TED演讲者：Jennifer Wilcox | 珍妮佛 威尔考克斯

演讲标题：A new way to remove CO2 from the atmosphere | 从大气中除去二氧化碳的新方法

内容概要：Our planet has a carbon problem -- if we don't start removing carbon dioxide from the atmosphere, we'll grow hotter, faster. Chemical engineer Jennifer Wilcox previews some amazing technology to scrub carbon from the air, using chemical reactions that capture and reuse CO2 in much the same way trees do ... but at a vast scale. This detailed talk reviews both the promise and the pitfalls.

地球遇到了碳的问题，如果我们再不开始除去大气中的二氧化碳，气候变热的速度就会加快。化学工程师珍妮佛 威尔考克斯带我们看这些了不起的科技，用化学反应的方式清除空气中的二氧化碳；其过程和树木很类似，但规模更大。这场巨细靡遗的演说，探讨除碳的承诺和所面对的困难。

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Four hundred parts per million: that's the **approximate** concentration of CO2 in the air today.	百万分之四百, 那是现今空气中, 二氧化碳的大约浓度。[00:12]
What does this even mean?	那到底是什么意思？[00:20]
For every 400 **molecules** of carbon **dioxide**, we have another million **molecules** of oxygen and nitrogen.	每 400 个二氧化碳的分子, 就会有另外 100 万个氧和氮的分子。[00:21]
In this room today, there are about 1,800 of us.	现在在这间房间中, 我们大约有 1800 人,[00:29]
Imagine just one of us was wearing a green shirt, and you're asked to find that single person.	想像一下,我们当中 只有一人穿绿色上衣, 你被要求去找到那一个人。[00:33]
That's the challenge we're facing when capturing CO2 directly out of the air.	那就是现今我们想要直接 捕获空气中的二氧化碳时, 所遇到的问题。[00:41]
Sounds pretty easy, pulling CO2 out of the air.	听起来挺简单的, 把二氧化碳从空气中去除。[00:47]
It's actually really difficult.	其实真的很困难。[00:51]
But I'll tell you what is easy: avoiding CO2 emissions **to begin with**.	但告诉各位什么很容易: 一开始就避免排放二氧化碳。[00:52]
But we're not doing that.	但我们没有这么做。[00:58]
So now what we have to think about is going back; pulling CO2 back out of the air.	所以现在我们必须回过头去; 把二氧化碳从空气中抽出来。[01:01]
Even though it's difficult, it's actually possible to do this.	即使很困难,还是有可能做到的。[01:08]
approximate: vt.近似;使...接近;粗略估计/vi.接近于;近似于/adj.[数]近似的;大概的 **molecules:** n.[化学]分子,微粒;[化学]摩尔(molecule的复数) **dioxide:** n.二氧化物 **to begin with:** 首先;本来	
And I'm going to share with you today where this technology is at and where it just may be heading in the near future.	今天我要和各位分享的是 这项技术的现况, 以及在不远的将来, 它可能的发展方向。[01:12]
Now, the earth naturally **removes** CO2 from the air by **seawater**, soils, plants and even rocks.	地球本身自己就会 把二氧化碳从空气中除去, 透过海水、土壤、植物, 和甚至石头来做这件事。[01:19]
And although engineers and scientists are doing the **invaluable** work to accelerate these natural processes, it simply won't be enough.	虽然工程师和科学家都投入在 加速这些自然过程的无价工作上, 就是还不足够。[01:29]
The good news is, we have more.	好消息是,我们还有其他方法。[01:39]
Thanks to human **ingenuity**, we have the technology today to remove CO2 out of the air using a **chemically manufactured** approach.	靠着人类的足智多谋, 我们现在有技术 可以把空气中的二氧化碳除去, 利用化学反应的方法。[01:41]
I like to think of this as a **synthetic** forest.	我喜欢把它想成是一个合成森林。[01:51]
There are two basic **approaches** to growing or building such a forest.	要种出或建造出这样的森林, 有两种基本的方式:[01:54]
One is using CO2-grabbing chemicals **dissolved** in water.	第一是使用溶解在水中且能够 抓取二氧化碳的化学物质。[02:00]
