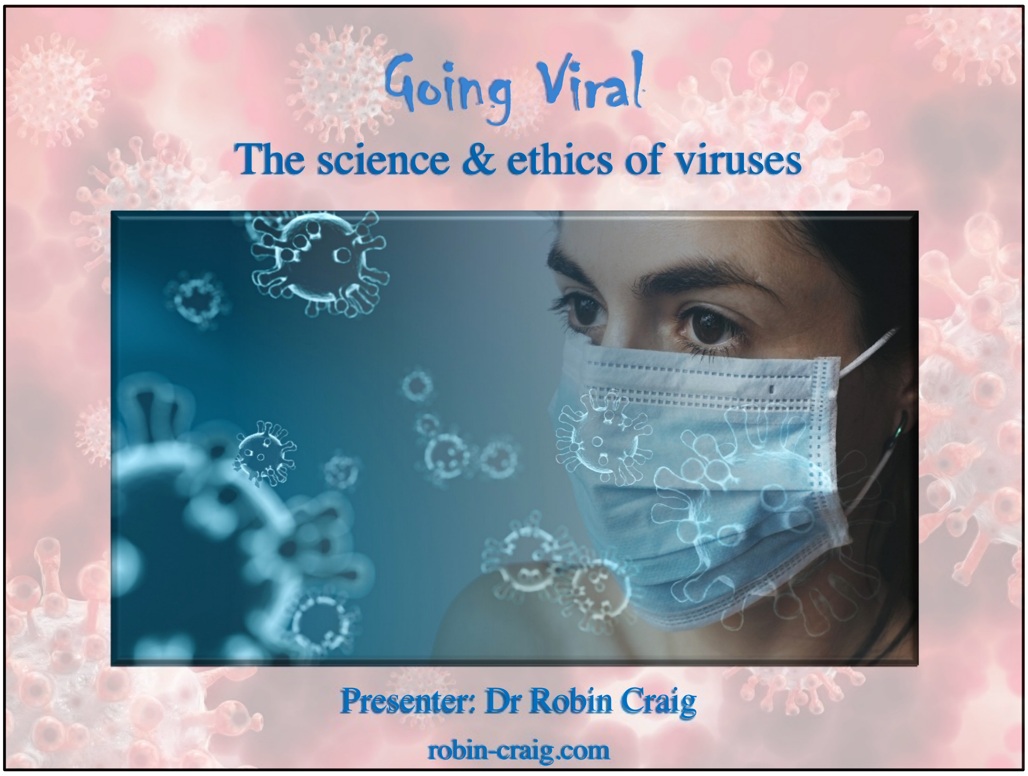


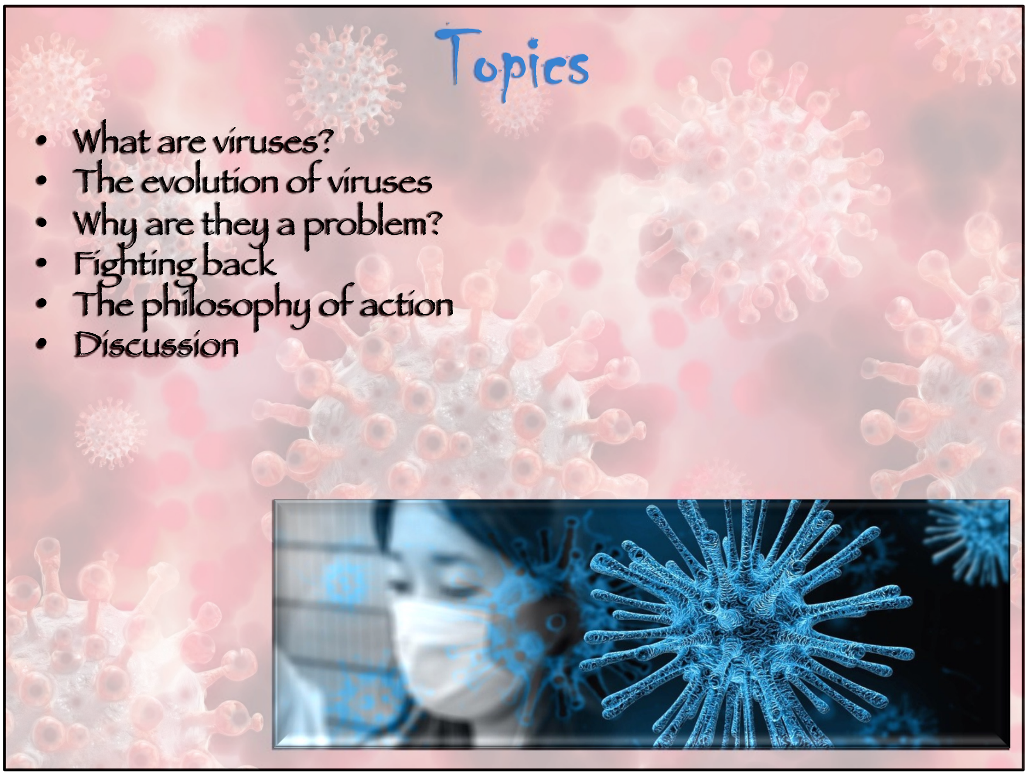
Hello everyone. For those of you who are new to these talks, I am Dr Robin Craig. My background is a scientist in the field of biotechnology, with an interest in both science and philosophy.

Today's topic is something you *might* have seen once or twice in the news lately: viruses and our response to them.

This is now my last talk on this cruise. However I will be at the Yacht Club at 4:15 PM today for the Insights Up Close session if you want to explore anything further.

When I was growing up, viruses were something feared, not something especially controversial. Everyone knew they were bad for us, and everyone was glad when a new vaccine or other treatment was developed. These days, both the science and the treatments are mired in controversy.

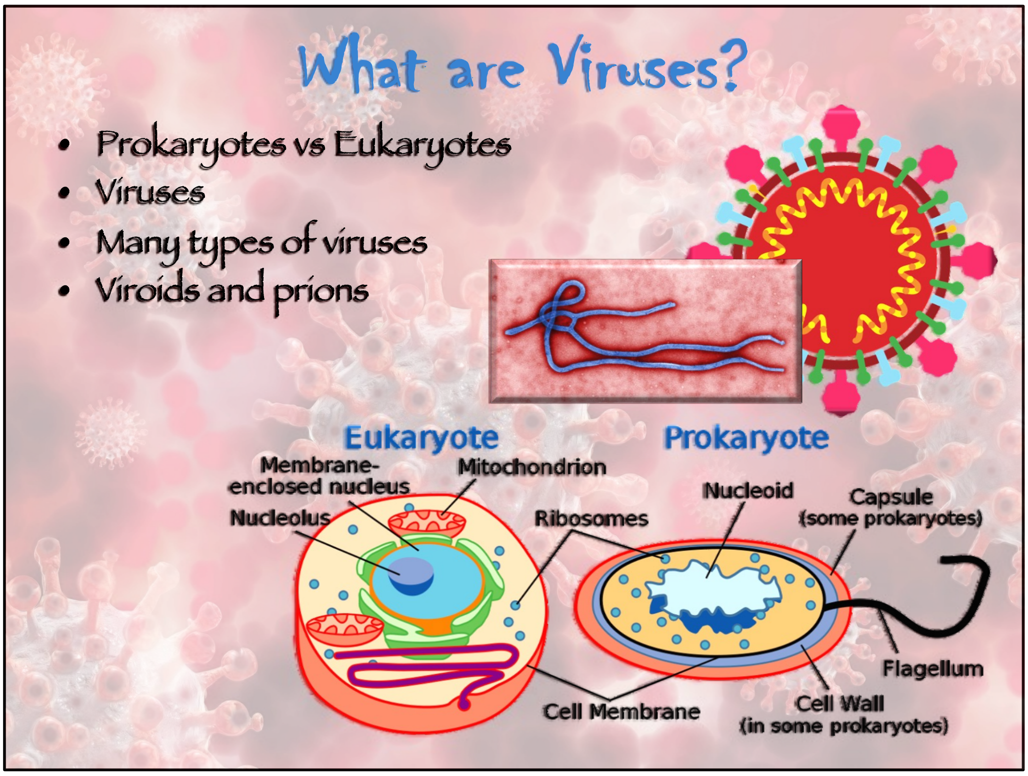
Let's see if we can make some sense of it all. ***



So here’s what we’ll be looking at today.

