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ET Conversations with ChatGPT founder: Sam Altman on fears from AI and more | Full video - YouTube

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## Q Explain in detailed summary if there is any talk about ai ethics, ai regulation, generative ai and thoughts about the future. each point separately.?

Sure, here are the detailed summaries on the topics of AI ethics, AI regulation, generative AI, and thoughts about the future as discussed in the video:

1. **AI Ethics:** The discussion on AI ethics in the video revolves around the potential impact of AI on employment and the socioeconomic contract. The speaker acknowledges the possibility of job displacement due to AI but also believes that new, better jobs will emerge. The speaker emphasizes the importance of adapting to labor market changes and the potential speed at which AI could cause disruption. They also discuss the importance of considering biases, inclusivity, and relevance to all users, not just those in major cities, especially in the context of AI development in India.
2. **AI Regulation:** The speaker believes that governments need to get involved in understanding and addressing the risks of AGI. They started their company, OpenAI, because they were concerned about AGI risk before it was widely discussed, and they believe that deploying systems can help people confront and understand the technology's risks and benefits. The speaker also discusses the importance of understanding exponential curves and the potential risks associated with GPT-10, an advanced artificial intelligence system. They emphasize the need for careful consideration and regulation of AI development, and highlight the efforts of their company to address these concerns.
3. **Generative AI:** The discussion on generative AI is centered around OpenAI's work on AGI (Artificial General Intelligence). OpenAI aims to create a system that can do what a human can do and contribute new knowledge to society. This includes the potential to cure diseases, provide education, increase productivity, and make scientific discoveries. The speaker also provides some insider information on OpenAI's plans for GPT-3, including making it smarter, more multimodal, and reducing hallucinations.
4. **Thoughts about the Future:** The speaker discusses various options for the direction of AI development, including training grounds for LLMs, pursuing new research directions, and fine-tuning open source projects. They mention that a nationally funded AI effort could be a good idea, but they are unsure of the right answer. The speaker also believes that revolutionizing artificial intelligence and energy are the two most important things for a better future. They are excited about the new scientific progress and the potential for sustainable development. They believe that we are underestimating the potential of these technologies and that they will lead to a better quality of life.

## Q Summarise this video in key points?

The video is a conversation between Sam Altman, the CEO of OpenAI, and Satyan Gajwani, the Vice Chairman of Times Internet. Here are the key points discussed:

1. **Sam Altman's Background:** Sam graduated from Stanford and has worked on various startups, including Y Combinator and OpenAI. He initially studied AI but became discouraged when neural networks were not working well at the time. He then started a company and later worked at Y Combinator, where he became interested in startups that take on hard technical challenges.
2. **OpenAI and Artificial General Intelligence (AGI):** OpenAI is a company focused on researching and deploying AGI in a responsible manner for the benefit of society. They aim to create a system that can do what a human can do and contribute new knowledge to society. OpenAI is different from other technologies in that it has the potential to cure diseases, provide education, increase productivity, and make scientific discoveries. However, there are concerns about the power of this technology being used in a negative direction, so OpenAI wants to be a force to help manage those risks.
3. **Impact of AI on Employment:** The speaker acknowledges the possibility of job displacement due to AI, but also believes that new, better jobs will emerge. The speaker emphasizes the importance of adapting to labor market changes and the potential speed at which AI could cause disruption.
4. **AI and the Socioeconomic Contract:** The author argues that AI will require a change to the socioeconomic contract and the way governments think about this. They also suggest that the current systems are not very good at doing whole jobs, but rather tasks, and that the nature of jobs will shift to managing teams of junior developers who can only do one-minute tasks at a time.
5. **AI Development and Regulation:** The speaker believes that governments need to get involved in understanding and addressing the risks of AGI. They started their company because they were concerned about AGI risk before it was widely discussed, and they believe that deploying systems can help people confront and understand the technology's risks and benefits.
6. **AI in India:** The speaker thinks that India's diversity of languages presents unique challenges and opportunities for AI development, and they emphasize the importance of considering biases, inclusivity, and relevance to all users, not just those in major cities.
7. **Future of AI:** The speaker discusses various options for the direction of AI development, including training grounds for LLMs, pursuing new research directions, and fine-tuning open source projects. They mention that a nationally funded AI effort could be a good idea, but they are unsure of the right answer.
8. **OpenAI's Plans for GPT-3:** The article provides some insider information on OpenAI's plans for GPT-3, including making it smarter, more multimodal, and reducing hallucinations.
9. **Impact of AI and Nuclear Fusion on Quality of Life:** The speaker believes that revolutionizing artificial intelligence and energy are the two most important things for a better future. They are excited about the new scientific progress and the potential for sustainable development. They believe that we are underestimating the potential of these technologies and that they will lead to a better quality of life.

