

**Transcribed from a presentation delivered as part of a CrossFit Health event at CrossFit Headquarters on Saturday, March 9, 2019:**

Thank you very much. My talk is — pivots rather well between the two other talk. So, the first talk, which was utterly brilliant, presented almost all the data that I was going to present, so thank you very much for that. And in my book *Breakfast Is a Dangerous Meal*, I say some very nice things about Dr. Lustig. So, as I say, “I pivot,” and the way I — this talk is going to work, in view of these two other talks, is I’m going to talk relatively briefly, and we’re going to really push the Q & A session, because that always works better.

So, let me just tell a few stories first. When I was an intern in my medical — in my hospital, and don't forget in Britain doctors go to medical school much younger than here, so I was only 23 or 24 at the time — I worked for the professor of medicine, and we had a patient who was extremely ill, but the professor of medicine persuaded the professor of surgery to operate on this person almost as a favor. And so I wheeled the patient across through what we call the operating theatre, patient was operated upon, very predictably died. And the professor of surgery instructed me to take this patient out of his operating theatre and put the patient in the anesthetic room, because he didn't want his statistics mucked up. I obeyed orders, whereupon the professor of anesthetics, in a rage, threw me out of his anesthetic room and said, “Under no circumstances will this patient be registered as dying in the anesthetic room.” So, rather reluctantly, I went back to our own ward so that the patient could be registered as having died under the professor of medicine, who was my boss, who told me very clearly — this is a true story, by the way — that admission was denied. And in the end, the patient was registered by me as having died in the corridor, and so no one had to take responsibility.

But I learned a lesson then about just how reliable some medical data can be. I then did a Ph.D. at the University of Oxford, and I discovered that my Ph.D. supervisor, when presented with data, had a sort of trick. He would look at the data, and he'd say, “Well, that point's an outlier, isn't it? I'm not sure about the circumstances of that experiment.” And he would remove the points, and then whereupon statistical significance would emerge and would publish. And I remember being really shocked — as shocked by him as I was by my professors of Barts — until I went to the University of Newcastle, which is a very respectable new — University in Britain, but not of the highest standards. It's not bad, I mean, Newcastle is a great university, but it's not Oxford or Cambridge. And I discovered a culture at Newcastle of scrupulous honesty. And I remember at one point saying to a friend of mine — we were working together — I said, “You know, if this was my old lab back in Oxford, and we were having this trouble, we'd save the next three months. We

wouldn't be — we'll just get rid of that." And I remember my colleague being truly shocked.

Newcastle had a culture of scrupulous honesty, with the result that everything went so slowly, and we were always being scooped. And I wondered then, and I still to this day don't know what the lesson of this is, but it seemed to me that one of the reasons that great scientists win the race — because science is a race — is in the sense, perhaps, they know when to cut corners. And so, honestly, I don't know — I just — I'm just telling you stories of things that have happened to me in my career without — without giving any conclusions. These are things that happened to me that made an impression upon me.

The reason I'm standing here is that, for the first time I wrote something interesting was when — and this sounds like a British story, but it relates to America very closely — when Mrs. Thatcher in the 1980s was denied an honorary degree by the University of Oxford because she'd cut the British government's funding for British science, and everyone erupted in the British universities. Mrs. Thatcher was destroying British science. And we had the same stories in, by the way, under Reagan, and there were similar cuts, and you have the same stuff in the literature actually in America about how Reagan was cutting and destroying British science — American science. My problem was that I was between Oxford and Newcastle at the time, and I could see that both universities were absolutely flourishing and growing huge numbers of labs all the time. And when I said to my friends in Oxford, "Well, where is this famous decline of British science?" And they said, "You don't understand, Terence. Oxford, Cambridge, London: The Golden Triangle, the government's protecting them. That's the heart of British science, but go out to the provinces and it's a desert." Well, I was out on the provinces. I was in Newcastle, and when I said to them, hospitals, labs growing all over the place in Newcastle, "Where's the decline in the British science?" "Oh, you don't understand, Terence. The government's protecting the provinces because that's where the votes are, but go to the heart of British science, Oxford, Cambridge, and London, and it's a desert."

And what I learned is that people very, very quickly, very — I mean these are top scientists — very quickly rationalize and create a little paradigm to justify what they believe is true. They, they weren't lying to me — these people. They were lying to themselves, actually. Because they wanted to pressurize the government. What I also discovered is that the pressure group, called Save British Science, was presenting data that was quite extraordinarily biased. And so we were told, for example, that the share of papers published globally by British scientists had fallen over a 10-year period by 10%; you had exactly the same data going on in America, by the way. We were told that government funding for science had gone down by so many millions of dollars — pounds. What nobody told us — nobody told us, was

that every 15 years, the total number of scientific papers in the world doubles, and has done so, by the way, since 1750 and continues to. So a 10% fall of share of papers actually means that instead of doubling every 15 years, British science was doubling every 17 years. And the reason the double rate in Britain was slightly slower than elsewhere was that the countries of the Pacific rim — Japan, Korea — and the Mediterranean rim, well they were growing so fast as they converge that they were — their doubling time was only 10 years. Equally, no one told us: yes, British government funding has gone down, but the private funding had gone up three times more in what's called crowding out. That's what happens in so much of the public sector. Government pulls back, private sector more than compensates for vice versa. And so, we were given very, very partial data, indeed, by people who knew they were presenting only partial data. And the people who knew they were presented partial data were senior professors in major British universities, and you had exactly the same thing going on here in America.

That was very interesting to me, and I wondered what that meant. Now we are told — now I know little about global warming, but I will say one thing about global warming. We are told that the science is settled and 97% of scientists will agree that CO<sub>2</sub>, blah, blah, blah, you all know the story. When our first child was born in 1991, we were told, although it wasn't put in these words, but we were told the science was settled, and 97% of neonatologists agreed that newborn babies had to be moved on their tummies to avoid what we call cot death. You have a slightly different name for it. In 1993, when our second child was born, we were told the science was settled and you had to put a newborn baby on its back. Because it turned out that putting babies on their tummies was responsible for over 70% of cot deaths.