It always helps to know what we’re looking at, so we’ll start with what viruses are, including some facts about COVID-19 >>
We will look at where they come from >>
Both in terms of their ultimate evolutionary origin and new variants.
We will see why they are a problem >>
And how we can prevent or treat viral diseases >>
And something that has caused a lot of controversy lately >>
The philosophy of those responses, especially public ones.

Finally I’ll open it up for questions and discussion >>
***



So, what are they?
Let's put viruses in the context of the kinds of life on planet Earth.

The major structural division in living things is between prokaryotes and eukaryotes >>
Prokaryotes are the older and more primitive version. They are cells with little internal structure ^^, basically a membrane around protoplasm in which all the cell components float around fairly freely inside the cell. That includes their DNA – prokaryotes have no defined nucleus. The water is essential to the function of all the molecules and structures in the protoplasm that keep it alive.
Eukaryotes are more complicated ^^. Like prokaryotes they share the basic structure of life: a membrane keeping the goodies inside separate from their environment. But many of the things inside are contained within their own membranes as specialized organelles. This includes the nucleus itself ^^ that contains DNA organised into chromosomes, plus mitochondria ^^ which are the energy powerplants, and in plants, the green chloroplasts that carry out photosynthesis.

Interestingly enough, the eukaryotes appear to have arisen as symbiosis between different prokaryotes. So both mitochondria and chloroplasts are the remains of formerly free-living bacteria. They still carry a portion of their original genes, separate from the main nucleus of the cell. As they are more complex, eukaryotic cells are usually much larger than prokaryotes.

Who knows what we are? …
Yes, we are eukaryotes. All complex multicellular life is.

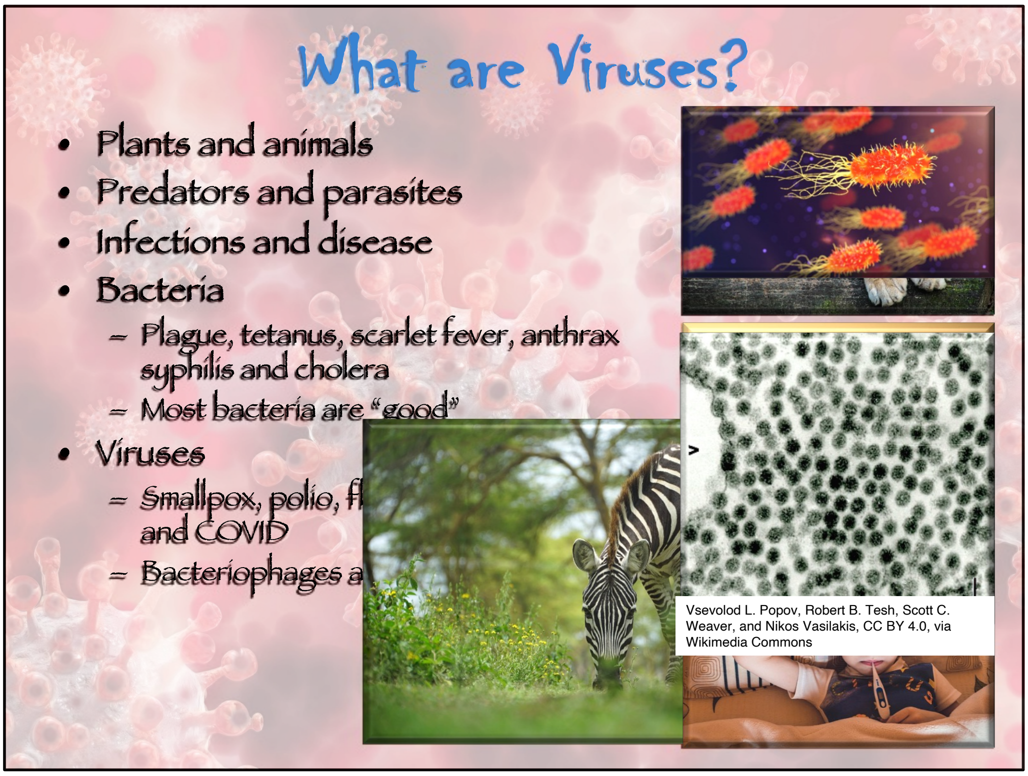
Viruses >>
Are something even smaller. Many people, including me, would not call them living things. They have an outside and an inside, but the inside is inert and not metabolically active. They don't eat, breathe, burn energy or move around under their own power. They don't have their own power. They are basically a shell enclosing their genes. The shell contains proteins which attach to their victims and inject the genes into them; they may also carry other preformed proteins that kick-start their replication inside the cell. Some, like the flu virus, are also wrapped in a membrane taken from their host cell.

There are many types of viruses >>
When you look around at the variety of eukaryotic life, you might not be surprised that there is also enormous variability among viruses. Their genetic material can be DNA like us, or RNA which in living things is used to carry out genetic instructions rather than storing them. Their DNA or RNA can be single or double stranded. They can be symmetric balls or polygons like this example, have a head and tail section, or be long threads like the infamous Ebola virus >>.

Do you think viruses are the smallest, lifelike things around? …

Even simpler than viruses are viroids and prions. >>
Viroids are just small circular pieces of RNA that don't even have a protein shell. All known ones infect flowing plants. Prions are kind of the opposite: they have no genetic material at all but appear to be misfolded proteins that cause their normal brothers to also misfold, and the accumulation of these out of shape proteins cause disease. The first human disease identified with prions was kuru, a form of dementia suffered by New Guinea cannibals, but they became famous with Mad Cow Disease, where prions spread from inadequately treated diseased cow nervous tissue to humans. Alzheimer's disease appears to be similar to a prion disease but is not caught by infection.

But Pro safety tip. I do not recommend eating human brains under the best of circumstances. **



So that's where viruses lie in the tree of life. Let's look at their ecology, or their interactions with other organisms.

The commonest distinction people make in the large scale living world is between plants and animals. >>
What's the difference? …
Plants make their own food from simple chemicals and sunlight, while animals eat the plants and each other.
Of course like all things in biology, there are all kinds of other complexities. Some plants like the venus flytrap eat animals.

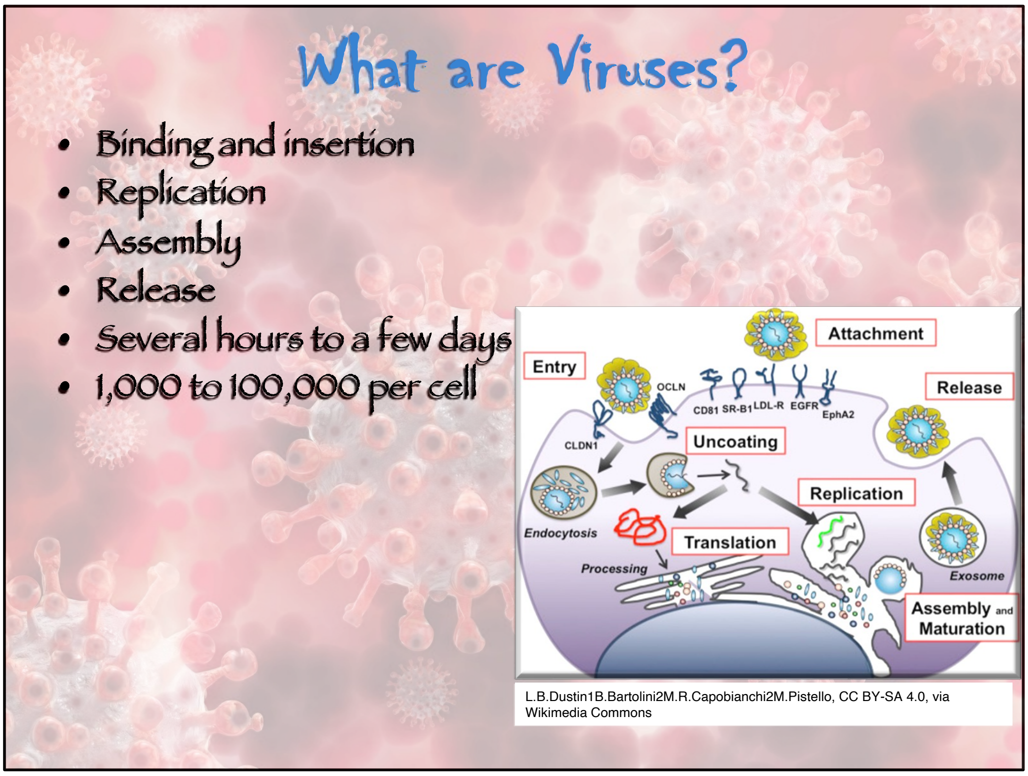
In terms of animals eating each other, the two main attackers are predators and parasites >>
Predators are big things that kill and eat their prey >>
Parasites are smaller and feed off living victims >>
They can be external parasites like mosquitoes and ticks, or internal parasites like various worms.
When the parasite is microscopic, we start calling them infections and diseases. >>
The classic perpetrators here are bacteria >>
As we saw earlier, bacteria are prokaryotes and are true living things with their own metabolism.
Infections can also be caused by eukaryotes including fungi and protozoa. But what advantage do you think bacteria have? …
As prokaryotes, they are simpler and smaller, and so tend to reproduce much faster. Some of them have a generation time less than half an hour.
Bacterial diseases, some of which have been major scourges of humanity in times past, include plague, tetanus, scarlet fever, anthrax, syphilis and cholera. >>