## Q Transcript

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https://www.youtube.com/watch?v=H1hdQdcM-H4

Transcript:

(00:00) I want to ask Sam some questions myself and then after that we'll open it up to a broader set of people so everyone can can have some time you know Sam just before we start I want everyone to understand your story because you have such an interesting background in the tech ecosystem you know help us walk us through from graduating stand we're not not graduating joining Stanford dropping out Running Y combinator running a different startup before that and now running open Ai and a number of things just help us

(00:28) understand how you came to where you are right now yeah so um I I started at Stanford where we met and I found I mean I was already in love with computer science but I really fell in love with it once I got there uh I actually went to study AI but at the time AI was really not working at all in fact very memorably one of my professors said the only sure way to have a bad career in AI is to work on neural networks we've decided those don't work um and so I got kind of discouraged and I started a company uh that was a great

(01:00) experience the company didn't work out that well but I kind of like learned about startups and thought they were a very powerful force and something I was very excited about so I then ran YC for a while and while I was doing that I got newly excited about the idea of startups that take on hard technical challenges and I sort of thought it was curious to me more people weren't doing that um it seemed like a really valuable opportunity with some other people started openai as one of those examples and many other

(01:30) things which have uh Gone on to be pretty exciting but really fell in love with openai um once it seemed clear that we were really going to have a chance at making true general purpose AI like a system that could do what a human can do and contribute new knowledge to society I got like really excited and wanted to go work on that and so stop being an investor and now I do that amazing so so first of all what is open AI is it just chat GPT are they the same thing are they different just help us understand what the company does

(02:03) we are a company that is doing research and deployment to try to figure out how to build AGI and how to responsibly deploy that into the world for maximum benefit so this is unlike other Technologies well other Technologies are like this too but this is a strong case of a technology that on the one hand is the most exciting most promising coolest thing I think that Humanity will have yet built we can cure all disease we can give everybody a great education Better Health Care massively increase productivity huge scientific discovery

(02:36) all of these wonderful things and we want to make sure that people get that benefit that benefit is distributed equitably and on the other hand uh there are the obvious concerns about the power of this technology used in in a negative Direction and so we want to be a force to help manage those risks so that we all get to enjoy that the benefits Chad GPT is definitely what we're best known for so I guess they're sort of synonymous at this point but openai is really about this quest for AGI so help us understand I mean all of us

(03:08) have played with it right we have poems getting written by it we've all asked it fun trivia questions to learn answers but help us understand you you uh you know without a doubt have a better understanding of how it's getting used all around the world in all sorts of different Industries vocations reasons talk to us a little bit about some of the most interesting things that you've seen like for example what's the most surprising use case of some of the technologies that you guys have built that you've seen recently

(03:37) so the main thing I would say that's interesting about it is its generality there's a lot of other systems that can go do this thing well adapting well or this thing and you know many cases better than Chachi PT some not like there's not probably not a the AI that can write a better poem or whatever but you know other categories you could find something that's maybe better but the fact that this one system is truly general purpose and can do so many things means that people are integrating into their workflow as a

(04:04) very powerful tool and so the same thing that can help you write computer code one of the areas that we've seen the biggest impact is what coders are using this for doubling tripling their productivity um you know there was a paper that just came out that when Italy temporarily banned chat gbt develop a productivity like fell in half on like a fairly big study and but it can do that it can also you know help you find information it can help you write a poem it can help you summarize documents it can translate

(04:36) things and people are using this which we hoped would happen as this sort of super assistant that just makes them more and more productive and it's that generality that I think is the coolest part so with with so much ability that maybe even you guys haven't even thought about how people are using it when you when you developed it and launched it um I'm sure you've seen a lot of interesting use cases right here out of India itself can you tell us something or just give us an example of something you've seen