What was fascinating to me was no one ever apologized. No one said, "You know, we might have got this wrong." What you actually got — it was almost like a Stalinist state — complete monolithic dogma. And then one morning, a completely different monolithic dogma, but both completely dogmatic. The science is settled, and 97% of scientists agree. So, it was almost as if science is like a huge school of fish all going in the same direction. There's a sudden flash as each fish turns around, but you hardly see the flash and then they're all going in the same direction with the same utter confidence as before. And I wonder if this isn't in fact a quality of science.

Now, when I first — wrote my first book on the economics of science, I was so fascinated by the complete myth that the British and American government had cut science, and everyone in the two communities was saying that that's what happened, that I wrote a book on the economics of science. And I showed — and it's relevant to what I'm about to say — that governments don't need to fund science, at least not for economic reasons. I talked about that — But the point was,

and I'm going to name someone, because he's now safely dead, and he was Nathan Rosenberg. Nathan Rosenberg is a very nice man and a great economist of science. He was a professor at Stanford. And I spent two or three days with him, and he taught me an awful lot about the economics of science and I read his papers, and at the end of this process I said to him — we were walking through the campus at Stanford and I've never forgotten this moment — and I said to him, “You know, Nathan, I've been thinking about your work in the field, and it seems to me that your own work shows that governments don't need to fund science. At least not if you're interested in economic growth.” And I've never forgotten — his hand shot out and grabbed me like this, and we stopped in the middle of this campus. He stopped — “Terence you must never ever say that. You must never even hint that that could be the implication of my work, because if ever it got out that Nathan Rosenberg” — he was talking about himself — “suggested that governments needn't fund science, what do you think that would do to my standing in the academic community? I would be shunned. What do you think that would do to the consultancies I get when I go and advise the Japanese or other foreign governments? All that work would stop, but my reputation would be destroyed. It cannot be said.” And he refused to tell me what he believed. I have no doubt that he knew that governments didn't need to fund science. I also have no doubt that he refused to admit it even to himself because he had a life. He was a fellow and a professor at Stanford, and that was important to him, and why not?

So, the reason I tell these stories is that I think there is a vast myth that scientists are somehow objective and honest. And I actually think the data shows that scientists are human beings, and they don't seek to be dishonest. I mean, it's very unusual to meet a dishonest scientists.

So, I wrote a book, which I'm just coming to, called *Breakfast Is a Dangerous Meal*. I would have liked it to have been about sugar and fat. I would have liked to have written the sort of book that our two other authors today have written, but that was already covered by people like them, and breakfast is where I came into it. So, I wrote it about breakfast and I — I review about 200 papers in here, and only one of them I think was actually dishonest. I think only one of these 200 papers I could sense where the scientists had done what my Ph.D. supervisor had done and pushed a few data points around. The other 199 rubbish papers were written by scientists who either interpreted it willfully wrong or were fooling even themselves.

So, let me tell you how I got into the business of nutrition. And I'm obviously not a very great person, because very great people work things out on abstract principles. The only things I've ever done of interest are those that struck me personally. So, I could see for myself that British science wasn't in decline and that bothered me, and I could see for myself that breakfast is a dangerous meal, and that happened very simply.

2010 I was diagnosed with Type 2 diabetes. Diagnosis was made by my wife who knows absolutely nothing about medicine, but she could see that I was peeing — and you know — you all know what the diagnosis of Type 2 diabetes is. I secretly knew, of course, but I thought if I ignored it it would go away, which wasn't very grown up, but there we are. And I was taken to my doctor by my wife. She drove me. It was like, this — again, like Stalin. And in the book I say he, because I — but in fact, she was a lady doctor. She's — anyway, very, very actually very serious Type 2 — I had very — very high levels indeed of blood glucose, and I'd lost a couple of what we call stone. I lost 20 or 30 pounds or something. I mean really terrible. And and I was told what to do. And what I was told to do was I had to eat frequently, and lots of complex carbohydrates, and avoid fat and don't drink. That's what I was told — 2010. I was given — I went to see the dieticians. I was given all this stuff, and I obeyed orders, but the one thing I did that disobeyed orders — So, this is England remember, which is a socialist country — I got hold of a glucometer. Which, England, they don't give to patients, because they don't really like patients measuring their own blood glucose levels because they might work things out for themselves. Although curiously they haven't. Millions and millions and millions of Type 2 patients have glucometers. I appear to have been the first one to point it out the crushingly obvious fact that if you are a Type 2 diabetic, as I discovered within two or three days, and you eat a standard breakfast as instructed by the dieticians — Porridge we call it, oatmeal you call it. That's what I was told to eat. — Your blood sugar levels just shoot — it starts off high, and it shoots up into the sky.

It turns out that the British Diabetic Association, which unlike the American Diabetic Association if the first talk is to be believed, still says you must eat carbohydrates and breakfast. The British Diabetic Association has now given up on giving patients glucometers in Britain, because, apparently, patients record all this and don't understand what it means. It's really very bizarre. But I trained as a doctor, and then did a Ph.D. in metabolic biochemistry, so I was able to interpret a blood glucose level, as everybody in this room can as well.

What I very quickly discovered for myself, feeling very lonely, is that breakfast was very dangerous for diabetics, because of course — and everyone in this room knows this — you have the morning cortisol peak. And the morning cortisol peak gives you instant glucose resistance. It's the one time you should not be eating carbohydrates. The effect, by the way, on diabetics of skipping breakfast is very dramatic, either Type 1 or Type 2 — and it — many of you will have such patients.

