of them.

I mean, there's plants.

There's photosynthesis.

And then there's the bottom of the food chain.

Now you know what's going to happen when the bottom of the food chain disappears.

This is one of the main kinds of animals that lives at the bottom of ocean because they've got these very small calcium carbonate shells.

If you make the ocean just a little more acidic, like we're doing, those shells don't survive, and those animals don't survive.

So that's what happens to a pteropod.

At the rate we're going-- like decades of time from now-- that's what happens.

So what you have in your goodie bag is a way to see this a little bit more accelerated.

So here's your goodie bag.

So I wanted you to-- I wanted you to see what's happening in the ocean, and you have now the tools to do that.

So in your goodie bag, you've got citric powder.

Imagine you take a lot of limes, and you squeeze them, and then you dry it all out.

And that's what you got-- citric acid.

Now you're going to mix that with water to change the ph.

And you're going to dissolve this powder.

That's the topic of today's lecture-- dissolution and equilibrium.

So you're going to mix that into water, and you've got a scale from a previous goodie bag.

So my hope is that you've been using that on a daily basis.

You take it with you places, and you can use that again here.

And you'll need that, because I want you to see how these shells dissolve.

And if you lower the acidity more-- we don't want to wait 40-- well, you can wait 45 days, but I want you to be able to do these experiments in minutes.

So we're going to go a little lower in acidity, in ph, but you're going to get the same result.

You're going to dissolve these shells.