(05:04) that's really inspired you that you've seen come out of the Indian market so India has been a country that has really truly embraced Chachi BT in a way maybe you can tell me why I'm sort of curious I'm hoping to learn while I'm here we're very delighted but uh there has been a lot of early adoption and real enthusiasm from the users one of the very earliest things like in the first weeks of launching chat gbt we heard about a farmer in India who wasn't able to access government services and Via

(05:37) like church BT hooked up to WhatsApp and some sort of complicated way was then able to and I was like that was like one of the early things we're like huh we did not think that was going to happen and and just to you know expand on it so so what I've understood about open AI is chat gbt is one implementation of the things you've built but you have capabilities to real time translate uh to transcribe audio into text and and are you seeing people use these in combination in ways that are surprising

(06:05) well we recently launched an iPhone app that has uh speech recognition in it which is that's hooking up two of our models together and people love that but the the main point that I would like to get across is none of the current systems really matter uh like we're going to look back at gbt4 and you know I don't know if any of you have like picked up an iPhone the original iPhone in recent years but it's like wow I cannot believe we were excited about this each pixel is like that big you know it's it just feels

(06:35) like this like incredibly Antiquated thing um the curve here is going to be much much steeper and what the systems are going to be capable of in the not distance future we think is going to be very dramatically different so this is like a system that I don't even know what to write this is like the old first like grayscale Nokia phone that looked like a little candy bar and the iPhone 14 is coming so what I would say is it's a mistake to get too focused on the current systems their limitations their capabilities the impact they're having

(07:12) the thing that matters here is we are on an exponential curve truly um two two big Miracles I think in the field number one we have an algorithm that can genuinely truly like no tricks learn and number two it gets predictably better with scale and that we're going to look back I think on those two realizations as a turning point in human history when you put them together but what it means is that the rate of progress in the coming years the capabilities are going to be significant so it's totally cool that Chachi

(07:45) Boutique can write that poem when a future system can like cure all disease or help us address climate change or radically improve education or make us all like 10 or 100 times more productive at what we do that's quite impactful it's amazing now let's flip to the other side of this because there's no doubt there's incredible power in this technology and you know with that comes challenges I want to play a clip uh maybe you guys can put on a clip of something I recently heard Sam speak somewhere and

(08:17) we can talk about it a bit could you uh play the clip please hi my name is Sam and I'm happy to be here today thank you all for joining I also wanted to say that the gentleman on stage with me is incredibly good looking and I also want to say that you should be very careful with videos generated with artificial intelligence technology okay so you didn't say that recently clearly that was just a ploy here but and thank you by the way it was very totally agree with that part um but but nonetheless I think it raises a real

(08:48) question right when you know this video if you look closely you can see the lips aren't perfectly synced but like you said this stuff is only going to get better and exponentially better fundamental questions are on authenticity what's real and what's fake how do we handle that yeah so that was like deeply in The Uncanny Valley it's very strange to watch but we're not that far away from something that looks perfect and there's a lot of fear right now about the impact this is going to have on

(09:17) elections and on our society and how we ever trust media that we see I have some fear there but I think we're actually gonna when it comes to like a video like that I think as a society we're gonna rise to the occasion we're going to learn very quickly that we don't trust videos unless we trust the the sort of provenance we'll have techniques like watermarking detectors more than that I suspect at some point if people are saying something really important they'll cryptographically sign

(09:44) it and you know web browsers or phones or whatever will build in some ability to say okay this is authentic but that part we can that part we can all uh adapt to like we did this with Photoshop there was a period of time where people thought if you see an image it's got to be real we learned we're like okay you know that thing is Photoshop did happen quickly videos like that that'll Society will build antibodies quickly but there's a related thing that I think is getting discussed less which is not

(10:13) the ability to generate mass media like that but customized one-on-one interactive persuasion and I think people are going to be able to create AIS that are very good at this so it won't just be like you know I'm watching a video of you but it'll be like I'm chatting with you back and forth and it's like the most interesting compelling conversation that I've ever had that's like affecting me in ways I don't know about and that's a new thing that's different than just generated media again I think

(10:44) we'll find a way to build societal antibodies to it but I don't think it's discussed as much and it's going to be a challenge I also want to talk about jobs because the the natural fear is AI is going to make us redundant particularly in markets like India where we have so much of a Workforce and a lot of it is oftentimes doing somewhat wrote work should we be worried about this I mean does this affect societal disruption on employment and capitalism and all the things and how we've been running