However despite their often deserved reputation, most bacteria are harmless or useful. >>
They help in digestion and make vitamins for you, and out in the environment they not only recylcle nutrients but fix nitrogen, and so are a major part of the success of larger lifeforms.

Viruses, however, are another matter. >>

As they have no metabolism of their own, they can only replicate inside living things. So all they can ever be are parasites, and since their entire reason for being is to replicate, they disrupt normal cell function and cause disease. While the same is true of viroids and prions, both those are simpler and less capable. Viruses are a potent combination of genetic material wrapped in a protective package designed for delivery and infection.
Examples of viral diseases are smallpox, polio, flu, measles, HIV, herpes and of course COVID. >>

Viruses don't only infect things like us >>
Some infect bacteria, and these are called bacteriophages, meaning bacteria eaters. Rather surprisingly, some even infect other viruses, and these are called virophages. There are some extremely large viruses called megaviruses. These are so large that when they infect a cell and are working to churn out their own copies, small viruses can infect those large viral factories and hijack them, the same as they'd do to a normal cell. ***

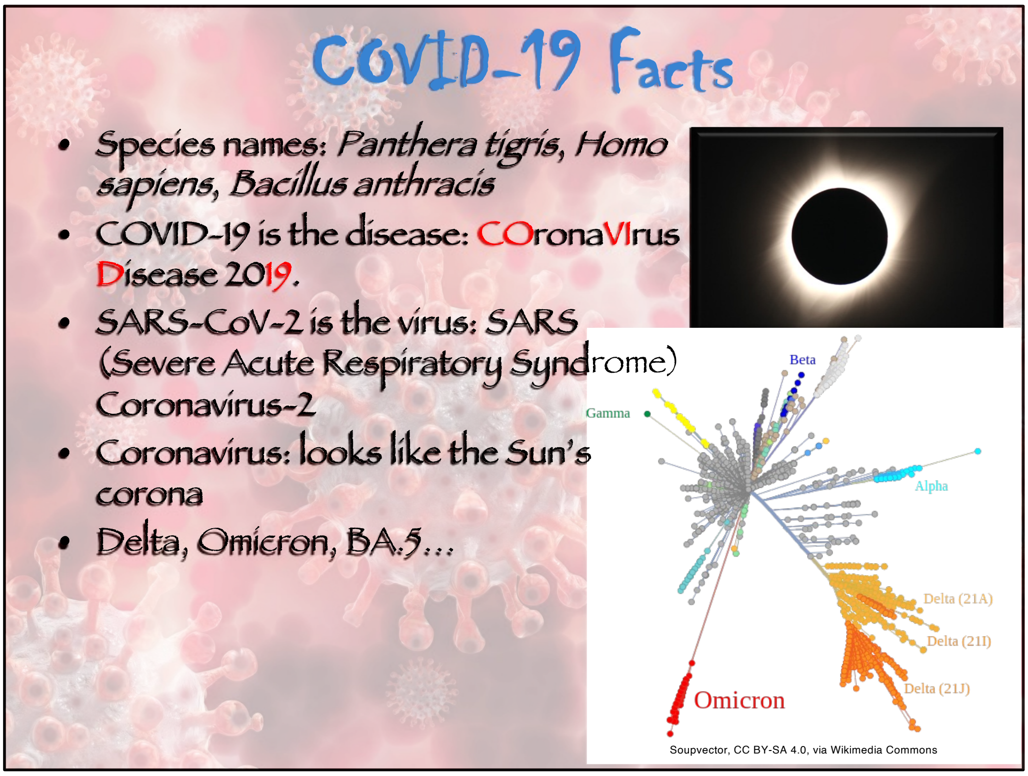


So how do they do what they do?

In order to sense and respond to their environment, living cells have all kinds of structures on their surface. >>
Proteins on the surface of the virus bind to these ^^ and depending on the type of virus, this either causes the cell to engulf the virus, or the virus actively injects its payload into the cell. ^^
The viral genes are then activated >>
and it takes over the cell metabolism to replicate its genes and make all its components ^^
These are then assembled >>
into complete daughter viruses ^^ which then escape from the cell >>
, usually destroying it in the process.

This process is quite fast, taking several hours to at most a few days >>
And releasing a thousand to a hundred thousand virions per cell >>

So you can see they're pretty good at what they do. **



Would you like to learn a few fun facts about everybody's favourite virus?

Like you have a choice.

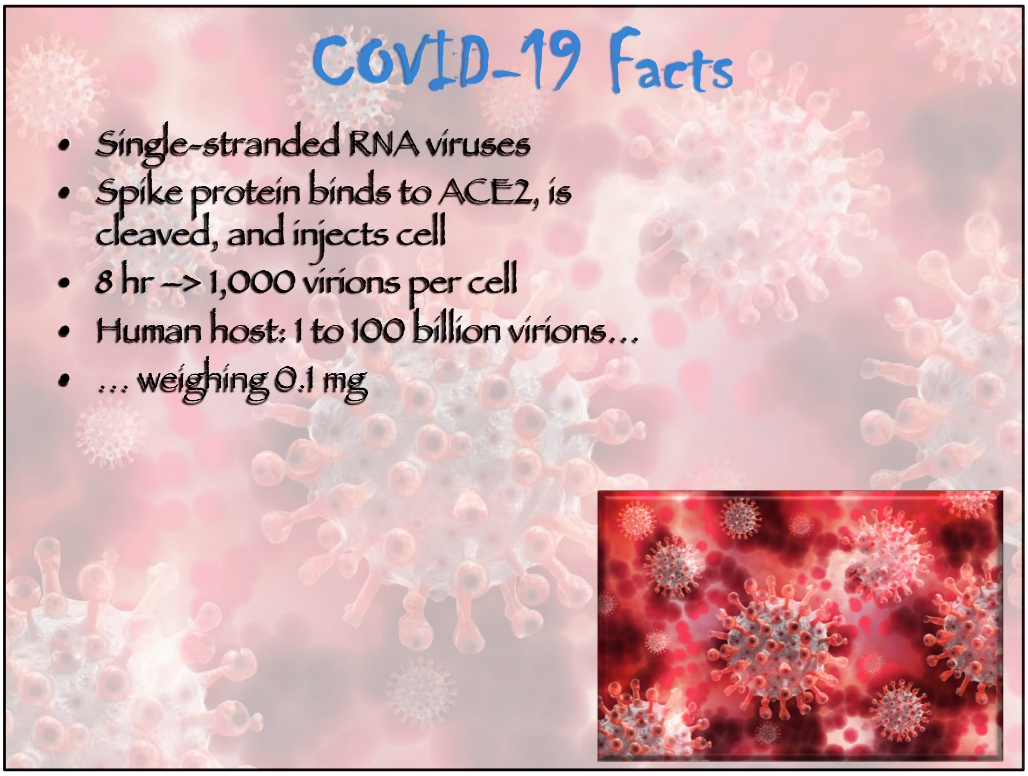
First a bit about organism names in science. In most of biology, species are given a "genus species" designation >>
, where the first word is the genus, the wider group that puts it in its context, and the second is the particular species.