removes: n.清除;[印刷]引语排版;迁移;差距(remove的复数)/v.除掉(remove的三单形式);搬开;迁移;脱掉 **seawater:** n.海水 **invaluable:** adj.无价的； 非常贵重的 **ingenuity:** n.心灵手巧,独创性;精巧;精巧的装置 **chemically:** adv.用化学;以化学方法 **manufactured:** adj.制造的,已制成的/v.制造,加工(manufacture的过去式) **synthetic:** adj.综合的;合成的,人造的/n.合成物 **approaches:** 处理 **dissolved:** adj.溶解的;溶化的/v.使溶解;使溶化(dissolve的过去分词)	
Another is using solid materials with CO2-grabbing chemicals.	第二是使用固态材料, 内含有能抓取二氧化碳的化学物质。[02:05]
No matter which approach you choose, they basically look the same.	不论你选择哪一种方法, 基本上它们看起来是一样的。[02:09]
So what I'm showing you here is what a system might look like to do just this.	我接着要给各位看,做这件事的系统 是什么样子的。[02:13]
This is called an air **contactor**.	这叫做空气接触器。[02:18]
You can see it has to be really, really wide in order to have a	它必须要非常非常宽, 这样才能有足够大的表面积

high enough surface area to process all of the air required, because remember, we're trying to capture just 400 molecules out of a million.	来处理所有必要的空气, 因为,别忘了, 我们试着在一百万个分子中 捕集四百个分子。[02:21]
Using the liquid-based approach to do this, you take this high surface area packing material, you fill the contactor with the packing material, you use **pumps** to distribute liquid across the packing material, and you can use fans, **as you can see** in the front, to **bubble** the air through the liquid.	如果要用液体方法来捕集, 你就要用这大表面积的包材, 把接触器用包材装满, 用幫浦将液体分布至包材的各处, 还可以用风扇,如图的前方所示, 让空气通过液体产生泡泡。[02:34]
The CO2 in the air is separated from the liquid by reacting with the really strong-binding CO2 molecules in solution.	空气中的二氧化碳和液体分离, 因为它会和溶液中结合力极强的 二氧化碳分子发生作用。[02:52]
And in order to capture a lot of CO2, you have to make this contactor deeper.	为了要捕集很多二氧化碳, 这个接触器必须要做得很深。[03:03]
contactor: n.开关;电流接触器 **pumps:** n.[机]泵;脉动(pump的复数);抽运器;无带轻便舞鞋/v.用泵送;抽动;汲取;盘问(pump的三单形式) **as you can see:** 正如你所看到的;你是知道的 **bubble:** n.气泡,泡沫,泡状物;透明圆形罩,圆形顶/vi.沸腾,冒泡;发出气泡声/vt.使冒泡;滔滔不绝地说	
But there's an **optimization**, because the deeper you make that contactor, the more energy you're spending on **bubbling** all that air through.	但有个最佳化的点, 因为接触器越深, 你就要花更多能源来把空气打过去。[03:09]
So air contactors for direct air capture have this unique characteristic design, where they have this huge surface area, but a relatively thin **thickness**.	所以,直接捕集空气的空气接触器 在设计上有这项独特的特征, 有很大的表面积, 厚度相对就很薄。[03:16]
And now once you've captured the CO2, you have to be able to recycle that material that you used to capture it, **over and over again**.	一旦你捕集到了二氧化碳, 你就得要回收那些用来捕集它的材料, 一次又一次。[03:25]
The scale of carbon capture is so **enormous** that the capture process must be **sustainable**, and you can't use a material just once.	碳捕集工作的规模是很庞大的, 捕集过程必须要是永续的, 材料不能只用一次就丢。[03:34]
And so **recycling** the material requires an enormous amount of heat, because think about it: CO2 is so **dilute** in the air, that material is **binding** it really strong, and so you need a lot of heat in order to recycle the material.	而回收那些材料就需要很大量的热, 因为,想想看: 在空气中, 二氧化碳会被稀释, 和它结合的材料非常强而有力, 因此会需要很大量的热, 才能回收那些材料。[03:42]