Anyway, I very quickly followed my own advice, which is no carbohydrates, no glucose. England in 2010 was not friendly — I felt very lonely working these things out for myself, but there we are. And I went back to my doctor, and she said to me — and I've never forgotten this conversation — she said, “Fewer than one patient in

100 has achieved what you've achieved. What — fewer than one in 100 — you have reversed your Type 2 diabetes.” Actually, it's not completely reversed. Most of my HbA1c levels fall in the sort of pre-diabetic range, but everything had been pretty damn reversed. “And you've done all the things I told you not to do,” and I said to her, and she's a great doctor by the way, so this is not a criticism of her, she's a lovely doctor. I said to her, “Well, doesn't that make you think?” And she said, “No,” she said, and she produced what we in England call the NICE guidelines. NICE stands for National Institute of Clinical Excellence, which is a Stalinist body that tells you what you have to do in medicine or you can get sued. “No,” she said, “here are the NICE guidelines, and it's my job as a doctor to obey the NICE guidelines. It's not my job to think, to do things original.” And so, I got nowhere with her.

If you were ever to come to the Cato Institute in Washington, D.C., and you were to walk into the doors with me, and you can go without me by the way, there's a very nice gentleman who sits at the front. He's a black gentleman, he's about 65, he's a retired staff sergeant of the United States Air Force, and if you walk in with me, he will stand up and salute — not you — it's me he's saluting, and the story is fascinating.

I got there about a year ago after — I won't bore you the details of my chronology at Cato, but about a year ago we were chatting, and he was telling me he'd been diagnosed with Type 2, and then it progressed to insulin dependence, as many of you will know, and it was terrible. He was completely out of control. His feet were becoming really painful. His doctor was beginning to talk to him about, “Hmm, that's bad news about feet hurting all the time.” His lipids were out — everything was out of control, and he was on insulin and the whole shooting match. And I said, “Have you thought of going on a glucose-, carbohydrate-free diet?” “Oh no, I can't do that,” he said. “I'm told I've got to eat breakfast, lunch, tea, and dinner. I got to eat complex carbohydrates, no sugar, but lots of complex carbohydrates and no fat.”

That's what he was told in Washington, D.C., a year ago. Just a year ago. So, I persuaded him — and my wife said, “You realize you're gonna get sued?” But anyway — I persuaded him. Within 10 days, not only was he not on insulin, he was on no drugs. He was completely cured. Completely. And now a year later, even his feet are beginning to hurt less. So, he went to see his doctor, and they sweetly took a copy of my book where all this is explained, and it was like a television show, the conversation I'd had with my doctor. She said even more enthusiastically, she said, “This is miraculous! We were talking about an amputation, and now you're cured.” She said, “I have never seen this before,” and he said, “Would you like to read the book where it's all explained?” And she said, “No.” He was really shocked, being a staff sergeant in the U.S. Air Force. In his naivety, he assumed that doctors and scientists were rational, curious folk who wanted to know how the world worked so

their patients could get better. His doctor's clearly a good person, but you can see the cognitive dissonance. What if she said that to another patient? You can imagine being sued a thousand times over.

So, we have a problem, which is that it's not just doctors, it's scientists as well, that we commit to paradigms, and then we bend the data to it. So, I wrote this book, which is I think why I'm here today — this article for Cato, which is "Why Does the Federal Government Issue Damaging Dietary Guidelines?" You all know the story, but let me just revise it, because it is so fascinating. Forty, 50, 60 years ago, there was this terrible outbreak of heart attacks, particularly of men in this country, but actually throughout the Western world. What's interesting is that no one knows what caused it. I mean obviously smoking contributed. Obviously, if you talk to Nina Teicholz, who's a friend, she thinks the introduction of vegetable oils, margarine, trans fats contributed. There's an extraordinarily tight correlation with the incidence of peptic ulceration deaths. So, one wonders if that had something to do with the helical bacterium epidemic. There may have been some connection. I personally am very interested in the fetal starvation hypothesis — All that is described in that. It's all online, of course — in which, if you are a child — a fetus born of a mother who is relatively malnourished, not starving but malnourished, but then you in later life become very well nourished, that seems to induce a terrific outburst of diabetes and heart attacks and things. And, you know, you have those Pacific Islanders where practically everybody's diabetic. Because that's exactly what those populations have gone through, from relatively little food to a lot of food. So, I think it's a complex thing. It's obviously a complicated thing

But Ancel Keys, the Minnesota physiologist, he decided this was because we were eating fat. And because atherosclerosis is made of fat, and we were eating fat, A equals B. And what is interesting about the Ancel Keys phenomenon is that even at the time, he was told, "You know, you're probably wrong." And this is well chronicled. Lots of scientists were saying, "You probably got this wrong."

And within two years, by the way, and I find this particularly fascinating — Within two years he'd said, "You know, I got cholesterol wrong." He himself said this. "You can eat as much cholesterol as you like. Makes no difference because it just turns off liver synthesis." It took the federal government 40 years — 2015 — to change the advice. They insisted that the proof, or rather the disproof was utterly meticulous. It took 40 years to disprove a hypothesis that had just been thrown out as a speculation. But because the federal government had absolutely committed to the speculation, it simply could not bring itself to acknowledge that that could be wrong. And Credit Suisse ran the foundation, by the way, and this is an attack on everyone in this room, and they published a paper in 2015 saying, "Is it interesting almost all doctors believe that eating cholesterol is bad for you, and you shouldn't eat eggs, and kidneys, and things?" and this just shows how ignorant doctors are.

But that's what we were all told. I was told. Because Ancel Keys' rebuttal of his own data was not accepted by the federal government.