For example, the common name "tiger" is a perfectly useful label for this animal >>
But the scientific name *Panthera tigris* ^^ also tells us that it belongs to the genus *Panthera*, so its closest relatives are other large cats such as lions, leopards and jaguars.
Or take the example of ourselves: *Homo* ^^ meaning "Man" and *sapiens* meaning "wise". You can see that one was invented before the Internet.
We are the only living member of the genus *Homo*, though there are numerous extinct ones, such as Neanderthals and more apelike ancestors. I suppose our being the only one left alive justifies the term "wise" even if our debates on the internet don't.
The same applies to bacteria. Thus *Bacillus anthracis* is the species of *Bacillus* ^^, which are a type of rod-shaped bacteria, which causes anthrax ^^.

Viruses are different, partly for historical reasons, partly because they are so different from true life.
COVID-19 is the name of the disease, not the virus itself >>
: simply an abbreviation for Coronavirus Disease 2019: it is a disease caused by a coronavirus first identified in 2019.
The virus itself is called SARS-CoV-2 >>
, as it is related to the SARS virus, the one that caused a panic some years ago but ended up more easily controlled.

Why "Coronavirus", do you ask? Who knows why they are called Coronavirus? …
The scientists who first saw them under an electron microscope saw they were surrounded by a haze of these spike proteins ^^
, which looked like the Sun's corona >> as you see in a solar eclipse.

Pandemic viruses can evolve very rapidly, so to keep track of that, they are given variant names or numbers. >>
This is why you hear about delta and omicron variants, and subvariants like BA.5. There are actually far more variants than you hear about in the press >>
This is the genetic tree back in December 2021. Each dot here is a different variant, identified by some change or changes in their genes. Fortunately, most such variants don't make much if any difference. They only become famous when they are faster spreading or more dangerous.
***



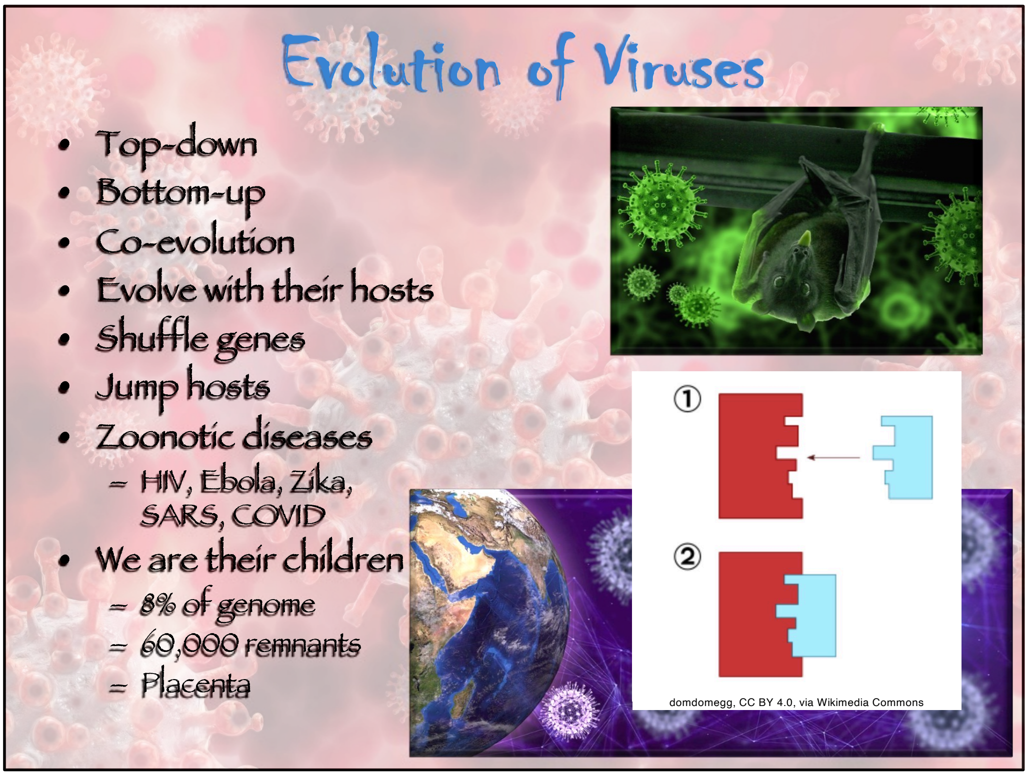
Let’s move from names to their biology.

You heard earlier that viruses can be DNA or RNA, single or double-strainded. Coronaviruses are single-stranded RNA viruses. >>

Since they are covered in the infamous spike protein, you should not be surprised that that’s how they infect cells. >>
The spike protein binds to a cell surface receptor protein called ACE2, which causes the spike protein to be cleaved by another surface protein, and the cleaved spike protein unravels and fuses the virus to the cell, injecting its RNA and starting the infection.

It then takes about 7-8 hours for it to finish and release about a thousand virions per cell. >>

Which then go on to infect more cells.
To give you idea of the scale of things in both directions, it has been estimated that at peak infection, their human hosts carry one to 100 billion virions >>
but all together weigh only a tenth of a milligram..>>



That's what viruses are. Now let's look at their evolution. Where did they come from?

In terms of their ultimate origin, where the first ones came from, nobody really knows. Viruses evolve so quickly and are so small that theories about where they first come from are necessarily speculative. But there are three basic theories.

First is top-down >>
: as tapeworms evolved from free-living worms, so viruses evolved from free-living bacteria. There are bacterial pathogens which live inside cells and rely on the host for some of their vital functions, so we can imagine this process continuing to an extreme end. And as you saw earlier, we know that mitochondria and chloroplasts evolved from free-living bacteria too.

Second is bottom-up >>
: DNA naturally recombines inside cells and all kinds of accidents can happen. It is not outside the bounds of possibility that occasionally this could result in a piece of infectious DNA or RNA, which over time became more efficient by collecting new abilities.

Third is co-evolution >>
: Life started simple and loose. It is easy to imagine early parasitic forms of DNA and RNA having always been with us and evolving over billions of years into what we see today.

At the moment we have no real way to know. Given their lifestyle and generation time, any number of evolved unique features and acquisition of genes from host organisms are possible.

Once we have viruses, how do they evolve? Again there are options.

First, they can evolve with their hosts. >>
For example, as our far fishy ancestors evolved into amphibians, reptiles and mammals, the viruses they were host to went on evolving with them. The tree of life is mirrored by the tree of their viruses.

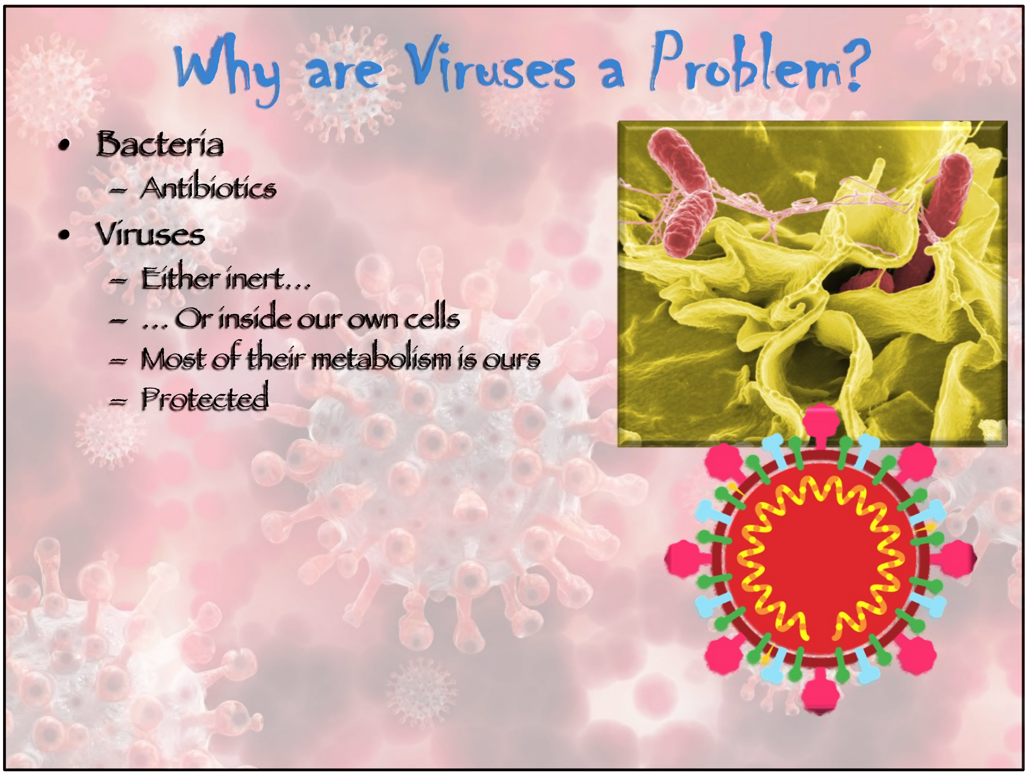
Second, they can shuffle genes, within their own kind or between quite different viruses >>
For example, this might happen if an animal is infected with two different viruses at the same time. There an easily be assembly errors. This is especially the case with the flu, whose genome is in 8 segments.

