

>> Welcome to Uncommon Knowledge. I'm Peter Robinson. TJ Rodgers is the founder, president, and CEO of the Cypress Semiconductor Corporation and the chairman of the SunPower Corporation. He holds a doctorate in Electrical Engineering from Stanford and sits on the board of trustees of his undergraduate alma mater, Dartmouth College. Neither a Republican nor a Democrat, TJ is an avowed Libertarian. Mike Malone, TJ, writing for ABC News on February 15th, "TJ is an unapologetic capitalist and an absolutely ferocious competitor." Fair description?

>> Very fair description.

>> Alright. Mike Malone again, "When the word green comes to mind, TJ Rodgers, the ultimate free market libertarian is probably the last person you'd think of. And yet here he is at the absolute epicenter of the green revolution helping lead the charge that will likely very soon make solar power as inexpensive as other sources of electricity." We'll talk about science in a moment. We'll talk about business in a moment, but first political philosophy. How do you square raging capitalism and ferocious competitor with green environmentalist? Have you discovered the inner TJ? What's going on?

>> No the--if you're a free market capitalist, then you make products for your customer so you make sure you make what they want. You make it cheap and reliable and you make a profit selling it to them. I don't have to agree with Al Gore politically in order to say people want to make pollution-free power today. People wanna reduce their dependence on the grid. There are a lot of people like that, so we make at SunPower high quality products for them and we make money at it, give you a little factoid. My company, Cypress, bought SunPower when it was an embryo for 0.05 billion dollars and today it's worth 5.0 billion dollars. That's a hundred to one return on their money. So green is green, there's nothing inconsistent at all.

>> That's a 100 percent—

>> Hundred to one.

>> Hundred to one return on the money over how many years? When did you buy it?

>> We both them in '02.

>> '02, okay. So, I noticed that you answer the question of environmentalism without a single reference to the environment. Your reference is entirely is your shareholders.

>> That's true, but if you think about—

>> [Inaudible] I'm waiting for you to say, and while we're making money we're also doing good.

>> We're doing the higher good, right. That's—

>> You're not interested?

>> The higher good is serving our customers. You know the cab is in London. You could say they're doing the higher good by waiting around for people and taking them from the airport downtown or the hotel owners in London. The fact is they're in business to make money, yet you can fly to London, get a car, go downtown and go into a nice room and that exist which is an accommodation that wasn't around forever until capitalism helped it happen because of people making a profit. That is the higher good. That you know just read anything that Friedman wrote and you can see that you serve people by making things they want. That kind of service is a higher service than the way our government looks at it which is to serve people is you elect me, I take over, I go to the big house, I get the driver and the big airplane and then I tell you what's good and if you don't like it, I force it on you. That's not the higher good as I see it.

>> Alright, so you take--We'll presume Milton for just one moment here. Milton Friedman wrote a famous essay on the question of corporate philanthropy. He was against it. The corporation and whatever people do in their individual lives with their own money is up to them, but the entire purpose of the corporation is to produce profits for shareholders. You do subscribe to that in its entirety? You wanna modify it a little bit?

>> The last time I quoted it was yesterday.
[Laughter]

>> Alright.

>> I was at the ECO:nomics conference run by the Wall Street Journal, and I just quoted Friedman as saying that the higher good is the creation of profit for the shareholders and by creating what they want, you are serving them and any diversion from that is negative. Now, does that mean companies can't be ecological? That actually was a panel I was on yesterday. Sure you can. For example, if I run Wal-Mart and I think I can improve sales and improve the image of the corporation by going solar and cutting my electricity bills at the same time, I'll do that and I'll claim I'm going solar. My customers like it. They're more likely to come to my store than not because we haven't done that. My company, you know—

>> When you say your company, you're talking about Cypress or SunPower now?

>> Both.

>> Okay.