optimization: n.最佳化,最优化 **bubbling:** n.冒泡,[化工]鼓泡;气泡形成 **thickness:** n.厚度;层;浓度;含混不清 **over and over again:** adv.一再地;反复不断地 **enormous:** adj.庞大的，巨大的；凶暴的，极恶的 **sustainable:** adj.可以忍受的；足可支撑的；养得起的；可持续的 **recycling:** n.(资源,垃圾的)回收利用/v.回收;再循环利用(recycle的现在分词) **dilute:** adj.稀释的;淡的/vt.稀释;冲淡;削弱/vi.变稀薄;变淡 **binding:** n.装订;捆绑;粘合物/adj.有约束力的;捆绑的/v.捆绑(bind的ing形式)	
And to recycle the material with that heat, what happens is that **concentrated** CO2 that you got from dilute CO2 in the air is now released, and you produce high-purity CO2.	如果用那样的热来将材料回收, 会发生的结果是,从空气中稀释的 二氧化碳所取得的浓缩二氧化碳 现在被释出了, 产生了高纯度的二氧化碳。[03:57]
And that's really important, because high-purity CO2 is easier to liquify, easier to transport, whether it's in a pipeline or a truck, or even easier to use directly, say, as a fuel or a chemical.	那很重要, 因为高纯度的二氧化碳比较容易液化, 比较容易运送, 不论是透过管线或是卡车都一样, 更容易直接使用, 比如,用来当燃料或化学物质。[04:10]
So I want to talk a little bit more about that energy.	所以,关于那能源, 我想要再多谈一点。[04:24]
The heat required to **regenerate** or recycle these materials absolutely **dictates** the energy and the **subsequent** cost of doing this.	重新产生或回收这些材料所需要的热 会直接影响到能源 和做这件事的后续成本。[04:28]
So I ask a question: How much energy do you think it takes to remove a million tons of CO2 from the air in a given year?	所以我要问一个问题: 你们认为要花多少能源 才能在一年内把空气中的 100 万吨 二氧化碳除去? [04:40]
The answer is: a power plant.	答案是:一座电厂的能量。[04:51]
It takes a power plant to capture CO2 directly from the air.	需要用一座电厂才能直接 捕集空气中的二氧化碳。[04:52]
Depending on which approach you choose, the power plant could be on the order of 300 to 500 **megawatts**.	看你选的方法是哪一种, 用的可能是三到五百万瓦特的电厂。[04:56]
concentrated: adj.集中的;浓缩的;全神贯注的/v.集中(concentrate的过去分词) **regenerate:** vt.使再生;革新/vi.再生;革新/adj.再生的;革新的 **dictates:** 规定/命令/使听写/影响/使人相信 **subsequent:** adj.后来的，随后的 **megawatts:** n.百万瓦特(megawatt的复数)	
And you have to be careful about what kind of power plant you choose.	要选哪一种电厂,也要十分谨慎。[05:03]
If you choose coal, you end up **emitting** more CO2 than you capture.	如果选择燃煤电厂, 最终排放的二氧化碳 可能比捕集到的还多。[05:07]
Now let's talk about costs.	现在来谈谈成本。[05:13]
An energy-intensive version of this technology could cost	这种技术,如果用的是高能源的版本, 每吨可能要花

you as much as $1,000 a ton just to capture it.	上 $1,000, 这只是捕集的成本。[05:15]
Let's translate that.	让我把它转成白话。[05:24]
If you were to take that very expensive CO2 and convert it to a liquid fuel, that comes out to 50 dollars a gallon.	如果你打算要把非常昂贵的 二氧化碳转换成液态燃料, 那么算起来会是每加仑 $50。[05:25]
That's way too expensive; it's not **feasible**.	那实在太贵了,不可行。[05:32]
So how could we bring these costs down?	我们要如何减低成本? [05:35]
That's, **in part**, the work that I do.	我有部分工作在处理这个问题。[05:37]
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There's a company today, a commercial-scale company, that can do this as low as 600 dollars a ton.	现在有一间公司, 商业规模的公司, 可以压到每吨 $600 的价格。[05:41]
There are several other companies that are developing technologies that can do this even cheaper than that.	还有好几间其他公司在开发技术, 想要把价格压到比那更低。[05:47]