And so, the question therefore is — and of course, as we all now know thanks to Gary Taubes and the work of others in this room — it was all nonsense on sticks from beginning to end, and so the question therefore becomes: Why do we do this as scientists? I mean, no one in this room needs to be told that science is always getting it wrong. Everyone in this room knows that the person who invented the idea that continents shift destroyed his career by so doing. Everyone knows that. Everyone knows that Semmelweis in Vienna destroyed his career by suggesting that obstetricians should wash their hands before rather than after delivering his babies. We all know that science is constantly correcting itself, and yet, at any one moment, it's always the same: 97% of scientists agree that the science is settled. And the government makes it worse.

There's a very good paper by a man called Daniel Sarewitz, which has got — again, it's available online, and he points out — here we come back to the government funding of science. This is what happens. Before — in this country, America — before 1950, the government in this country did not fund science. Something that's often forgotten is that there was no federal government funding of science apart from military stuff. But there was no federal government funding of science for the purpose of supporting science for its own sake or supporting economic growth. Because you were utterly committed to the concept of laissez faire, so even when Smithson gave the money for the Smithsonian Institution, there were votes in the con — quite a lot of it. I mean, it was really debated — “Should we take the money?” — even though it was someone else's money, because this wasn't the federal government's responsibility. In the end, it was taken, but that was the beginning and end of American involvement in science until 1950, and the reason for that was laissez faire.

And then, in 1950 the Truman Doctrine was announced, and you entered on permanent war with the Soviets, and the Cold War, and then you started to fund science as part of the military initiative, in fact. But you then created a monster. And the monster is the NIH and the NSF, and all the other funding bodies. Before 1950, if you wanted to do science in this country, America, you either had to go to a charity like the American Heart Foundation, or whatever, or you had to go to a company like Bell Labs and say, “I want to do science and ultimately this is what I want to show.” And as Sarewitz says, “It's technology that keeps science honest.” It's because ultimately, what you as a scientist were doing was ultimately going to be tested against the patient, or against a radar machine, or whatever. It's the technology that kept science honest, but now you get money not for being right, you get money for satisfying the prejudices of the people who sit on the committees in the NIH and the NSF. And if someone like Ancel Keys comes along

and says, “97% of scientists agree that the science is settled, and eggs give you heart attacks,” then the only papers that get — the only grant applications to get accepted, the only papers that get published, the only people who get promoted to tenure are those who say all the right things. Otherwise Nathan Rosenberg's hand grips you and says, “Never, ever say that, Terence!”

And so what we have done is we have created a self-referential system by which you are rewarded for reinforcing the prejudices of people who may well be wrong and will never know, because their science hasn't been tested against reality. They're getting the money from Congress, and they're giving money to their chums. And that doesn't work so well in nuclear physics. It doesn't work so well when you've got a rocket going to Mars, but once you're in the world of low-grade statistics — and here the first talk really couldn't have put it better — once you know, you can use statistics for anything.

I remember when I was an intern, and the hospital I was in suddenly got this new machine so that instead of saying, “I think we'll test sodium or I think we'll test potassium,” you — this is England by the way, very backward — you sent off a blood sample to the lab, and you suddenly got 50 results back. We'd never had anything like this before. I was part of that process when suddenly, doctors instead of looking at discrete analyte, suddenly got a whole mass of things that — enzymes, all sorts of wonderful sophisticated things. And every single patient was abnormal, because the definition of normal range was 95%. You only had to have 21 tests and we were getting 65 tests. Two or three of them would of course be wrong — and so, abnormal, and then — And it's the same as stats. You could — I mean you really can do anything with stats. You can not publish things. The level — the numbers of biases are vast, and you will bias yourself either consciously or unconsciously to get the grant.

So, in the book on breakfast — Then I'll actually shut up, because the question answer is what we really want — In the book on breakfast, the facts about breakfast are really simple. The idea that breakfast is good for you is an idea that oddly, and this may surprise many of you, is promoted by the Kellogg's company and General Mills and the bacon companies, and they fund armies of scientists. If you want to work on breakfast, you will get your grant. I can tell you now you'll get your grant. As long as Kellogg's believe that — well I'm not going to name Kellogg's because that could get me into trouble. As long as the company you're interested in believes that you want to write a paper that says breakfast is good for you, you will get funded. I promise you there's no difficulty. I mean there really is no difficulty.

The truth about breakfast is this, by the way: It's a complete myth. If you eat breakfast, you will on average consume more than 200 calories a day than the person who skips breakfast. This is now so well established that even places like

Harvard — and we heard earlier, that paper we read about, that the former speaker was getting so, rightly so agitated about towards the end — the one that says carbohydrates are good for you. And that last paper that came from the Harvard Public School — Public Health thing — well, they write similar papers on breakfast. Even they now acknowledge that breakfast actually increases the number of calories — even Harvard now does.

So, what breakfast does: It increases the number of calories, and yet — and now this is where the myth comes, and this is worth thinking about — people who eat breakfast are thinner than people who don't. Let me say that again. People who eat breakfast are thinner than people who don't. Well, obviously eating breakfast makes you thin in some magical way, which is what we've been told for decades now. Of course it's not true. I mean, the fact is true. The fact is true — what is actually happening is this. Firstly, people who are fat skip breakfast because they're trying to slim, and it's the easiest meal to skip. People who are thin think, "Oh, I'm thin. I can eat as much breakfast as I want." That explains one major correlation.

The other correlation — and I'm going to use words sensitively. I don't want anyone thinking I'm being insensitive, so I'm just using words sensitively — There is a real socioeconomic gradient about breakfast. People of the more humble socioeconomic groups, and I'm not trying to offend anyone here, tend to lead more chaotic lives. They tend to smoke more, they tend to drink more, they tend to be larger, and they tend to skip breakfast because of the lives they lead. While nice slim middle-class people who live in posh areas of Boston, they tend to eat very discreetly, but they obey orders and eat breakfast, because they know they have to. But they lead ordered lives, and so they're slimmer.