>> But let's say Cypress for example. My company, we don't talk green talk in the company. As a matter of fact I get itchy when I hear that kind of stuff. I want--A little anecdote. In one spot the president of SunPower, Tom Warner, blathering about icecap or something like that and so I headed, I went to Eddie's trophy shop and I had a trophy

made up for him. I bought two size-13 Birkenstock shoes and had them glued on to a plaque and I gave him what I called the first Daniel eco [inaudible] award so--But the fact is without having to join that mindset, students coming out of college today do wanna work in a company that is gonna work on the environment. And guess what? I really work on the environment. In the conference yesterday, I had 2 talking heads. In one side a lawyer runs the Environmental Defense Fund and the other side I don't know what he was, but he runs the Competitive Enterprise Institute. And they were like two loud speakers screaming political slogans. It was nerve wrecking. I'd almost rather been water boarded for the equivalent amount of time than going through that and I finally had to point out to them of the three of us each having strong opinions, there's only one guy actually causing carbon dioxide molecules to come out of the atmosphere and maybe when they do things that are counter productive to that, they ought to rethink their political theories.

>> Okay. I said in introducing you that you hold a doctorate in Electrical Engineering from here at Stanford, so a couple of questions for TJ Rodgers scientist, to Dr. TJ Rodgers, the science of global warming. Let me give you 2 quotations and just see what you do with them. First, science writer Elizabeth Kolbert of the New Yorker Magazine, "As you add more greenhouse gases to the atmosphere, you get higher temperatures. This is absolutely beyond dispute." Second, science writer John Tierney of the New York Times, "Considering how many false alarms have been raised previously by scientists, the population crisis, the energy crisis, I wouldn't be surprised if the predictions of global warming turn out to be wrong or greatly exaggerated." How do you evaluate those 2 statements?

>> Short answer is probably correct not. So, absolutely correct as she was saying, and B is probably right but nobody can know. Carbon dioxide absorbs infrared light from the sun and then it vibrates, and vibrating molecules is another way to think about heat. So, it is true that carbon dioxide will capture light energy and turn it into heat energy. It's also true if you look at data. It's very fussy, but if you look at data over the last 150 years i.e. the industrial timeframe that the temperature of the earth has gone up something in the order of 0.7 degrees centigrade. That change is very, very much smaller than the natural swings of 10 degree centigrade the earth goes through as it goes from ice age to warm.

>> That would be about a 10,000 years cycle?

>> 10 to 50,000 years. Yes.

>> 10 to 50, alright.

>> And nobody really knows why it is and I read different theories, but right now I've heard that the latest here I read which sounds interesting is that continental drift actually can block and unblock ocean currents and this is what causes the earth to completely freeze over a hundred percent or to completely unfreeze to the point there are palm trees on the north pole. Also, we can measure carbon dioxide. 125 years ago, there was about

260 parts per million CO2 in the atmosphere and that was about 370, and we've got a little bit warmer. Okay, that's probably true. The next thing we know based on observation which mean--makes this true that this computer models they use are highly suspect is that the warmth on the earth is tending to make the cold areas warmer, not make the hot areas hotter yet. And that means we're at the end of ice age right now if you just look at it on a geologic timescale. That means the North Pole and the South Pole and Greenland are gonna have less ice on them, maybe no ice. That's happened to us in the past. Whether or not that's being caused by this carbon dioxide from men are being caused by just natural earth phenomena is in dispute. Fred Singer, who's written a paper for the Heartland Institute sort of the non-international IPCC, I forgot the acronym but the--The answer is the UN group.

>> Right.

>> And he claims that natural phenomena dominate the earth and nobody really knows. My last point is interesting an interesting anecdote. They grew a crop of broccoli on the coast of Greenland this year. So farmers up there are actually creating source of income for themselves that they didn't have before. So, it's just not clear to me that that is a catastrophe that during the next 200 years, we're gonna have the icecaps recede a little bit.

>> So, can I--I wanna make sure that I--Let me sum up and you tell me if it's a fair summary. One, on the science of global warming the critical question whether there is anthropogenic global warming, global warming caused by human activity, and whether this anthropogenic global warming you're not sure. The science is unclear. How would you say?