I'm going to talk to you a little bit about a few of these different companies.	我要跟各位谈谈 这当中的少数几间公司。[05:53]
emitting: n.发出,散发;发射/v.散发;喷出(emit的现在分词) **feasible:** adj.可行的；可能的；可实行的 **in part:** 部分地;在某种程度上	
One is called Carbon Engineering.	其一是「炭工程 （Carbon Engineering）」。[05:57]
They're based out of Canada.	该公司位在加拿大。[05:58]
They use a liquid-based approach for separation combined with burning super-abundant, cheap natural gas to supply the heat required.	他们用液态的方式来做分离, 再搭配燃烧足够且便宜的天然气, 来供应必要的热。[06:00]
They have a clever approach that allows them to co-capture the CO2 from the air and the CO2 that they generate from burning the natural gas.	他们有个很聪明的方法, 可以同时捕集空气中的二氧化碳, 以及燃烧天然气所产生的二氧化碳。[06:09]
And so by doing this, they **offset** excess pollution and they reduce costs.	透过这么做, 可以抵消掉额外的污染,并减少成本。[06:19]
Switzerland-based Climeworks and US-based Global **Thermostat** use a different approach.	瑞士的「气候工程（Climeworks）」 采用不同的方式。[06:25]
They use solid materials for capture.	它们用的是固态的捕集法。[06:31]
Climeworks uses heat from the earth, or **geothermal**, or even excess steam from other industrial processes to **cut down on** pollution and costs.	气候工程公司用的是来自地球的热, 或地热, 或甚至是工业过程中过量的蒸汽, 以减少污染以及成本。[06:34]
Global Thermostat takes a different approach.	全球恒温公司用的方式不同。[06:44]
They focus on the heat required and the speed in which it moves through the material so that they're able to release and produce that CO2 at a really fast rate, which allows them to have a more **compact** design and overall cheaper costs.	他们把焦点放在必要的热 以及热通过材料的速度, 这么一来,就可以快速地释放和产生 那些二氧化碳, 让他们的设计可以变得更小巧, 整体的成本也比较便宜。[06:46]
offset: n.抵消,补偿;平版印刷;支管/vt.抵消;弥补;用平版印刷术印刷/vi.装支管 **Thermostat:** n.恒温器;自动调温器/vt.为...配备恒温器;用恒温器控制 **geothermal:** adj.[地物]地热的;[地物]地温的 **cut down on:** 削减,减少 **compact:** n.合同,契约;小粉盒/adj.紧凑的,紧密的;简洁的/vt.使简洁;使紧密结合	
And there's more still.	还有更多其他的。[07:06]
A synthetic forest has a significant advantage over a real forest: size.	和真实的森林比,合成的森林 有一个显着的优势:大小。[07:08]
This next image that I'm showing you is a map of the **Amazon rainforest**.	我接下来要给各位看的图, 是亚马逊雨林的地图,[07:14]
The Amazon is **capable of** capturing 1.6 billion tons of CO2 each year.	亚马逊每年可以捕集 16 亿吨的二氧化碳。[07:18]
This is the **equivalent** of roughly 25 percent of our annual emissions in the US.	这大约等同于美国每年 排放量的 25%。[07:24]
The land area required for a synthetic forest or a manufactured direct air capture plant to capture the same is 500 times smaller.	换成是合成森林 或专门用来捕集空气的电厂, 若要捕集相同份量的二氧化碳, 所需要用的面积 小了 500 倍。[07:30]
In addition, for a synthetic forest, you don't have to build it on **arable** land, so there's no competition with **farmland** or food, and there's also no reason to have to cut down any real trees to do this.	此外,合成的森林 并不需要建造在耕地上, 不会和农地或食物产生竞争, 也不需要砍伐任何真正的树木 就可以做到。[07:41]
I want to **step back**, and I want to **bring up** the concept of negative emissions again.	我想要先退一步, 我想要再提一下负排放的概念。[07:58]
Amazon: 亚马逊； 古希腊女战士 **rainforest:** n.(热带)雨林 **capable of:** 有...能力的;可...的 **equivalent:** adj.等价的,相等的;同意义的/n.等价物,相等物 **arable:** adj.适于耕种的;可开垦的/n.耕地 **farmland:** n.农田 **step back:** 后退,退后;无意义 **bring up:** 提出;教育;养育;呕出;(船等)停下	