(11:15) I mean to some extent yes every technological Revolution leads to job change and this will be no exception um I guess three thoughts number one job change itself is fine uh you know if you kind of look at the history of this in two generations we can kind of adapt to any amount of Labor Market change and there's new jobs and the new jobs are usually better and that's going to happen here too some jobs will go away there will be new better jobs they're difficult to imagine as we sit here and dream about the future it's going to

(11:48) look like the thing that might be different about this is the speed with which it could happen and I think it will require a change to the socioeconomic contract and the way governments think about this if it if it happens at a very fast pace the second thing is it's not going the way people predicted so far and I don't think it will in the future so the current systems are actually not very good at all at doing whole jobs they're very good at doing tasks and so the the nature of the job if you're say a computer programmer to

(12:21) stick with that example shifts to you kind of like manage a team of extremely extremely Junior developers that can only do one one minute task at a time and then someday they'll do 10 minute tasks and then they'll do an hour task but you'll still have to think of like the house is all going to fit together what I want to build and you know maybe eventually it learns that too but this idea that instead of replacing jobs it's making people dramatically more efficient and there is such a demand to

(12:48) overhang in most places you know if we can overnight make the world create 3x more software because we make every software developer three times more efficient that is not nearly enough that does not nearly fulfill the demand the world has for software and I think we'll see that in many other places um so another example of this is that the consensus not the consensus the like absolute belief of experts around the world 10 years ago first AI is going to come replace the physical labor jobs so truck drivers

(13:20) Farmers Factory workers real trouble then it'll come for the sort of easier kinds of cognitive labor then maybe eventually like computer programmers even a mathematician and then you know way in the future or maybe never because maybe it's like magical and human the creative jobs and of course we can look now and say it appears like it's going exactly the other direction but that was like really non-obvious certainly to us we started thinking we were going to build robots and it's still in some deep way sense to

(13:52) me seems like it should be much easier to make robots than it is to make gbt4 but here we are I think with other job impacts it's just going to be surprising but I think the world will get way wealthier you'll have a productivity boom and we will find a lot of new things to do you talked about robots and you know we've talked about sort of the the real practical likely disruption that we're gonna see because of AI but we also have to talk about that one percent like Extinction risk or that robots are going to come and take over

(14:29) our lives how do you think about that I mean you have actually been probably more so than the average person um cautious about this and and for us we kind of think of it as sci-fi kind of like in the in the realm of not really realistic but interesting to talk about but I think you would say it's it's something real that we have to think about for sure like I want to be super clear I don't think current systems are dangerous I don't think there's any way that gpt4 like causes an existential

(14:57) risk to the world but people are very bad at thinking about exponential curves and gpt10 may be a extremely different thing given the importance of getting this right even if it's a one percent chance I think putting a lot of effort into thinking studying like how we align an AGI how we design Safe Systems at this kind of scale is super important um and starting that early is really good I think we can totally manage through it I think we're developing techniques to mitigate it this is really why we started the company this was like

(15:33) our initial focus and still is our most important Focus um but yeah we need to address this so is there like a power switch in the back of your office that nobody knows about where you can just like the Jurassic Park that giant yeah it has to be big and dramatic but you pull this big thing and it shuts down all the systems if we need it exactly like that okay good okay I'm glad I feel better now okay and it works even if you're traveling right I mean yeah okay anyways um so let's talk about regulation

(15:59) because again I think what's really unusual is this company is a few years old but really for the for the consumer it's like less than a year old because a chat gbt and yet here you are traveling the world meeting leaders globally to talk about the importance of Regulation and not only are you doing that you are probably one of the most vocal people saying we need it and not one of those you know we'll regulate ourselves leave us alone type of things you are saying governments need to step up understand this and get

(16:29) involved this is very weird this is not like how most startups operate what's going on well again we started the company because we were nervous about AGI risk before you were really before people even talked about AGI um and now I think part of the reason we deploy systems is so that people confront the technology feel it understand the risks the benefits and now a lot of other people are also very excited but sharing the concern I think this is a special moment where the globe can come together and kind of get this right and we certainly

(17:02) would like to try to do that so let's talk a little bit more about AI in India because it's so unique for us and there's so many interesting use cases that are very India specific you know one of the obvious questions we think a lot about are languages right India has one of the largest depths of languages hundreds of languages in the country now ai is by and large trained on what's publicly available what's available on most of the internet which is you know inevitably going to be mostly English