>> There I would say there is probably anthropogenic global warming and its magnitude is probably seven tenths of a degree centigrade over the last 125 years.

>> I see, alright. Next question. Is it dangerous? And on that one you're skeptic or open minded or you just don't know.

>> Nobody knows, nobody knows. You know, a world with less bearing cold spots maybe a better world than where we are. You know then of course the other fear, the fears that are thrown out are the rising of the tides Al Gore has talked about 6 feet. Well, if you look at the IPCC report, it's going back to their first report. They just issued number 4. Number one I think was 2001. They were talking about 6 feet of rising water. Now, that's been studied very carefully and a bunch of paper is written on it. There are newest estimate. They have 5 scenarios and the worst of the 5 scenarios is that the water levels worst case are gonna rise 2 feet by 2100, 2 feet in a century. Hardly, a catastrophe has to run out and trash our economy immediately because of that estimate.

>>Okay, last question then on the science of global warming for you as a scientist, to me as a layman. Let me try a little Karl Popper on you. You know Karl Popper is the great philosopher who came up with a notion of falsifiability. To be strictly speaking

scientific, any theory must not comport with some conceivable set of empirical data. That is to say to be strictly speaking, scientific--something has to be open to be proven wrong empirically, right? So, you read the newspapers and you discover that good weather, bad weather, sweltering heat, some places increasing cold of everything gets claimed is evidence for global warming. The question is if it were false, how would we know it?

>> Well, I think you just attack that kind of logic at face value. I have a joke inside of my company. Manufacturing people like to run a razorblade factory that just continues to make the same thing. Unfortunately, my customers [inaudible] they are--keep ordering different stuff from us all the time and the manufacturing guys get jerked around and the changing of products is euphemized as mix by our manufacturing guys. So, every time we go into a meeting, did they lost some money, the yields aren't as good, they get up and say mix. And one day I looked at one of my--and said, "You know, I think if you backed your car to the parking spot and backed it into a fire hydrant, then at the bumper you jump out of your car and scream mix, was a fault of it." And that's the way the press is today with--you know we have science reporters who don't have degrees and they report science as sort of a blurb level. You know, every time a hurricane comes through, we have you know "Oh my God, we're having more violent storms." Well, you know if you just looked at the data which they don't because they don't care, they have a religion and they select the data to support their religion, then of course the religion by definition is something that you believe and doesn't have to be proved. So--but if you look at the hottest day, hottest record heat days and you look over the last hundred years, we're not in a period right now where we're setting record days of heat. It was--that happened in the '40s. So you know, basically every thing is "Oh my God, it's global warming." I don't mind it because it's so—

>> Good for your business.

>> Well, it's so wrong that they discredit themselves, so let them do it.

>> Alright, the SunPower story. Tell me the story. You bought that company 6 years ago, what it does, what it's worth today.

>> Okay, 2000 we were built—

>> 8 years ago.

>> Well, no this is a precursor.

>> Alright.

>> We're building a building, so the guys come in with the checklist, what kind of chairs, what kind of cubes, do you want triple pane glass, yada, yada, and last one was do you want solar on the roof.