Negative emissions require that the CO2 separated be	负排放是要把分离出的二氧化碳 永远从大气中除

permanently removed from the atmosphere forever, which means putting it back underground, where it came from **in the first place**.	去, 也就是,把它放回到地底, 因为它最初是从地底来的。[08:04]
But let's face it, nobody gets paid to do that today -- at least not enough.	但要面对现实,现今没有人 能靠做这种事赚钱——至少赚不了多少钱。[08:17]
So the companies that are developing these technologies are actually interested in taking the CO2 and making something useful out of it, a **marketable** product.	所以,在开发这些技术的公司 其实是想要把二氧化碳拿来 做成有用的东西,有市场的产品。[08:22]
It could be liquid fuels, **plastics** or even synthetic **gravel**.	可能是液态燃料、塑胶, 或甚至合成碎石。[08:32]
And don't get me wrong -- these carbon markets are great.	别误会我的意思—— 这些碳市场是很棒的。[08:37]
But I also don't want you to be **disillusioned**.	但我也不希望各位的幻想破灭。[08:42]
These are not large enough to solve our climate crisis, and so what we need to do is we need to actually think about what it could take.	刚谈的这些都还不足以 解决我们的气候危机, 我们需要做的是要真正去思考 要花什么代价。[08:45]
One thing I'll absolutely say is positive about the carbon markets is that they **allow for** new capture plants to be built, and with every capture plant built, we learn more.	对于碳市场, 有一个优点我一定会说, 那就是,因为它们, 新的捕集厂得以建立起来, 而每建立一座捕集厂, 我们就会学到更多。[08:54]
permanently: adv.永久地,长期不变地 **in the first place:** 首先;起初 **marketable:** adj.市场的;可销售的;有销路的 **plastics:** n.塑料;整形外科;外科修补术 **gravel:** n.碎石;砂砾/vt.用碎石铺;使船搁浅在沙滩上;使困惑 **disillusioned:** adj.醒悟的;幻想破灭的;不抱幻想的/v.使幻想破灭(disillusion的过去分词);唤醒 **allow for:** 考虑到,虑及	
And when we learn more, we have an opportunity to bring costs down.	当我们学到更多, 我们就有机会把成本降低。[09:06]
But we also need to be willing to invest as a global society.	但我们这个全球共同体也得要 愿意去投资。[09:11]
We could have all of the clever thinking and technology in the world, but it's not going to be enough in order for this technology to have a significant impact on climate.	我们或许有各种聪明的想法和技术, 但那还不够让这项技术对于气候产生够显着的影响。[09:18]
We really need regulation, we need **subsidies**, taxes on carbon.	我们很需要法规, 我们需要补助, 碳相关的税。[09:28]
There are a few of us that would absolutely be willing to pay more, but what will be required is for carbon-neutral, carbon-negative paths to be **affordable** for the majority of society in order to impact climate.	很少有人会愿意付更多, 但需要做的是, 要让碳中和与负碳的途径 便宜到社会上大部分人都能负担, 这样才能对气候有所影响。[09:34]
In addition to those kinds of **investments**, we also need investments in research and development.	除了那些投资之外, 我们也需要在研究和开发上做投资。[09:49]
So what might that look like?	所以,看起来会是什么样子? [09:55]
In 1966, the US invested about a half a percent of gross domestic product in the **Apollo** program.	1966 年,美国将大约一半的 国内生产总值投资在阿波罗计画上。[09:57]
subsidies: 补助金,补贴,津贴(subsidy的名词复数) **affordable:** adj.负担得起的 **In addition to:** 除...之外 **investments:** n.[经]投资,投资的财产;投资学(investment的复数形式) **Apollo:** n.阿波罗(太阳神);美男子	
It got people safely to the moon and back to the earth.	该计画让人类安全登陆月球, 并返回地球。[10:06]