In fact, if you look at breakfast knowing that, you immediately discover all sorts of fascinating correlations. So, for example, girls who skip breakfast lose their virginites, on average, two years earlier than girls who eat breakfast. Does this mean, therefore — I obviously don't have to finish the sentence — you never hear that from the cereal companies, because even they know that you know that it can't have anything to do — it must be an association. And so it goes on. There are all these associations out there, and it doesn't take very much intelligence to work out which associations will please your funders, whether it's the NIH, which by the way, does believe in breakfast, or the American Diabetic Association, which sadly does believe in breakfast, or whether it's a corporation.

And so, we are stuck with the problem that we scientists love our paradigms, and the other great problem — and I'm going to shut up now — the other great problem is that all great scientists ignore falsification. We are all told that science is about falsification and verification. So, a statement is a scientific statement, and when it's falsified, oh, it's gone, and — that is not true. All great scientists ignore

falsification. I may tell you one little episode, and then I'll shut up because, questions.

If you look at the age of the Earth — In the nineteenth century, this was a major debate. How old was the Earth? And it turned out that there were two schools of thought. Those scientists who measured the temperature of the lava, and the stuff in the middle of the earth, and the rates at which the Earth conducts heat worked out that the Earth could not be more than five million years old, because if it was any older it would have cooled. On the other hand, another group of scientists, they were the — looking at the fossils. They worked out that the Earth had to be at least 300 million years old. Otherwise you couldn't have had all those layers of rocks and those fossils. Each group of scientists had been disproved. They'd been disproved — both of them. So, in the world according to the textbooks, each group of scientists says, “Oh, I've been disproved. I shall go off and become a gardener or something.” That's not what they did. What they did is, they created two different — this is largely based in London. London was then the capital of science. Of course America now is. They call — they form two societies as the Geological Society and there was the Zoological Society. And if you believed in one set of facts — and it went with religion, by the way, and never underestimate the power of unreason in science — All the Christians went with the five-million-year theory, because that's not Genesis, but it's close to Genesis. All the atheists went to the 300-million-year theory because that really showed the Christians. And it really is how they divided. I mean, it's quite bizarre that is how the scientists divided, which tells you that science is so often driven by unreason — very important.

And for many many years, they've, if they met in the streets or the clubs, they were of course very polite to each other. The two group societies had different societies, different journals, different meetings and ignored each other. They refused to accept falsification. Very important. As it turned out, in the end, as we all know, it was the 300 million crowd — in fact, of course, as we now know it's 4.5 billion, but they didn't know that, but the point is, they were right. By the way, for those of you who wondered how it was resolved, someone somewhere, nothing to do with this debate, discovered something called radioactivity. Someone somewhere discovered that radioactivity releases heat, and someone somewhere discovered that the center of the Earth is radioactive, so obviously the Earth is 4.5 billion years old. But they didn't know at the time. The point is, if Sir Charles Lyell and Charles Darwin, and all the other gradualists had done as we are told they should have done and accepted falsification, it wouldn't have been a good thing.

So, what makes science so difficult? Just like my friend in Oxford who would beat his friends in Newcastle because he knew when to subtly cheat and so he was always three months ahead, so the scientist who ignores falsification may be a moron, but all great scientists also ignore falsification — all! You look at the career

of any great scientists and actually ask yourself, “Was he or she ignoring falsification at that stage of their career?” The answer is always yes. They were all — I mean you cannot think of a great scientist, once you ask yourself that question, who hasn't ignored apparent falsification.

So, it's complicated. And I'll now take questions. Please, are you allowed to ask a question? Is he allowed to ask a question, Greg? Right, right.

*Question: It's very interesting — I just think that, first of all, I made the point that there's a difference between science and medical science, and the standards are different, and in the extreme case of physical science, if you know something — if you don't know something, you don't know it. If you're a physician and you have two theories and you don't know something, you don't have the luxury of saying you don't know. You have to make a decision. It's why we think highly of physicians, because most of us don't want to shoulder that responsibility, but they're different things. And the, the tendency to think that falsification is a threat is much greater in medicine than it is in science. And the NIH, and well — I don't know what kind of statistics you can find, but most people can show you the decline in federal funding for science, and that the NIH is doing very good science. The trouble is that it's also doing dreadful stuff, and I had described myself as becoming a whistleblower in the sense that if Nina Teicholz exposes — exposes falsification, she's bringing out a truth. If I do it, I'm a whistleblower, because I'm still something of an insider, and the real problem is we don't want to bring down the NIH. The NIH is — the nutrition corner of it has descended into near intellectual hell, but — and there are people that do science, and they do it seriously. And they — the word you used, it's exactly right. They know when to ignore apparent falsification and when to jump ship, when they have to.*

Dr. Kealey: Thank you. What — we're agreeing with each other. Does anyone else want to agree with me because — Please over there, and then there.

*Question: I'm a scientist. So, I hope that doesn't make everybody in here hate me. I do exercise physiology work, and the reason I got into this is because I had a goal — I'm curious, first of all. Secondly, the mission is to do research that's relevant, that could inform practicing physicians in a way that can benefit them and their type of patients. You made a very convincing case that science cannot be trusted ... and that's right in line with the work that CrossFit Health has been doing for a long time ... interesting, very illuminary work. Sounds like the foundations are really being shaken by a lot of this information coming out. So, my question is, if clinicians can't look at the scientific literature for information that's going to impact — how does it even work? How do they — where do they go?*

Dr. Kealey: Did you ask that earlier question against Richard? Was that you as well?

*Question (continued): No.*

Dr. Kealey: It's a very good question.