>> This is for Cypress? You're—

>> Yeah, yeah, headquarters. So I go classic. I go--I want solar if it makes money and I don't want solar if it doesn't make money, very simple. So, you did a return on investment calculation and the payback time was 7 years. Alright, then you have to make a choice. If a person in my business gave me a payback time in 7 years and said spend money, a million six is what we spend in a way. But I was building it, a 25-year building, even a 50-year building and to put some--and solar cells are warranted for 25 years. So, a 7-year payback was there. A building is worth more when you put it on, so I could get my money back in any time and I wanted to look a little bit forward, so I put them on the roof, put my head, solar cells having ROI. That is there on the edge of economic viability. They're not quite there yet, but I'll stretch a little bit. That very year, I bumped into [inaudible], a fellow PhD student in my program at Stanford and he tells me, "Hi, how are you? I'm not so good. I'm about to go out of business and layoff half my people. And oh, by the way I make the most efficient solar cells in the world." And if you remember there's an airplane called the Solar Challenger which was an airplane with covered wings [simultaneous talking]. Yeah, covered with solar cells and run with 14 2-horsepower motors and flew on the energy of the sun. And he made those cells, his company made those cells. So, I went to my board and said, "Let's buy SunPower and let's invest in SunPower." "No, it's not got to do strategically." And it turns I'd had to go to my board 3 times over 15 months to finally to get them to see the light and [inaudible] attended. So, I wrote a check personally for 750,000 bucks to Swanson to keep his company, and going in eventually in 2002, we bought the company for 0.05 million.

>> We, the Cypress.

>> Yeah, 0.05 billion, we Cypress. And since that time, this year they'll do a billion to a little bit over billion to the revenue. We just installed the largest solar installation in the history of the United States, Nellis Air Force base down there in Las Vegas. I got a 14-million watt, hundred million dollar solar installation.

>> Give me a mental image. How many is that? Is that—

>> 140 acres.

>> 140 acres.

>> Right. And now you see the importance of efficiency. We make the most efficient cells in the world and that 140 hectares would have been 280 hectares had the use the cells of one of our competitors in Phoenix that but it has to be have the efficiency of our cells.

>> Okay now, the article by Mike Malone that I quoted earlier says that you are in the middle of the revolution that may make--that is likely. I think it was the word Mike used, likely to make solar energy as cheap as other sources of electricity. But, recent article on SunPower in the New York Times writes this. "Solar cells are without the potential for

exponential gains and performance and falling costs that are hallmarks of the computer world." So, I myself, layman that I am think in terms of 2 kinds of prototypes here. One is the chip, which has been your business until now where you've got Moore's Law. You've got rapidly falling cost, increasing efficiencies, and the other is the battery where try as they might, manufactures have only been able to make very small incremental improvements. Which sort of technology is solar cell?

>> We're in the middle. Moore's Law which tries integrated circuits basically said that you decrease the price by a factor two on a chip every--around the functions on the chip, every 2 or 3 years.

>> Right.

>> And Moore's Law is running out of gas by the way, but it's been around for 30 years and it's been this amazing decline. I mean if automobiles had followed Moore's Law, literally today you could buy a new Chevrolet for a penny that we get 10,000 miles. But again, I'm not exaggerating.

>> Right, right.

>> Those are real numbers. Alright.

>> Aright, solar cells the New York Times it says somewhat wrong as what a learning curve but it's not as deep or as prolonged. For example, we today make 22 percent solar cells. If I make the world's most—

>> 22 percent meaning?

>> Okay, the sun shines on the earth with an energy density of approximately 100 watts, 1 light bulb per square foot.

>> Got it.

>> Okay, and if I have a solar cell in this 1 square foot or an array of them, I can get 20 percent of that or 20 watts of power out of that.

>> So you need 5 solar cells of that size to light 1 light bulb.

>> That's right.

>> Got it.

>> So it turns out the theoretical efficiency of silicon, it's an empirical number, it's not a calculated number, is around 29 percent. So we've gone from nothing to 22 percent. There's only 7 points left to 29. We can see our way to 25. So, that will run out of gas but other things won't. For example, we can make them cheaper. We used to take a

piece of silicon and it was 650 microns thick, you know like thicker than the thinnest pencil lead and we now make 160 microns. So we're using, you know, fraction of the silicon used to that, release the lower cost.

>> And when you say we can make them better or cheaper, it's because of you've been in this business of playing with silicon for a quarter of a century at Cypress, so you a manufacturing edge.

>> That's right.

>> Alright. So, the technical edge is there but not as large as it might be in the wild and woolly old days when you started manufacturing chips in the '80s.

>> Yes.

>> Silicon, if you just wanna look out as far as I can see and I can see about 5 years.

>> Alright.