Half a percent of GDP today is about 100 billion dollars.	当年国内生产总值的一半, 约等于现今的 1000 亿。[10:11]
So knowing that direct air capture is one front in our **fight against** climate change, imagine that we could invest 20 percent, 20 billion dollars.	已经知道直接捕集空气 是我们对抗气候变迁之战的前线, 想像一下,若我们能投资 20%, 即 200 亿元,会如何。[10:15]
Further, let's imagine that we could get the costs down to a 100 dollars a ton.	此外,也想像一下, 我们能把成本降低, 降到每吨 100 元。[10:25]
That's going to be hard, but it's part of what makes my job fun.	那会很困难,但这也是让 我的工作很有趣的原因之一。[10:31]
And so what does that look like, 20 billion dollars,100 dollars a ton?	所以,200 亿元, 每吨 100 元,会是什么样子? [10:35]
That requires us to build 200 synthetic forests, each capable of capturing a million tons of CO2 per year.	那会需要建造 200 座合成森林, 每一座每年都能够捕集 100 吨的二氧化碳。[10:39]
That adds up to about five percent of US annual emissions.	加起来,总共约是 美国每年排放量的 5%。[10:48]
It doesn't sound like much.	听起来不很多。[10:53]
Turns out, it's actually significant.	结果发现,其实是很重大的。[10:55]
If you look at the emissions associated with **long-haul trucking** and commercial **aircraft**, they **add up to** about five percent.	如果看看长程货车运输 以及商業飞机 相关的排放, 它们加起来大约是 5%。[10:57]
fight against: v.对抗;反对;与.....作斗争 **long-haul:** adj.长途的;长运距的;长时间的 **trucking:** n.货车运输;货车运输业;以货易货/v.交易;打交道;用卡车运(truck的ing形式) **aircraft:** n.飞机,航空器 **add up to:** 合计达,总计达	

Our **dependence** on liquid fuels makes these emissions really difficult to avoid.	我们对于液态燃料的依赖, 让这些排放非常难避免。[11:05]
So this investment could absolutely be significant.	所以,这项投资绝对是重要的。[11:11]
Now, what would it take **in terms of** land area to do this, 200 plants?	要花费多少土地面积,才能做到 200 座捕集厂? [11:17]
It turns out that they would **take up** about half the land area of **Vancouver**.	结果算出来是大约 温哥华土地面积的一半左右。[11:22]
That's if they were **fueled** by natural gas.	前提是要用天然气来当燃料。[11:26]
But remember the **downside** of natural gas -- it also **emits** CO2.	但别忘了,天然气也有不利的一面, 它也会排放二氧化碳。[11:28]
So if you use natural gas to do direct air capture, you only end up capturing about a third of what's intended, unless you have that clever approach of co-capture that Carbon Engineering does.	所以,如果用天然气 来直接做空气捕集, 最后只能捕集到 预期量的三分之一左右, 除非你有聪明的同时捕集方法, 就像炭工程公司用的方法。[11:33]
And so if we had an alternative approach and used wind or solar to do this, the land area would be about 15 times larger, looking at the state of New Jersey now.	如果我们有替代的方法, 用风力或太阳能来取代, 土地面积会变成约 15 倍大, 近似现在的纽泽西。[11:45]
dependence: n.依赖;依靠;信任;信赖 **in terms of:** 依据;按照;在...方面;以...措词 **take up:** 拿起;开始从事;占据(时间,地方) **Vancouver:** n.温哥华(加拿大主要港市) **fueled:** v.加燃料(fuel的过去分词) **downside:** n.下降趋势;底侧/adj.底侧的 **emits:** 发出/放射/发行(emit的动词单数第三人称形式)	
One of the things that I think about in my work and my research is **optimizing** and figuring out where we should put these plants and think about the local resources available --	我在工作和研究时, 会思考的其中一件事情, 是要想出把这些捕集厂 放在哪里最好, 并考量可得的当地资源——[11:56]