Third, they can jump hosts >>
Anything we can catch from animals is called a zoonotic disease >>
This can happen because they have a broad ability to infect many hosts like rabies, or they can infect people with weakened immune systems.

But the ones we're concerned with today are ones that gain the ability to infect a new host.
As you've learned, viruses infect their hosts by interacting with surface proteins. >>
The structure of these differs between species. So viruses have natural hosts, the ones whose surface proteins fit whatever the virus has. If the host has a different pattern from this ^^ the virus is simply blind to it.
Unfortunately, viral infection can produce billions of new viruses each time, and occasionally one of them might be able to latch on to the surface of a different host, and provided that new host isn't so different that the virus can't infect it, this can allow the virus to jump hosts. Once in, all its progeny inherit its new key.

Viruses which have recently jumped from their original animal hosts to us include such nasties as HIV, Ebola, Zika, SARS and COVID. >>

One fascinating aspect of viral evolution is that in a very real sense, we ourselves are the children of viruses. >>
Some viruses actually integrate their genome into the host's DNA. Over the eons of evolution, some of these get inherited, and some of them end up in everyone.
About 8% of our genome is made up of these viral remnants, >>
comprising 60,000 or more instances, which is more than our number of genes for proteins. >>
Some of these are still partially active, though none are fully active and none appear to cause disease. The most recent is about 5 million years old.
Some appear to protect us from other viruses. But the most interesting is that one really ancient viral protein called syncytin has an important role in forming the placenta, >>
so pregnancy in all mammals is dependent on it. So in a sense we are literally their children. ***

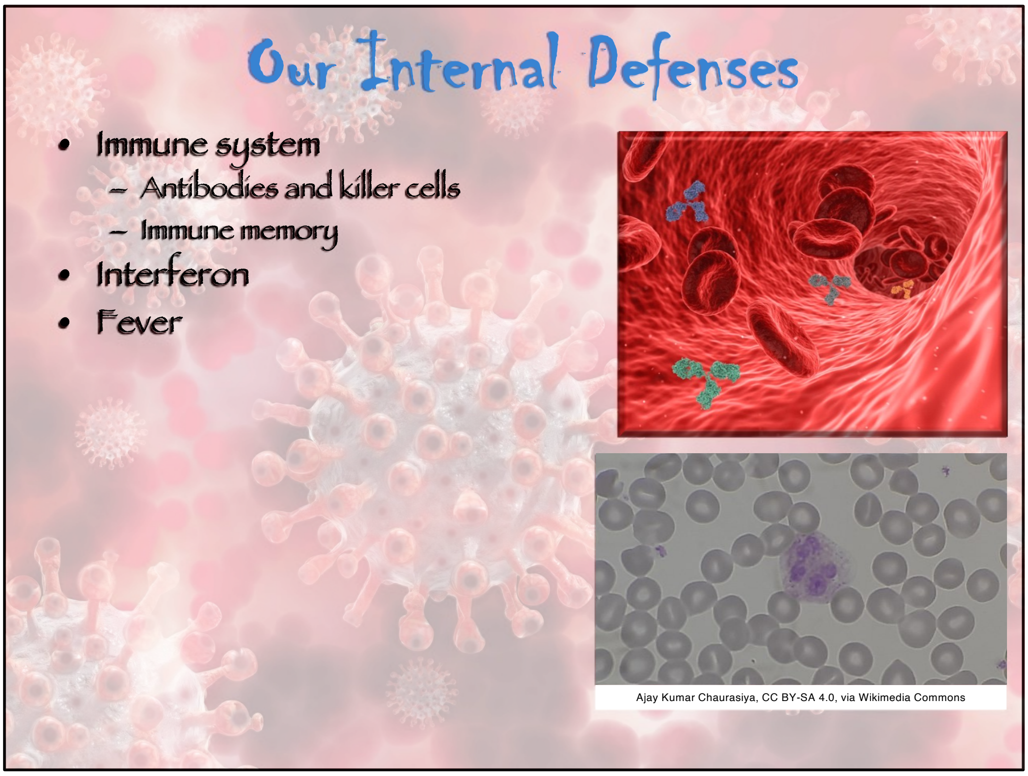


What viruses are explains why they are a problem.

The other major cause of disease is bacteria >>
But these are free-living things far removed from us on the evolutionary tree. While they share much with us, a lot of what keeps them alive is unrelated to what keeps us alive.
So we can attack them using antibiotics. >>
These are chemicals which kill the bacteria but don't affect us. So we can take tablets or injections and the antibiotics will wipe them out without harming us.

But viruses are something else >>
Before they infect us, they aren't doing anything. >>
We can't disrupt their metabolism or stop them dividing because they don't do anything like that.
By the time they're a problem, they are inside our own cells >>
This causes two problems. First, as you've seen they have few genes of their own: for most of what they do, they hijack our own cellular functions. >>
So we can't shoot them without shooting ourselves.
Secondly, unlike most bacteria they are not multiplying outside our cells where, for example, antibiotics in our blood have easier access to them. Anything we want to hit them with has to be delivered inside our cells >>
, and cells are pretty selective about what they let in.

This is why antibiotics are useless against viruses. **



All is not lost, however.

Viruses have been with us forever, so as much as they have evolved to infect us, we have evolved to fight them.

Of course we are not completely open to the world. Our skin and other membranes resist invaders. But you can't breathe or eat without some degree of access, so often enough, germs will get in.

A major defence against any disease is our immune system.>>
When our immune system encounters molecules it doesn't recognize, it works to produce antibodies that bind to pieces of it. Successful immune cells then multiply to attack the invaders.
This results in two types of response, antibodies and killer cells >>
Antibodies are molecules that float around in the blood >> ^^
and on surfaces and bind to their targets or antigens.
While killer cells such as white blood cells >>
kill or eat their targets
By binding their targets, antibodies can neutralize toxins, block viral infection, or mark the invaders for destruction by killer cells.
In addition, infected cells chop up pieces of the invaders and present them on their surface, marking themselves for destruction by immune cells.

An important feature of the immune system is immune memory >>
It can take 7 to 10 days to mount an immune response to a new infection. But your body retains a memory of past infections. Depending on the particular qualities of the response, at best enough circulating antibodies will remain to prevent new infections before they can get started; at worst, your response to another infection will be far faster, and eliminate it before you get sick.

Related to this is interferon. >>
If a cell recognizes that it is infected by a virus, it releases interferon, which is a protein that attracts the attention of the immune system. Basically, it is asking to be killed before the virus has a chance to multiply and infect others.

One side effect of interferon is fever >>
Fever is a symptom of your immune system fighting infection, rather than a symptom itself, so if that's all it is and you aren't really uncomfortable, you are better off not trying to fix it. **

Still, it is best to keep them out in the first place if we can, and there are some relatively simple things we can do.