>> I'm gonna cut the cost of silicon solar cells in half. And when that happens, it'll be a no-brainer that every new household have a solar roof on it. You just--when you think about it, it would be more expensive to own the house in the first year and a half without the cells than to have them on.

>> Okay, that brings us to what this government ought to do. Let me just give you 3 plans for dealing with global warming, Al Gore, Barack Obama and John McCain. And I'm just gonna read you quotations and let Dr. TJ Rodgers have at them. Alright, Al Gore's plan. By the way, did you see the Gore movie "An Inconvenient Truth"?

>> Yes.

>> Give it a grade, A to F.

>> Well, F. As a matter of fact, it really did receive F where the British Supreme Court recently ruled that in order to make it legal to show children in Britain [simultaneous talking] 8 disclaimers about factually incorrect information embedded in the movie.

>> Alright, okay. This is Al Gore, quote. I'm quoting him now. "For the last--" he's speaking in 2006 in this quotation. "For the last 14 years, I, Al Gore had advocated the elimination of all payroll taxes," I see your eyes light up, "including those for social security and unemployment compensation and the replacement in the form of pollution taxes principally on CO2. The overall level of taxation would remain exactly the same." Take that libertarian. You're not gonna be worse off under this. "Would, in other words, be a revenue neutral tax swap. But instead of discouraging businesses from hiring more employees, it would discourage businesses from producing more pollution."

>> Okay. Well, my first thought is to go back to World War II and a story which may or may not be true but a story about when Franklin Delano Roosevelt went to Europe to one of the conferences and negotiate the end of World War II and it was said that he laid a map on the table and started drawing circles over various parts of Europe redefining the boundaries of the European countries in the logical manner that they should have been defined to begin with which would end all these war stuff. So, Al reminds me a little bit of FDR, the grand democrat when he's talking about sort of rearranging history. And you know, don't worry too much about the people who's the boundary and those country name changes because of the grand plan from the man on top. I think [inaudible] in the government ought to get out of the energy business. I would gladly, in a nanosecond, sign a deal which said the United States Government will subsidize no energy of any form for any company and I would sign that in a minute and I would get a lot of Silicon Valley CEOs to sign it too. One of the reasons solar has got to be on the take, much to my chagrin, is that there are huge subsidies to ethanol, to petroleum, you know at the same time we're talking about creating CO₂, we're subsidizing petroleum.

>> Right.

>> And basically if you are the only unsubsidized source of energy, you're in huge disadvantage where the government is funding your competitors. I'd like to get rid of it all.

>> Okay. Barack Obama, cap and trade. The basic idea here is as you know, businesses would be permitted to emit greenhouse gases up to a certain level after which they would either have to have credits or purchase credits from other businesses. Obama here gives business a [inaudible]. That is to say if they emit under a certain level, they get to sell their unused credits and a stick which is that if they emit above the level of their credits, they get taxed on it. Senator Obama, "Unlike the other cap and trade proposals that have been offered in this race, presidential race, no business will be allowed to emit any greenhouse gases for free. Businesses don't own the sky, the public does. And if we want them to stop polluting it, we have to put a price on pollution." Now that's not an unsophisticated comment really because what he's saying is that we should capture the externalities, right? That makes sense from an economics--Okay, so TJ on Obama.

>> It turns out that was the debate yesterday. I am not—

>> On this panel yourself.

>> Yeah. I'm not completely hostile to it. As a matter of fact, Obama's way of stating it probably captures freedom and free market. It's better than stuff I heard from the Environmental Defense Fund yesterday. Go back to an example. During the Reagan years, we had so-called acid rain and the mechanism is very simple. If you have coal that's got sulfur in it, you burn it and you get carbon dioxide from the coal and you get sulfur dioxide from the sulfur. And when sulfur dioxide reacts with water it forms sulfurous acid, and it comes down on the rain and it makes slightly acidic the groundwater and land water lakes. So, what happened was we had a cap and trade

system like you just discussed. You were allowed to emit so many tons per year and then after that if you wanted to do more than that, you have to buy credits from other people.