*Question (continued): I ask it every day.*

Dr. Kealey: First of all, there's a very — it's a very important question, and the first question that Dr. Feinman got, which was a similar question, was also a very good question. So, let me just answer this. First of all, John Ioannidis at Stanford wrote a paper. It's now been cited over 5,000 times: "Why Most Scientific Papers Are Wrong." And it's not just John Ioannidis. There's a group of them now. They're superb. There's a, some of the group in Charlottesville, the Truth Review in Stanford, a bunch of others. I talk about them there. And these people are pointing out that over half of all scientific papers are just wrong. So, the question is therefore, how do we know? Well, the answer, I'm afraid, is to understand what a scientific paper is.

When, after I published my book, I was interviewed by what we in England called The Times Higher Education Supplement, what you call The Chronicle of Higher Education, and they said, "Would you like to distill in one sentence what you've learned from this study of breakfast?" I said, "Yes. When I pick up a paper on breakfast —" and there are hundreds of papers on breakfast. It's one of the three meals of the day — there's an enormous industry out there. Breakfast is a major business, and I think it's hugely responsible for obesity. "When I pick up a paper on breakfast I always ask myself — the first thing I ask myself is, 'How and why are these lying bastards lying to me?' And if you don't pick up a paper and ask yourself that question, you're going to be gulled."

So, for example, Richard Feinman, he put up that paper from the Harvard group, the last paper he put up about how carbohydrates will save the world. I picked up that paper like everyone else, but I only got as far as the second page because I looked at that first table — we had a conversation about it. These people are claiming that for the last 20 years, this entire population — there are thousands of them, 15,000 or something — they're all claiming that over the last 20 years, they've all eaten, on average, 1,600 calories a day. Well, of course they've been not eating 1,600 calories — they've all put on weight, by the way. All completely normal people. I mean, I don't know what you call it, but these people are clearly misrepresenting and misreporting what they're actually eating. No serious scientist, I mean, I'm not talking about myself as reading the paper. I mean the people in Harvard doing this out — no serious scientist at that point would do anything other than "Well, we can't do the study. This is crap."

So, every — with the exception of a very small number of people, and this is how science started by the way — People — what people don't understand is what peer review is. Peer review started in — this is not a nationalist point. Please don't think I'm some sort of Little Britain — but peer review started in England in the 17th century when we created the Royal Society and stuff. It wasn't as people now think it is: "Oh well, have they used the right p-value here?" What peer review was, actually, was: "Is he one of us?" Or was he some sort of lunatic? Peer review was a social thing. "Do we know this person? Can we trust him or her?" So, for example Leeuwenhoek, the great Dutch micro — microscopist, used to send his stuff to the Royal Society as a letter, and he would then have affidavits attached to it from very distinguished members of the Dutch aristocracy who would confirm that they had also seen these things under the microscope. So, the point about his peer review was actually about, "Can we trust this person?" which is why, by the way, every scientific society to this day — and all of you belong to all sorts of medical and scientific societies — are just like posh clubs in London. You've got to be sponsored, you've got to be seconded, and there's a vote, and then you join the society. It's like joining a club. And so, to come back to what a paper is, the only way you can understand a paper is to see yourself as a judge. You're a judge in court and here is someone who is an advocate, primarily for their career. What they're actually trying to do is to promote their own career. That's what they're doing, because they're human. As Dr. Feinman pointed out, sadly, many scientists are in fact, human. So, they're trying to promote their careers, and they have a point of view, and they know that if they say the right thing, they get the grants and the promotion. Say the wrong thing, hm — and on the other side, it's Dr. Feinman, and me, and others. And your job is to recognize that these scientists are advocates, are advocates in law. If you believe everything a lawyer says in court, then you should read every scientific paper and believe it to be true. If, on the other hand, you're capable of recognizing the judges have to work out when the lawyers are trying to mislead — And I'm afraid the really difficult answer to your question is this: Unless you're a real expert, you haven't a hope in hell. I mean, the average person wouldn't have a clue at that Harvard paper, unless they knew that no one can survive for 20 years on 1,600 calories a day, and yet put on. So, that's the difficulty. Very few people could —

I'll tell you something very interesting about this group of people like John Ioannidis who have smashed all the um, all the myth about scientifics. They're very strange people in one respect. I spent my entire life almost exclusively at Oxford and Cambridge surrounded by giants, you know? I know Nobel laureates. All these people, they have much in common. One of them is a very strong personality. These are dominant men. Ancel Keys was a sort of gorilla of a monster who just bullied everyone into believing what he believed. Look I see that you're nodding. Ioannidis and his chums, they're all the same: They're quietly spoken, they're modest, they're humble, they are genuine seekers after truth. And I've never seen anyone point out that this very interesting new group of people, who are

completely smashing science, have very different personalities from these giant alpha males — females as well — these giant alpha males who dominate most science. And I think that's very interesting.

Peter — oh no, there was another person here and then at the back. Yup.

*Question: I'm not a scientist. Forgive my ignorance. Is it possible that the advent of wearable technology and real-time data offers an opportunity for faster change maybe at the grassroots level? For example, I have a member that came up to me. He had access to a wearable device that was literally a patch that he put on his arm that gave him his blood glucose level on his phone. He was a health-care lobbyist. He said he had access to it. He said all you had to do was tell your doctor you're pre-diabetic. But he told me that it fundamentally changed what he ate because he was able to see it in real time. Is it possible that technology is coming? Will it change?*

Dr. Kealey: Technology keeps science honest, absolutely. And in fact, lots of diabetics have those and things now in England, and I'm sure in America too. Absolutely. Yes is the answer. But of course, if you're worried about fat, and carbohydrate, and atherosclerosis, what are you going to measure? I mean, that's that's part of the problem, you know? So, but yes, the things are easily measurable and technology can save you from medical incompetence, yes. The answer is yes.

Yeah, so, there's a question there, and a question there, and a question there. So, all right. So, can I say that — can I just go in order? So, that one there, yeah?

