I want to talk about ionic and electrostatic bonds, and I know many of you are taking chemistry and the chemists have a slightly different take on an ionic bond than we do.

The classic chemists’ ionic bond is like sodium chloride. Sodium chloride, we will never discuss in BIO 111.

Our ionic bonds are slightly different.

I want to talk about them.

Fundamentally, they're the same.

It's a positive charge and a negative charge; there's no difference there.

How they come about is slightly different, so let me show you what I mean.

So I want to say in Bio 111.

So when the chemists tell you a slightly larger story, don't be alarmed.

So these are not due to 2 very different electronegativities. T

That is most the time in chemistry when they talk about ionic bonds, it's going to be because they have very different electronegativities.

I talked about that last time.

That's like electron theft, where chlorine steals an electron from sodium.

In the case of bio 111, you still have positive and negative charges. Still an ionic bond, but it's not due to electron theft.

It's due to the most basic form to unlike charges attracting.

OK.

And these are full charges only, not partial.

So it's only an honest to God Ionic bond, if you really got full charges.

I'll give an example that we'll see lots more complicated ones than this.

But just to be an example.

These particular molecules it doesn't really matter; they're just nice simple examples.

And then you have something like this.

And what you have between these two charges?

Is an ionic bond.

And so a couple of things just to say it's between the plus and the minus.

A full plus and a full minus

A note about symbols.

We reserve the straight solid line to mean a covalent bond.

So how do you show these other bonds.

These hydrogen bonds we use sometimes dotted lines, sometimes squiggly lines, basically anything other than a solid line.

A solid line means a covalent bond.

A non solid line means something else; another kind of interaction that we care about.

That's because covalent bonds are special.

They’re what actually hold the parts of a molecule together.

So that's one kind of ionic bond.

There's another kind of bond I just want to mention: van Der waals.

VDW for short.

This is important but extremely weak, so it's possible between any two atoms.

There are no special requirements whatsoever.

It is the weakest bond.

It is, however, always present between any 2 molecules?

But only important when nothing else is possible.

And so, if you take the case when we talk about those liquid gases, liquid hydrogen, liquid oxygen, liquid nitrogen, those, none of those things can make hydrogen bonds.

The hydrogen in hydrogen gas is not a special hydrogen, so they're only held together by Van der Waals bonds.

That's why it has such a low boiling point.

It's easy to break those really weak Van der Waals bonds, right?

And so the thing is, the is if we ever ask between any two molecules, are Vander Waals bonds possible?

The answer is always yes.

So if you fall asleep and I ask about Van der Waals bonds, you can safely wake up and say yes, because the answer to that question is always yes.

Van der Waals bonds are always possible, right?

However, they're not usually a big issue because there’s stronger stuff going on.

There are situations though, where they're the only bond that can get made.

How do they form?

We will not fuss about it in detail, but basically it's due to interactions between random transient polarization of molecules.

All right so if I were forming a bond with the table over here, right so they got a cloud of electrons between us. You know they're moving really fast.

Sometimes by accident there might be slightly more than by that by the table, even if we have the same electronegativities totally equal sharing.

Sometimes the electrons might happen to be a little bit more over there, which means this is slightly negative, which means anything in the neighborhood that’s slightly positive will slightly stick to it. But slightly right, so Van der Waals is only a big deal when there's nothing else going on, and it's extremely weak force, but it's worth knowing about because it's it is there.