>> Right.

>> And the other people got a credit for example by having a sulfur scrubber so they didn't emit to their cap, then they could make extra money by selling you the credits and the polluters at an economic disadvantage.

>> So you introduce a market mechanism of a kind?

>> That's right. On the other hand, you know it is big brother telling you what you got to do and if it's lay down with a heavy hand, it can really wreck an economy. A cap and trade system--and of course, it's in my interest here to look you square in the eye and say, of course solar energy, light comes down, creates some electron, it will appear in a piece of silicon and we force the electron to go out and go through your motor, for example, before it comes back and recombines with the whole that was created, and there's zero carbon dioxide from that. So, it would serve me well to look you in the eye and say I believe in it and I believe that cap for carbon dioxide ought to be set very high. Because of course, where are people gonna go to get their credits—

>> Straight to you.

>> Right, right. So, it's my interest. If we have to do something, a cap and credit of a modest level, 5 dollars per ton of CO2 emitted, living alone the market below it and now subsidizing the market may be the way to start to understand the problem better.

>> Okay.

>> But if we come in with some sort of doctrine, they're less Obama-like and more Hillary-like or more Al Gore-like that will show up to do the following, we could mess up the economy and a lot of people.

>> Last example here is John McCain who is cap and trade--incidentally I have to--this is legislation he introduced in 2005. This is not his current proposal, but for the sake of argument, it's cap and trade. It's roughly the same as Obama with one difference. He wants heavy subsidies for nuclear energy, so if John McCain cap and trade with federal subsidies for nucs.

>> Okay. Again, I'm having a schizophrenic reaction. I don't like subsidizing energy. The minute you subsidize nuclear energy, the problem is you either gonna put me out of business or you're gonna have to subsidize solar energy also, and I'd rather get rid of subsidies. So, let's get rid of that. On the other hand, I think we have foolishly into our detriment the [inaudible], the very same greenpeace organization the was rallying against nuclear energy 20 years ago screaming about the apocalypse of the Three Mile Island, now is in favor of nuclear energy. Well, you know the rhetorical questions is were you

screwed up back then or are you screwed up now. My answer to the question is both then and now for at least with greenpeace. And I like nuclear energy because assuming--and I think this is a good assumption, assuming you could control obviously the very toxic waste which I think we can, we can store it. You can make very clean, very cheap energy. And if you wanna look at 2 countries that have done that, you will--Look at France.

>> Right.

>> They have—

>> 80 percent of their power

>> That's right and no carbon dioxide going into the world. So I don't think, I don't think John needs to subsidize the nuclear companies. You know if you look at the big companies, General Electric, et cetera that are capable of doing that, they've got plenty of money. They can do it on their own.

>> Okay. Let's turn now--I wanna get back to the--We've done TJ Rodgers businessman, TJ Rodgers Scientist, let's TJ Rodgers major figure in Silicon Valley for about 30 years now. What's happening in the valley? I have once heard you remark that the government can say anything it wants to and do anything it wants to, but that it's when venture capital money starts getting spent on hiring smart engineers in Silicon Valley the problem actually get solved. Let me just name an alternate energy technology. You tell me what's happening in the valley.

>> Okay.

>> Whether money is being spent and good talent is being attracted and commercial viability. Ethanol biofuels generally, anything going on?

>> Ethanol, total waste. Arthur Daniel Midland, the greatest lobbyist pork barrel company of all times, gold record winner. Read a bunch of papers on ethanol and the bottom line is that if you count the energy consumed to make a gallon of ethanol and convert it back to equivalent gallons of gasoline, it takes somewhere between 1 and 1.3 gallons of gasoline equivalent energy to produce 1 gallon of ethanol. So, the very best is a [inaudible] masked camouflage for burning gasoline anyway.

>> Okay.

>> The problem is--Now, that can change. The problem is take corn or grapes for that matter. Part of the grape plant is cellulous, wood and leaves.