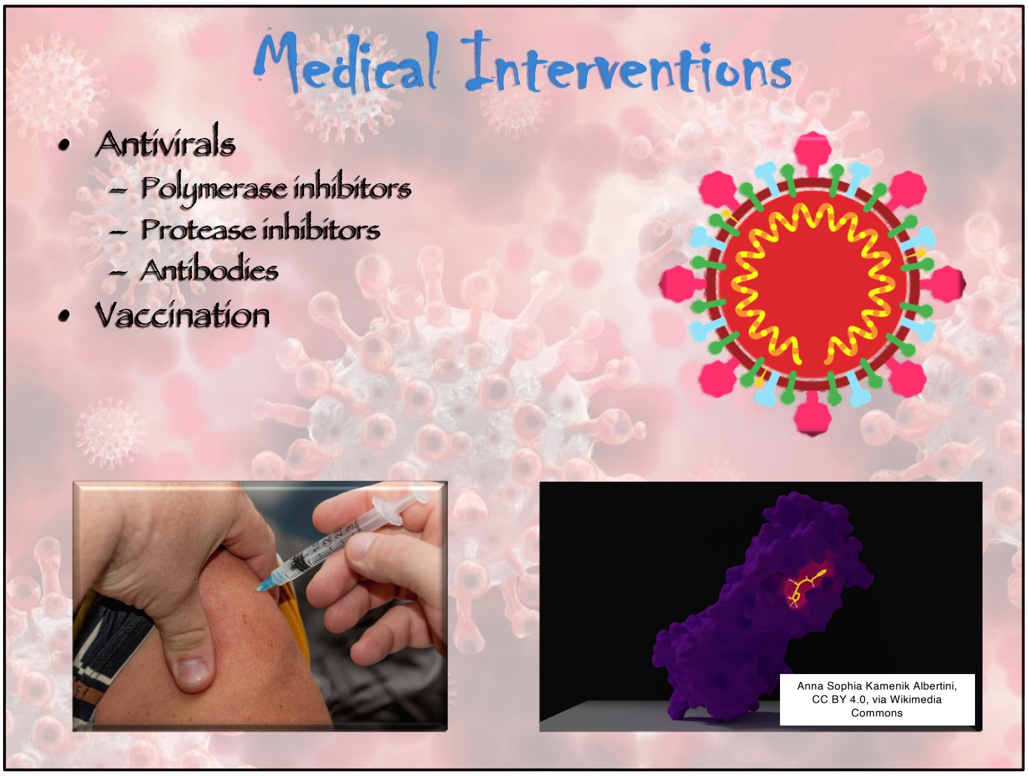
The first is simple physical separation. >>
You have to literally catch a virus, so just staying away from other people reduces your risks. >>
This ^^ is good.
This ^^ is less good. However, this one ^^ does come with some advantages, so I don't recommend you eliminate it entirely.
When the risks are high, it can be wise to take this to the next step by using physical barriers, such as staying at home or even entering full quarantine. >>

Respiratory viruses are generally spread via respiratory droplets, expelled via sneezing, coughing or plain breathing. So masks >>
Are useful for stopping that in both directions, to you and from you.
Although viruses themselves are far too small to be blocked by a normal mask, the respiratory droplets carrying them are much larger, and *can* be stopped effectively. For the best protection you need a properly fitted, efficient mask. But any mask with reasonable filtration that you actually breathe through instead of around will give some protection and is better than nothing.

Scientists once did an experiment where they put some fluorescent chemical up the noses of some adults and let them loose in a party. Afterwards they used a UV light to show where the chemical ended up. Who cares to guess what they found? …
It was everywhere, on tables, walls, you name it.
So viruses can easily be spread by direct and indirect hand contact, so simply washing your hands >>
is a good defence: and like masks, that is true in both directions.

If all these seem simple, you're right. But the COVID pandemic became so politicised that even these became controversial, and flat refusal to do them even became some kind of test of manhood in some quarters.

There used to be an ad in Australia about pushbike safety whose message was "heroes wear helmets." So let me say that real men take sensible precautions. ***



Our fight with viruses is basically an arms race between us and them, and even with our bodies' defences, viruses can still make us very sick and even kill us.
So a lot of effort is expended on finding useful treatments.

As with our own defences, there are two basic approaches.

The first is antivirals. >>
The virus analogues of antibiotics. Viruses might be minimal, but they still have some genes ^^ essential for their function, proteins they need ^^ to get into cells, and further proteins they need to multiply.

So if we're lucky, we can discover small molecules that block something unique but essential to the virus. The commonest type are polymerase inhibitors. >>
Many viruses rely on special polymerases to copy and express their genes, especially if they are RNA viruses. So we can disrupt their function or the copies they make.
Unfortunately our own cells also rely on polymerases. But with a bit of luck, we can find compounds that inhibit the ones the virus needs without affecting ours too much.

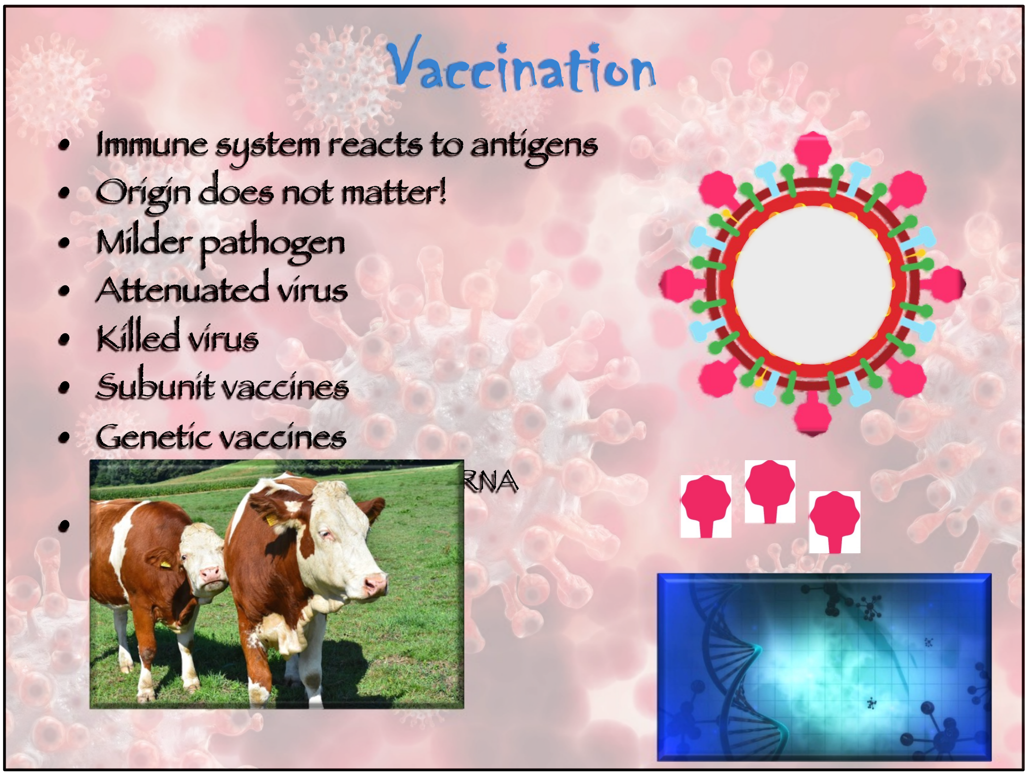
A second common type is protease inhibitors >>, which prevent cleavage of longer proteins into shorter pieces needed for viral function.

Both polymerase and protease inhibitors have been successful against COVID.

And sometimes, antibodies to the viral exterior >>
Can block the virus's ability to infect.

The problem with antivirals is that they are often only partially effective, are likely to have side effects, and are often expensive, and that makes them better for treatment than prevention. So you have to get sick first, or at least be at particularly high risk of infection.

But our best medical treatment is … ?
Making our own antibodies: Vaccination. >>
We saw how our immune system is one of our primary defenses against viruses. Vaccinations take advantage of that to give us immunity without having to catch the disease first. ***



Vaccination is so important it is worth delving more deeply into it.

As already mentioned, vaccines exploit our own immune systems to give us immunity without having to get sick first.