whether it's land, water, cheap and clean electricity -- because, **for instance**, you can use clean electricity to split water to produce hydrogen, which is an excellent, **carbon-free** replacement for natural gas, to supply the heat required.	不论是土地、水资源、 便宜且干净的电力—— 因为,比如,可以用干净的电力 来做水分裂,产生氢, 氢是很好的天然气替代品, 不会产生碳, 用来产生需要的热。[12:06]
But I want us to reflect a little bit again on negative emissions.	但我希望大家能再次反思负排放。[12:22]
Negative emissions should not be considered a silver bullet, but they may help us if we continue to **stall** at cutting down on CO2 pollution worldwide.	负排放不该被视为神奇的解决方案, 但如果我们在减少全球二氧化碳时 一直遇到瓶颈, 负排放也许可以幫助我们。[12:26]
But that's also why we have to be careful.	但也因此,我们得要很小心。[12:36]
This approach is so **alluring** that it can even be risky, as some may cling onto it as some kind of total solution to our climate crisis.	这种方法非常诱人, 甚至可能有风险, 因为有些人可能会太依重它, 把它视为是气候危机的完全解决方案。[12:39]
It may **tempt** people to continue to burn fossil fuels 24 hours a day, 365 days a year.	它可能会诱使大家继续燃烧 化石燃料,一年 365 天, 一天 24 小时不断地烧。[12:47]
optimizing: n.[数]优化,最佳化/adj.最佳的/v.最佳化(optimize的现在分词) **for instance:** 例如 **carbon-free:** adj.不含碳的 **stall:** n.货摊;畜栏;托辞/vi.停止,停转;拖延/vt.拖延;使停转;使陷于泥中 **alluring:** adj.诱惑的,诱人的;迷人的,吸引人的 **tempt:** vt.诱惑;引起;冒...的风险;使感兴趣	
I argue that we should not see negative emissions as a replacement for stopping pollution, but rather, as an addition to an existing **portfolio** that includes everything, from increased energy efficiency to **low-energy** carbon to improved farming -- will all **collectively** get us on a path to net-zero emissions one day.	我主张不要把负排放 视为是阻止污染的替代品, 而是在既有的方案组合外, 再外加一个无所不包的方案, 内容从增加能源效能, 到低能源碳, 到改善农業, 会一起让我们有朝一日 能走上净碳排放为零的路途。[12:55]
A little bit of **self-reflection**: my husband is an emergency physician.	一点点自我反思: 我丈夫是急诊室医生。[13:17]
And I find myself **amazed** by the **lifesaving** work that he and his colleagues do each and every day.	他和他的同事每天的工作就是 拯救人命,我觉得很了不起。[13:23]
Yet when I talk to them about my work on carbon capture, I find that they're equally amazed, and that's because **combatting** climate change by capturing carbon isn't just about saving a **polar** bear or a **glacier**.	然而,当我和他们谈到 我的碳捕集工作时, 他们也同样觉得很了不起, 那是因为用捕集碳来对抗气候变迁 并不只是要拯救北极熊 或是冰河。[13:31]
It's about saving human lives.	它也是在拯救人命。[13:45]
A synthetic forest may not ever be as pretty as a real one, but it could just enable us to **preserve** not only the Amazon, but all of the people that we love and **cherish**, **as well as** all of our future generations and modern civilization.	合成森林可能没有 真实森林那么漂亮, 但有了它, 我们就不只能保育亚马逊, 还能保护所有 我们爱与珍惜的人, 以及我们未来的世代 和现代文明。[13:49]
portfolio: n.公文包;文件夹;证券投资组合;部长职务 **low-energy:** 低能耗 **collectively:** adv.共同地,全体地 **self-reflection:** n.反省 **amazed:** adj.惊奇的,吃惊的/v.使...吃惊;把...弄糊涂(amaze的过去分词) **lifesaving:** adj.救命的;救生用的/n.救生 **combatting:** 与.....格斗,与.....对抗(combat的现在分词形式)/斗争,反对(combat的现在分词形式) **polar:** adj.极地的; 两极	

的；正好相反的/n.极面；极线/ **glacier:** n.冰河,冰川 **preserve:** vt.保存;保护;维持;腌;禁猎/n.保护区;禁猎地;加工成的食品 **cherish:** vt.珍爱/vt.怀有(感情等)；抱有(希望等) **as well as:** 也;和...一样;不但...而且

Thank you.	谢谢。[14:08]
(Applause)	（掌声）[14:09]