>> Right.

>> Part of the grape plant is sugar, sweet grapes. Did it with corn, part of the corn is stalk and part is corn kernels which have sugar in them. Well, we turn the sugar into ethanol which we can burn, but the whole rest of the plant is cellulose which we then proceed to usually grind up, put in the ground where it emits methane which is a very bad greenhouse gas. What's gonna happen? It turns out--it's kind of amazing in the chemistry but--Glucose, the molecule of sugar is a 6-atom ring and if I just consider that as a ring, there is 2OH or hydroxyl groups, half of the water molecule on glucose one points--they both point down, alright, and that's fermentable. Cellulose is the exact same ring. Cellulose is made out of sugar, believe it or not.

>> Right.

>> And the only difference is one of the hydroxyl groups points up, one points down and the thing polymerizes in the [inaudible] function of sugars making cellulose. What we got to learn how to do is we got to learn how to take the sugar in the stalk, break it apart, and metabolize it and use all of the energy of the corn plant, not just the fruit of the corn plant. And if we can do that, that would be a breakthrough.

>> Is anybody working on that in the valley?

>> Bunch of people are working on that. There's different ways to do it. One is you can have exotic new chemical reactors which break apart the stuff. It turns out we know very well in the animal world, this happens. Termites eat wood. If you ate wood, you die because your body can't digest cellulose. Termites can eat wood and they can digest cellulose. Cows can eat grass because they got bacteria in their forestomach that can then break apart cellulose and get energy out of it.

>> So we have--I wanna—

>> Bio—

>> get through.

>> Bioengineering is one and genetic engineering. Now of course, this is where I have my concerns about the conservative side of the spectrum. You know, God doesn't want us to bioengineer but if we could change the gene structure of plants, we might be able to change the ratio or the type of sugars in them to our great advantage. This is gonna happen, but this is a 20-year kind of thing.

>> This is more pure research at the moment. There's nobody--nobody's got commercially viable work.

>> Well I know, I know a company right now that's got a chemical reactor that can turn plant waste into something that--a cousin of natural gas.

>> Alright, so there's stuff out there. Wind power.

>> It's great. Wind power is bigger in volume and cheaper per kilowatt hour than solar. Wind power, there's a problem in both solar and wind power, of course it's intermittent. But, anytime you can fill in a gap and put energy into the system during some time of the day, it's still a winner. You know, and here we go again with the so called environmentalist where, if you remember, they shut down the Altamont Pass awhile back. Somebody found 3 or 4 dead birds underneath a windmill and then they shut it down.

>> Seagulls run into the blades or something.

>> Right, exactly. They shut it down for awhile and talked about it. Roslyn Newspaper editorials then turned it back on. So it turns out that the wind industry is running against a negative image in the public right now. It's very difficult to get permits to put up wind.

>> Technically though, are there ways of--do you see--Again, earlier I asked you where does solar cells fall on the spectrum between Moore's law and very--the very kind of very slow incremental gains you see in the production of batteries, where is wind power? Are there technical advances that we can expect or at least hope for?

>> I think winds almost mature. That is I would look at it for example, the improvement we get out of the internal combustion engines in the future will be minimal and I believe wind turbines are pretty much at their efficiency level, but having said that, you can make power for 5 cents of kilowatt hour with wind.

>> Right.

>> That's one third the price the utilities charge in California. So they're already there.

>> Nuclear power is a long story I know, but I just wanna know Three Mile Island took place in 1979, Chernobyl as I recall was 1986--it was the mid '80s. Are there technical advances that have taken place that make nuclear power more, let's say politically viable, because people can be persuaded that it's safer than it used to be?