Our immune system works by reacting to antigens >>
These may be foreign chemicals or fragments of the surface of a pathogen.
And the most important point is it doesn't matter where they come from >>
Our immune system doesn't know or care where they come from. So there are a number of ways vaccination can work.

One is simply infecting with a milder pathogen. >>
The first vaccine was developed by Dr Edward Jenner, who noticed that people who had had cowpox, a quite mild infection, did not contract the far deadlier smallpox. He then showed that deliberately infecting someone with cowpox did indeed make them immune to smallpox. Thus vaccination was born.
The word vaccination actually comes from the Latin for cow, vacca, >>
and literally means inoculation with cowpox. This method worked because cowpox is related to smallpox, and while causing only mild symptoms, its surface is similar enough to smallpox that antibodies to cowpox also work on smallpox.

A variant of this method if we don't have a mild natural relative like cowpox to hand is using an attenuated virus >>
Kind of making our own cowpox: deliberately culturing the disease agent until a variant arises that can still infect but with minimal symptoms. This is the origin of the Sabin polio vaccine.

Getting further away from the disease, we can use killed virus >>
This is what the original Salk polio vaccine was. It works if you can destroy the virus's genetic component or otherwise inactivate it without affecting the surface proteins which give the immune response.

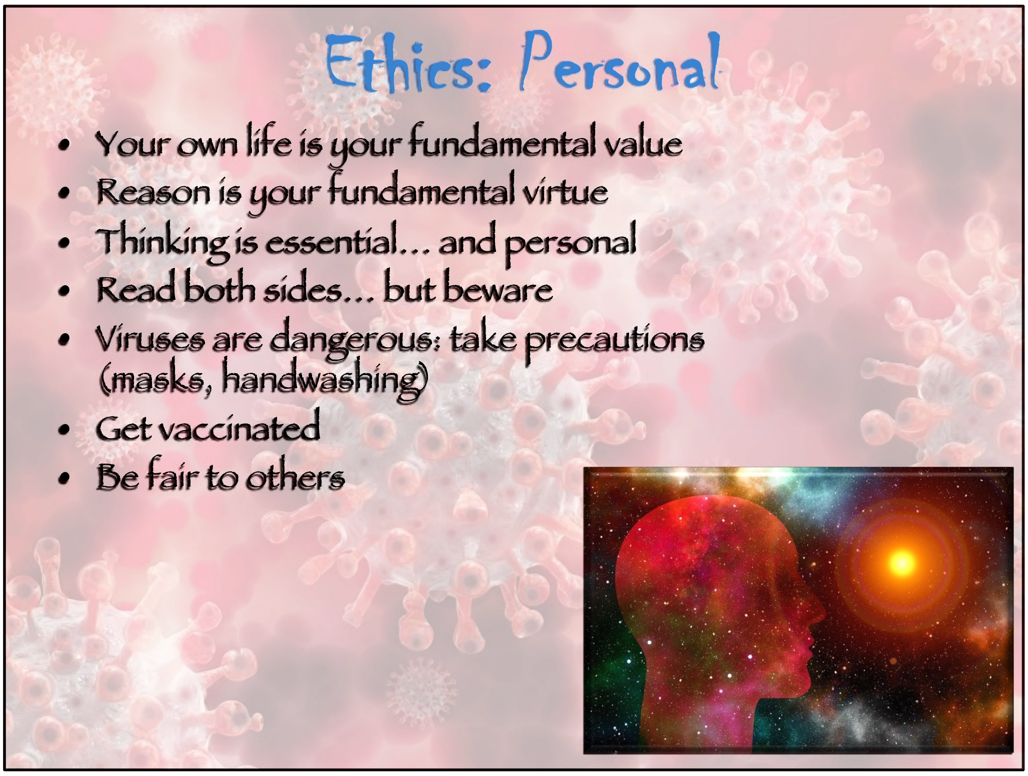
All those basically use the whole virus. But the immune system reacts to fragments of that, so we can leave out the virus altogether and just use subunits >>
As these are what the immune system is responding to anyway, this can be an effective strategy. It has been used in hepatitis vaccines.

A higher tech version of this is genetic vaccines >>
Instead of injecting subunits into us, these inject the genetic material for those subunits, which our own cells then use to make the proteins.
There are two kinds of these: adenovirus and mRNA. >>
Adenovirus vaccines use a virus that can't replicate to insert DNA into some of our cells, which then make the protein and present it to the immune system. mRNA vaccines skip a step and inject messenger RNA directly into cells, which similarly directs protein production and presentation.

The advantage of genetic vaccines is that an infectious virus is not involved at all, and especially with mRNA it is much easier to quickly develop and scale up a vaccine compared to other methods.

The one silver cloud of the COVID emergency is that the need for a quick solution has given us good data on genetic vaccines far faster than we would otherwise have had. While any medical treatment has some side effects, genetic vaccines have proven overall safe and effective – and certainly safer and more effective than catching COVID. With the resulting knowledge and production facilities, we are now much better placed to face any future new diseases and pandemics.

However, like all medicines, vaccination has its limits. >>
The initial effectiveness of the immune response can vary, the level of antibodies can drop with time, and new strains can evolve to be less susceptible. That is why you might need booster shots, either the same to refresh your response or altered to better protect against new strains. That is why you need a new flu shot every year, because flu has evolved to be variable and the dominant flu strains change.
***



I promised that my talks would combine science and philosophy, so now it is time for the philosophy.

What should be our personal ethics when dealing with viruses?

I don't have time in this talk to derive a whole ethical system, so I'll just outline some basic principles that I hold.

Your own life is your fundamental value >>
And as that depends on accurate knowledge, reason is your fundamental virtue >>
So thinking is essential, but it is also personal >>
Nobody can do your thinking for you. It has to happen in your own brain. Even if you have to rely on experts, you are the only one who can decide which ones to trust.
When you yourself are not an expert, it can be difficult even to know who to trust. This is worse in the internet age, where any idiot can pretend to know what they're talking about.
So the best advice I can give is to read both sides, but beware >>
Experts aren't always right: but they are more likely to be right than random internet activists, even if they have "doctor" in front of their name.
Try to learn basic background knowledge, such as what makes a clinical trial useful. For example, that something works in a petri dish or Fred down the street got better after he smoked a cigar proves nothing. It might indicate a direction of research, but the research, with proper controls and enough numbers, is essential before you go off popping the latest internet fad pill.
And beware conspiracy theories: any argument based on the claim that the majority of experts are out to deceive you is almost certainly twaddle.
If there are honest-seeming questions that the experts seem to be evading: then is the time to take them to task and try to get a sensible answer.

That said, I will give you my advice. You can trust me, I am a scientist…

Viruses are dangerous, so looking at point (1) here ^^^ act accordingly. >>
In the absence of actual science to the contrary, that masks at least reduce respiratory droplets and handwashing at least reduces viral spreading is plain common sense. It should be non-controversial. Refusing to wear a mask in the middle of a pandemic is not a sign of rugged individuality, but of dangerous foolishness.

If there is a vaccine available, get it >>
You have an immune system for a reason: use it. Millions of years of evolution can't be wrong.

A consequence of these first three points ^^ is that you should always treat other people with justice >>
You do not spew dangerous germs over other people for the same reason you don't throw rocks at them.
Even if you have something as simple as the common cold, you should avoid coughing it over other people. You should be even more careful about something more dangerous. ***

Our defences against viruses are heavily tied in with science, so we also need to consider the ethics of that.

Fundamentally, scientific ethics are no different from personal ones >>
Science should be animated by the use of reason in order to improve human life, while honouring the rights of the individuals who make up humanity.
Science is so powerful that ethics is even more important for it.

As Francis Bacon wrote, knowledge is power >>
So research into viruses is good. The more we understand them, the better we can work out how to fight them.
Historically, the fight against COVID-19 was incredibly fast, and that speed was built on decades of knowledge not only of viruses but things like molecular biology.

But then there's things like this >>
If we're worried that some unknown viruses might trigger another pandemic, I'm not sure the solution is to go looking for them to bring them back to our cities.
I find it hard to accept that the rather nebulous benefits are worth the risk.