*Question: I want to introduce two complications and see how you respond. The first one is, is it breakfast, or is it what people eat for breakfast? Because in America, it's sugar cereals, it's Pop Tarts — you know so, is it that? Or would the same effect that you're alleging, the unhealthy result to breakfast, occur if people were eating differently — real food? That's question one. Question two: You drew a stark distinction between public- and private-funded science. But what we actually have going on in the United States is public-private partnerships. So, we have very intense industry involvement, even when it's nominally publicly funded science. You have pharmaceutical and food industry representation at NIH and CDC. Hundreds of millions of dollars going from the food and beverage industry and pharmaceutical industry to CDC and NIH. You have — they're represented in governments. So, perhaps we have something actually even worse than public- or private-funded science, but a collaboration.*

Dr. Kealey: Okay, these are two fantastic questions. To take the first one quickly, because I've written about it here. So, you're absolutely right: It's carbohydrate in the morning that's the killer. And in my book I said, "If you're one of those people who just has to eat breakfast and you're otherwise ill, then eat something like strawberries or blackberrie, or blueberries and cream," because contrary to myth,

there's very little sugar in those things. I know we're not meant to believe in the Glycemic Index anymore, but they have very low glycemic, these fruits. So, if you're going to eat in the morning, for heaven's sake eat something that's not carbohydrate, essentially. The trouble is, most breakfast, as you point out —

Now, your second question is very interesting, and I want to take up the point about lung cancer. Because actually it's illustrated, very interesting, by lung cancer. Contrary to what you said, with great respect, and I'm a great admirer of your work as you know. Richard, what's his name at Oxford who discovered lung cancer — you know who —

*Audience: Dahl.*

Dr. Kealey: Thank you. Who I actually knew. I mean I'm not, I'm not — I didn't have an insight, but I knew him reasonably well. We got on perfectly well when I did my Ph.D. Dahl, I'm afraid, told an untruth. Dahl was a Marxist, by the way. He was refused admission to this country when he wanted to come to conferences because he was a member of the Communist Party, which is relevant. Hitler was the man who discovered that cigarettes cause cancer, because he was convinced that cigarettes were bad for you. Hitler, remember, bought into the whole progressive story of the 1930s. So, he was a vegan, he didn't believe in cigarettes, he didn't believe in alcohol, you know, he was a complete — and of course the whole eugenic thing was what everyone believed. Hitler was an absolute classic progressive of the 1930s. We've all forgotten how completely mainstream his ideas were. Not — never talked about any more. He was completely mainstream, and one of them was, cigarettes had to be bad for you. It was just common sense, which goes all the way back to King James in England, by the way, in the 17th century. So, when he got to power he called his epidemiologists together and he said, "Go out there and prove the cigarettes are bad for you, or there may be unfortunate consequences." So, they went out, and to their amazement because — to their amazement and because it was so easy, the data, it just fell out as you implied. And all this is referenced, by the way, in my book. I'm not inventing this story. The danger just fell out: Cigarettes are unbelievably bad for you. The doc — the story that doctors used to tell, that, you know, take a cigarette and you'll get a cough, clear out the lungs getting the mucus — turns out not to be true. Doctors are very — doctors being human are very good at inventing these stories — we all do that.

So, the trouble is that the stuff is then published in the Nazi literature, and for some odd reason, by the 1940s, people weren't reading the Nazi literature. So, when Richard Dahl secretly knew this and he just kept quiet about it — he pretended he'd done original research — complete balderdash. Richard Dahl absolutely copied them, and he was very keen to, because as a Marxist, he didn't like capitalism, and cigarette companies tend to be in the market. So, that was the real story of that.

But the reason I tell the story is this: The big myth is that left to their own devices, companies would neglect R&D. The big myth is that R&D is a public good — this is a very well-defined economic term — and because it's a public good and only a public good, private companies will not fund it. I hate to use a rude word, but this a lie, a lie that's been fostered very carefully by everybody, sadly.

So, the companies love this idea because then this is a form of corporate welfare. “Oh Congress, we need money. Give us money, because otherwise we're just too poor. We'd never fund R&D unless you give us the money, Congress.” Congress loves giving money for science. I've never forgotten when the sequence of the human genome was announced. Who actually announced that the human genome had been sequenced? Was it some white-coated scientist somewhere? Or was it President Bill Clinton standing with his big chest saying, “We've, we've got it.” It was President Bill Clinton taking all the credit with Tony Blair on some link from England. And the irony about it — it was funded almost exclusively by the private sector. It was the Wellcome Trust in England, which is a charity, and it was Cetera in this country, which is a for-profit company run by Craig Venter. The government was very much only a minority player, but who took all the credit? Bill Clinton. So, governments love funding science, because it makes them look important. The general public love science being funded, because they believe that without government funding of science, we wouldn't have all these wonderful things. They just bought into the myth. And scientists love it because without the government funding of science, they might actually have to do work that is of value to society, as opposed to doing work that actually — “Wouldn't it be fun if we did this?” — Because that's what the NSF is: a club by which they have 5.5 billion dollars a year, which they give to their chums. It's not that they don't do good science. Of course they do good science at the NSF. As we know, NIH has problems. But the point is, this is swagger science. This, it's like — I mean, the pyramids were beautifully built. If you go to a pyramid, you know, the mort— they're beautifully constructed, but whether the pyramids did much good to the average Egyptian is questionable. And it's the same with publicly funded science. It's an opportunity for scientists to have fun at someone else's expense.