>> Well first of all, the Soviet nuclear reactor is a graphite block design that we never used in the United States. And by the way, they built that design because they claimed it was safer. And if you--then therefore I would claim the reactors we have today are perfectly safe. You know, we belched up some radioactive gases once in Three Mile Island, inexcusable and bad. However, would you like to count up how many people have died in the oil industry or from the pollution from the oil industry or how many coal miners have died or died from pollution in coal, how many people are dying during this programs, several from pollution and in from coal plants in China where they're putting one new coal plant on line everyday in China. So, if you really count the externalities and don't make it a religion but a more accurate scientific exercise, our nuclear energy is extremely safe in the form we've got. By the way, the plants that have been safe that mostly World War II technology and our technology for control, our electronics, our

monitoring capabilities gotten lot better. So, all the plants wouldn't change their basic design a whole lot. The monitoring and control systems for the plants would be infinitely better and therefore the risk that would go out of control will be a lot less.

>> Last question about this alternative technologies. I know that you're hard of course as also your investment is with solar, but we've talked about biofuels, wind power, nuclear, and solar. In the world, let me give you an imaginary experience. In a world in which there were no government subsidies for energy of any kind or whatsoever, and you were an investor with a million bucks to play, which of those energy groups would you invest in?

>> And I could be assured, which is a big if, that my million dollars if invested would end up online.

>> Alright, yes.

>> Nuclear.

>> Nuclear.

>> Sure.

>> Okay, very good. TJ, we've talked about the science of global warming, alternative energy sources, let me ask you a couple of open-ended questions just to see what else might be on the line to TJ Rodgers. The rise of China and India, where do you have--you have plans in China and India don't you?

>> We have--we're in both places.

>> Okay. If you had a million dollars to invest in a countrywide index fund, which country would you choose?

>> Almost all the third world countries are good. That's if we were manufacturing oriented fund, China. I'm a manufacturing guy but I've already--I already understand the fact that pretty much everything I'm gonna buy in the future is going to come from China if it doesn't already come from China or major parts of it aren't made in China. They're good at manufacturing in there. They're so cost conscious. Their entire culture is that way. Manufacturing in China. Brainpower, research and development, India, a very tough school system, a lot of very, very smart people, underemployed, so if you're a western company and show up in Bangalore like we did, you have people walking in the door that are blow away intelligent. So if it were an RD fund, I'd put it--I'd put it in India.

>> Okay, you wouldn't be tempted to put a million dollars in the United States, the next century does not belong to the United States?

>> No, no. I am great bull on America and in particular in Silicon Valley. I just need parts of the puzzle.

>> Alright.

>> Okay, you know to me as Wall Street is to the financial industries so as Silicon Valley to technology. This is a center of the world.

>> This is where it happens.

>> But you can't afford to pay somebody 60,000 bucks a year to work in a factory. So that's over. You need design talent here but if you can hire a designer, chief designer in India for a third or quarter of the rate here, you need to have the [inaudible] to get the weighted average going down. Meanwhile back at the ranch, I can't think of a place where you could have a discussion like the one we've had this morning and I could get in my car and drive to something real about everything we've discussed this morning in less than 30 minutes. So what we have to do here is understand that congratulations we're now rich, rich means we earn a lot of money. My administrative assistant is knocking on the door of 100,000 bucks a year. The flip side is we have to create more value. We can't just do something that can't get done elsewhere cheaper. We have to rise to a higher level. Invent energy things, make new forms of energy, change a system, make chips that have never been made before. That's what we've got to do here then we can continue to run things and raise up our standard of living.

>> Last question, somewhere in America there's a young TJ Rodgers, by which I mean someone with both technical and commercial aptitude. Maybe this is a kid about to graduate from the [inaudible] school of engineering at Dartmouth which I mentioned because you sit on the board there. What career advice, give me 2 sentences of career advice for a 24-year-old TJ Rodgers.

>> Electronics, biotechnology, or the science side of energy, those are the big problems and you always get the big bucks for solving the big problems, and even more important than that, you have the most fun solving the problems that aren't solved where you get to be part of the action of the country.

>> Dr. TJ Rodgers, thank you very much. I'm Peter Robinson at the Hoover Institution for Uncommon Knowledge. Thanks for joining us.