Even worse in my opinion is "Gain of Function" research >>
This is deliberately altering a virus to make it more virulent or able to infect new hosts.
There is some rationale for this in learning about how a virus could become dangerous and how to treat it. But that is very thin. It is unlikely that this will happen to hit upon the next naturally occurring pandemic virus. It seems to me to be research of minimum value and maximum risk.

Speaking of the risk, as you probably know, there are theories that COVID is not natural but escaped from a lab doing one or both of these kinds of research. >>
The evidence is that such research was being done in Wuhan where the pandemic started, there are some genetic markers consistent with an engineered genome, and a natural intermediate host has not been definitively identified.
However current evidence is more in favour of a natural origin. I am slightly inclined toward that view, but if they ever prove it was a lab escape, I won't be very surprised. ***

**

That brings us to the stickier question of public and especially government action.

My primary political principle, the one that derives from the personal ethical principles on my earlier slide, is individual rights >>
That means the rights to life, liberty, property and the pursuit of happiness.

But that does not mean doing anything you feel like. As everyone has the same rights, these rights imply that you can never initiate physical force against another person >>
If you do, you are necessarily violating *their* right to life, liberty, property and the pursuit of happiness.
Either we all have those rights, or none of us do.

The only reason we need a government is to protect those rights. >>
While actual governments violate rights all the time, to do so is invalid and immoral. Its proper purpose is the defensive or punitive use of force to protect the rights of individuals.

So where does that lead us?

In principle, the concept of quarantine is valid >>
It is not controversial that if someone is walking down the street firing a gun, the government should stop them.
Nor should it be controversial that if someone turns up carrying a deadly, contagious disease, that they should be put in isolation where they can't infect others, and if they refuse, they can be forced to.

The problem comes with things like COVID, where you can have and be spreading the disease before you even know you have it. It is one thing to throw someone into quarantine because they are obviously sick; but to what extent is it moral for a government to stick you in quarantine just because you *might be* sick, and worse than that, it is actually quite unlikely that you *are* sick?
That is, is it valid for the government to enforce pre-emptive measures, not only quarantine but things like wearing masks? >>

Who knows the answer? …
Me neither.

I can say that your answer will depend on your idea of the role of government, >>
which derives from your philosophy of government.

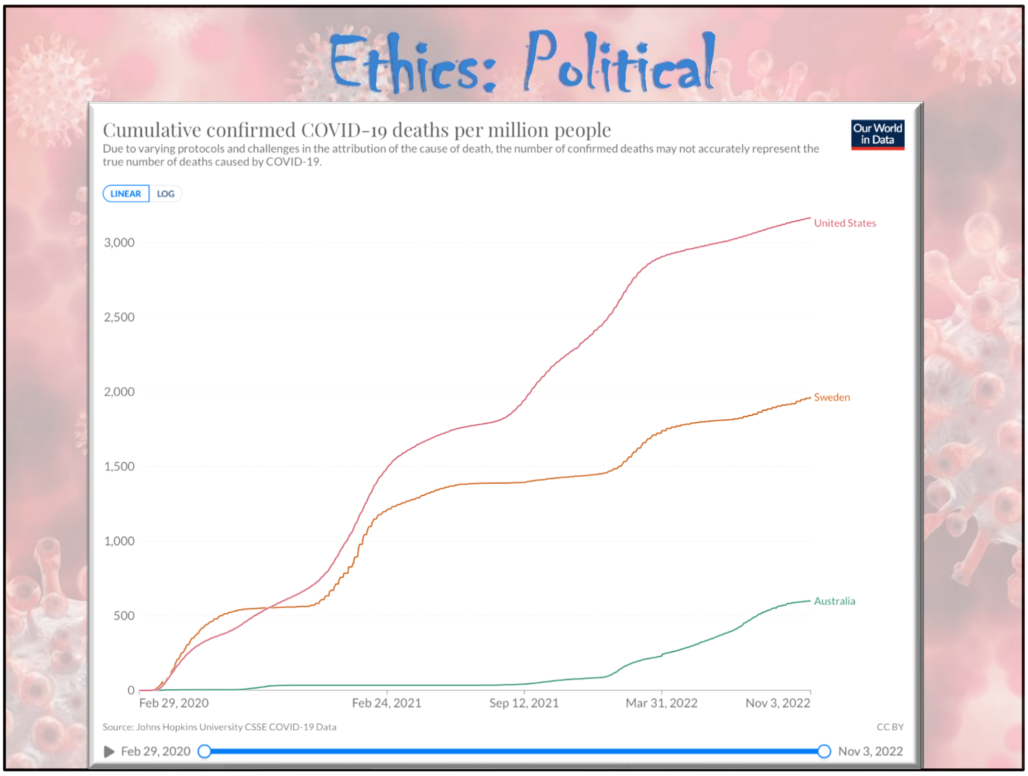
My philosophy of government is that it exists to protect your right to life ^^, but the only actual way to do that is to protect your right to live it according to your own judgement.
Not to ensure your safety by protecting you from all possible harm at any cost to everybody else.
Not to wrap you in cotton wool, but to leave you free, and everyone else equally free.

After all, it is impossible to make anyone completely safe, because nothing is completely safe. >>
It is not safe to travel, play sports, use electricity or even eat.
The question is one of balance: at what stage does something move from the acceptable day to day risks of living, to objective recklessness towards others, violating their rights?

That is the correct way to frame the question:
Not "Will this particular government action protect some people?"
But "Are rights being violated? And if not, how can we protect without violating rights ourselves?"

And if history teaches us anything, it is that one of the least safe things is an overly powerful government >>

One of the saddest thing about public responses to the COVID pandemic is that in a rational society >>
None of the government overreach people complain about would have been "necessary".
People should not need to be commanded to wear masks, minimize exposure or get vaccinated. They are obvious things to do. Similarly, individual rights include your right to act according to *your* judgement. So people and businesses have the right to close their doors or demand that people on their property have to wear masks or be vaccinated. ***



But have the government responses to COVID been worth it?

Another good question!

I think it will be years before we get an objective assessment of the value versus the cost of public responses to COVID.
Partly because of the complexity of the data, partly because other factors vary so much, and partly because there are so many vested interests in pretending to have done the right thing.
Partly because you can't just look at one thing. You can't just look at infection rate reduction due to lockdowns, without also looking at the negative effects of lockdowns on everything from poverty to children's health.

Still, I am sure that if the data shows they were wrong, we will be receiving a lot of public apologies from politicians.

But maybe we can get some indications.
There was a lot of trouble in the USA about governmental responses being too much or too little. Sweden was famous for having a very softly-softly approach, though they weren't completely free of mandates. Australia was quite strict for most of it.

Now look at the cumulative COVID cases per million people over the course of the pandemic >>
The USA ^^ and Sweden ^^ ended up fairly comparable, and ironically the one with the largest numbers was Australia ^^

But look at the death rates. >>
The USA has twice the rate of Sweden, and despite its higher case rate, Australia is much lower than either of them. ^^
I think the explanation for Australia is that cases didn't take off until after vaccination rates were high and the viral strains were less deadly.

But there are plenty of confounding factors. The USA has far more densely populate regions, Australia has a warmer climate, and so on.

Perhaps there is another important lesson here. Even in the United States, the cumulative death rate has only reached a bit over 0.3%, which is substantially higher than the flu, but nothing like the Black Death.

So whether the ongoing economic, social and personal costs of all those government lockdowns and mandates are worth the benefits in the context of the normally accepted day to day risks of living remains to be seen.
And I hope one day, will be seen.
***

That brings us to the end of the main part of the talk, and I hope it didn't make you feel sick ...

You can contact me via my website if anyone wants to continue the conversation in future or pay me lots of money to speak at one of your own events.
I'm also a regular contributor to the web question and answer site quora.com on numerous philosophical topics.
And of course you're also free to come up and talk to me if you see me around the ship.

If you liked this talk, >>
you might also enjoy the novels I've written on scientific and philosophical topics, available on Amazon. Their plots include a number of the topics I talk about, including artificial intelligence, genetic engineering, cyborg technology and Time Travel.

If you're still looking for a way to spend your $100 refund or buy a unique gift, there are still some of these left in the bookstore and I'll be signing outside the Golden Lion immediately after this talk.

And don't forget "Up Close and Personal" today at 4:15 at the Yacht Club.

Which brings us to…

Do you have any questions?