(17:32) probably a lot more Western focused in terms of just the sheer quantity of stuff that goes into training how do you think about biases how do you think about inclusivity how do you think about multilingual countries like India and making a product that's relevant that's useful not just for all of us fancy people sitting in Bombay and Delhi but for you know everyone in the mass of the country yeah it's it's super important to us uh we've had a big step forward from GPT 3.5 to 4 at non-english

(18:02) languages so gpt4 is is pretty good at say the top 20 languages and okay at maybe the top hundred we will be able to push this much further uh you know it's challenging for us for very small languages spoken by you know only a few tens of thousands or hundreds of thousands of people that that's difficult but the systems are fundamentally going to be very good at this I think and it's important for us to do now as you were saying it's not just the language it's also the history the culture the values and we want the

(18:34) entire world represented in here there will be some areas where the world's got to agree on like here the sort of global bounds of the system but mostly if you want to use it in the US or in India that can be under a different legal framework and then in different parts of the culture in each Place it'll it'll be very different and I think that should all be represented in there we recently launched a new program to give out grants for people with run experiments of the ways we can do this uh the way we

(19:00) can collect this but we we really really want to you know India has been particularly unique and successful globally at building a lot of the underlying technology Stacks to support new innovation in digital with India stack UPI Adar things like this do you think India should build its own llm AGI AI engine you know in some sense should we think of this a little bit like nuclear technology where every country should be building its own capabilities and you know a little bit more nationalist in the way we think

(19:35) about this I mean how do you think as a country we should think about AI as something in a sovereign sense first of all it's super impressive to see what India has done I think in a way that really no other country has uh with these sort of saying we're going to do National technology really well and like make it a really like a National Asset uh in terms of AI strategy I think there's like a lot of things that can work I think this question of sort of AI Serenity none of us have an answer to yet

(20:07) feels like it's gonna be at least somewhat important but the main thing that I think is is important is figuring out how to integrate these Technologies into other services and that is an area that I think governments are behind on and don't have the answers to yet um but you know I think like hopefully we all start to use llms to make government services way better and both from like how do I enroll in this program to like how do I get better health care but but if you're in the Indian government

(20:40) should you be like we need to set up a team of crack Engineers to build our own open AI I mean is there a concern for us to say are we depending on like for fundamental infrastructure are we depending on something that's not owned by our country yeah I think it is good to have certainly some sort of AI research effort what exactly that should do you know should that be training ground up llms should that be pursuing new research directions should that be focused on fine-tuning open source projects I think there's a lot of

(21:08) options there and there's I don't yet like have conviction on the right answer but some you know nationally funded AI effort feels like a good idea one of the things that I think is so interesting is that open AI straddles this line of being a non-profit and a for-profit and I don't know how I don't know if I fully understand it I don't know if many people do I know you've raised money from investors and Microsoft is definitely one of your shareholders uh when we think about it is it do we think

(21:43) of open AI as something that's here for society to do societal good is it here to make money for its shareholders is it both what happens if those conflict we're definitely here for the societal good like that's super clear and that's why we put up with all this complications can you help us understand what exactly does it look like so there's like a non-profit that has a board that governs this thing that we call a capped profit where our investors can make a certain return um but if we ever need to make a

(22:13) decision that is in favor of societal good but not in favor our shareholders were set up to do that and one of the most controversial things I heard was that you don't own equity in open AI why is that what's going on um I mean it started just as like sort of this Quirk of our structure where we needed non-conflicted people on the board who didn't have Equity a certain number of them certain percentage and then I kind of just like never got like I forget about it until it comes up in something like this but it's I don't

(22:45) think it's like a particularly noteworthy thing like I made a ton of money early in my career I actively invest so I expect to make a ton more I get far more value from even like personally selfishly speaking I get far more value from like all of the other sort of benefits that come from running to open AI a very interesting life than I would for more money but most of all like I just believe that this is going to be the most important project of our time and I'm super grateful to work on it if you need me to

(23:16) like send you reminders to to keep up on it I'm happy to do that just let me know so look a lot of people have flown in here from all around the country to come hear you and while understanding all this theory about AI is cool help us do our jobs better I wanted to put you in a couple roles and tell me okay you are now the CEO of a hospital in India what should you do and not theoretical go hire a couple people like tell like help me do my job better be my AI for a second here one of the things that we have heard from a lot of doctors

(23:46) uh is that they're they're using chat GPT with gpt4 to help come up with new ideas for tricky cases so you know input the symptoms maybe the test results say I can't figure this out what are some ideas for the differential diagnosis and in many cases getting great results back awesome now let's say you're running a bank what do you do this is like rapid fire we're all taking notes to do our jobs better here um like a sort of traditional like bank branch on the street that kind of Bank not like

(24:18) an investment operation yeah like a bank like a traditional bank that issues credit cards and checking accounts and all that stuff hmm um I think I would try to just like on a very brief little side journey of my career I once like helped build a mobile banking app and on the side no no it was like it would okay yeah whatever um I still think the consumer experience of banking is terrible and could be a lot of it could be replaced by like chatting with an llm it's interesting let's say you're running a university you're uh you're a

(24:54) Chancellor I mean we've all seen how Chachi PT can definitely affect the education experience now let's say you're running a university yeah that one I think is pretty clear I would just like go redesign the education experience I would have the equivalent of like personalized tutoring interactive textbooks um I would like I would integrate it into like all parts of the learning process now now just totally theoretically let's say you're running like a large news media company in like a market like India like just as

(25:24) an example what would you do and let me just get my pen real quick but uh yeah what would you do just tell me um one of the things that you know there's been a lot of controversy about whether this is going to be good or bad for the publishing industry in news in particular one of the things that we've heard from journalists and reporters who are actually using the the product is that it helps them do the boring parts of their jobs better and they get to spend more time reporting talking to sources thinking of ideas and so I think I would

(25:55) just like encourage everyone to just start using it and now let's say you are the ministry in India responsible for overseeing technology AI Etc um you know what what would you do in that situation like what would you be doing today as a regulator I would say you know we have the G20 coming up India can play like a huge role here in global conversation about what this sort of international regulatory thing might look like and we are going to really focus on that between now and September and make sure we prioritize that

(26:34) can you tell us something that you haven't told other people about what's coming from open AI like maybe just some Insider information that we could use in some form or you know we kind of tell people what we're working on like it's gonna get smarter it's gonna get multimodal we're gonna try to like teach it to generate new ideas come up with help us like discover more new science we're going to reduce hallucinations we're going to give users like more control so no one feels like it's biased

(27:01) or at least it's biased in the way you want it to be biased we don't have like a lot of secret plans here I think always as a company to our strength and weakness we just sort of say what we think and what we're going to try to do it's amazing now the one of the most amazing things about you Sam is that you are running what is going to be one of the most impactful companies in history whenever people say impactful they know they they leave out whether it's going to be a good or a bad impact that is a

(27:29) very purposeful leave out because we don't know right but it's you you're gonna shape the world with this we know that and this isn't your only job as I understand or maybe it's not your only like operating it's the only thing that I'm like can you tell us what else you're doing that's like exciting you or motivating you outside of an open AI sure you're side hustle sure if we put it that way um I think we're gonna get nuclear fusion to work in the next few years at and importantly not just as a

(27:57) scientific demonstration but as incredibly cheap energy and at global scale so I think other than AI if you could do one thing that would like really help the world get richer increase the quality of life it's very cheap energy I think there's like a huge historical correlation there and I think we've all like lost sight of the appropriate ambition level here of how how much of an impact we could make but if we can get Fusion to work and if we can make enough of it for the world then if it can like cut the energy cost 10x

(28:29) plus that's pretty great I'll pick that one so your side gig is nuclear fusion I don't I I I'm an investor and sort of like helper of that one it's amazing so so just so I understand you're you're revolutionalizing artificial intelligence and energy not you specifically I think these are I think those are the two my basic model of the world uh is that the cost of intelligence and the cost of energy are kind of what compound and everything else and if we want a radically better future those are the two things we

(29:04) should focus on trying to like make abundant it's incredible so my last question for you is what is the most exciting thing that you are seeing globally in your own company like what is the thing that outside of everything we are all talking about and seeing that excites you about where openai or even not just AI in general what's the most exciting thing ahead I mean I I think it's this generation of of new scientific progress if these systems can really contribute additional understanding of the world to

(29:46) better technology better science that that is like the sustainable way that the world actually gets better and that the quality of life increases we're not there yet it might be soon it might take a while but I believe we are going to get there and that will I think we all underestimate that it's amazing Sam thank you so much thank you to be clear Sam asked me to talk less and to open it up for you all to ask more