Put it all together, and this is the danger: We need — I hate to say this, because Hitler truly was one of the most loathsome creatures in the world, so please don't anyone think that I have — ghastly. But, he was right about one thing: We want government-funded science only to challenge industry. It's a complete myth that industry wouldn't produce enough science of its own. Industry is only interested in profit and has no difficulty funding as much science as it needs. The average drug company spends more money on advertising than R&D for God's sake. The idea that there's a shortage of money is just balderdash. We need governments to challenge industry, and if I was king for a day — as the question that you got — if I

was God for a day, if governments are to fund science, it should be to challenge industry, not to support it. Thank you. Yeah?

*Question: I have laryngitis —*

Dr. Kealey: Well I'm keeping away from you.

*Question (continued): I completely agree with your diagnosis. I couldn't agree more. My own travels through health science and medicine completely corroborate your experience as well. When I was at Rockefeller University, I realized scientists weren't interested in the truth, they were interested in their truth. No argument. I agree with your diagnosis. I disagree with your therapy. It is exactly for the reason that you just said — that Russ just said, as well — that exactly — that is for that reason we have to have government-sponsored science, because the industry is going to do science that benefits itself, and I will show the data within the nutrition field that demonstrates it is only because of independent science, that is not industry-funded, that we are actually getting to the real answer with respect to this entire nutritional debacle. Because any aspect of science in which dark forces can commandeer the science for their purposes, there has to be a counter. And the only counter currently, in the absence of foundations having zillions of dollars, is government. I agree that some of the people who sit on those study sections are co-opted, no argument there. They have their own truth to protect, and their truth was developed within that previous dogma. That's the difference between dogma and research. The fact is, the only dogma is there is no dogma. Everything we believed 10 years ago was already wrong, and everything we believe today will be wrong 10 years from now. Then you say, "Well, then why do research at all if it's going to be wrong in 10 years?" It's because research is a zigzag. It's not a straight line. And so, if you stay in place you will never progress forward. If you let industry co-opt science, which is what you're arguing for, I would argue that that is exactly what put us in the dark ages in the first place.*

Dr. Kealey: Okay. There is no disagreement between us, and I may have expressed myself inadequately. However, let me say this. First of all, we are both agreed — yours is a very complicated and sophisticated question — so, let me just go through step by step. We're both agreed that scientists pursue their own truth, but as I tried to illustrate earlier, that is the nature of science, and it's inevitable. And therefore, we should actually understand that's how it works, and therefore we have to harness it to our own end. You know, like the history of the Earth and the Christians. So, that's fine, we agree completely. I also agreed with you — well, I completely agree with you, but I would have a different nuance — that the role of the government funding of science is to challenge industry. However, it does displace foundation money. If you look at foundations, you see very clearly in the 19th century, particularly in England, you know, you think you have things like the Wellcome Trust. And then in England, we stopped producing foundations when the

state nationalized science. In this country, the state nationalized science in 1950 — 1940, 1950. If you look at American science before then, you had people like Einstein working — you had lots and lots of really interesting — I mean Moony Goddard developed all those rockets and things on private Guggenheim money, for example. You had plenty of foundations. What happened in your country after the war when the state massively moved in on science is the foundations stopped. Now, that's changed now. You have things like the Bill and Melinda Gates Foundation, and you'll fund it — which is huge by the way, biggest charity in the world.

So, yes. I agree with you completely, Dr. Robert Lustig. The role of the government is to challenge industry, but it's not the role of the government to displace foundations who are even better than the government, and that's the only danger.

*Question (continued): I won't argue that.*

Dr. Kealey: So, we both agree.

*Question (continued): You absolutely need independent funding.*

Dr. Kealey: Yeah — I agree with you.

*Question (continued): That, I agree with. But allowing industry to co-opt it is exactly the wrong prescription.*

Dr. Kealey: We are completely agreed, but don't forget, industry buys politicians and politicians control the NSF. That's the danger.

Please, is this lady next? I don't know. This lady next, and then that gentleman there. Yeah, oh sorry, sorry, sorry, sorry —

*Question: The answer to the question: The recommendation in my book is that you eat to the meter. I don't have diabetes. To me, the meter is what I call the "pondrometer" which is the bathroom scale. And if you're gaining weight, you're eating the wrong food. That simple.*

Dr. Kealey: You're quite right. So, this lady, that gentleman and this gentleman. So, let's start with the lady first.

*Question: I think the saddest thing I've observed and heard multiple times today is the way in which an average doctor is hampered from advising your layperson who knows even less about statistics and even less about basic biology because of what we call "standard of care." So, I'm wondering if you have any thoughts about how to balance the*

*need of physicians to have a standard of care against free speech rights, the ability to say, "There is this paper here that says that this is a factual way to go," but they're told they can't do that or they face professional liability. And from a ground level, we're talking about an ivory tower of how to have the right data, but you also have three layers down of how do you impact and reach millions of people who are being told complete garbage, and the people who tell them that can't say any different without losing their license.*

Dr. Kealey: Well, did everyone hear this question? Could you hear in the back? Yeah. Actually, I don't have an easy answer to this. I mean, all I can do, and these two have also done, is to point out there is a problem, and the problem is a big gap between what we are told by the panjandrums and the poohbahs and what appears to be real. And by the way, it's not just fat and carbohydrate, it's salt. The whole salt myth, well, it's a myth. I mean, you can have too much salt — you can certainly have too little salt, but —

*Audience: It's true of water.*

Dr. Kealey: It's true of water. It's — it's true of many things. And all that we —

*Audience: There's no abuse potential.*

Dr. Kealey: Of salt?

*Audience: There's no abuse potential. It's not addictive. We talk about ionic substances, it makes a difference.*

Dr. Kealey: Right. What I'm going to say to you, because I'm so worried about time, is, actually, I don't know the answer any more than you do. And the answer to that very good question can only be found collectively. The very fact that you raised the question leads to some fairly obvious answers, but I have no greater insight into that than do you. So, rather than — it's a very good question, by the way — but rather than answer that with my own views, which are no better than anyone else's, let me just say we should recognize it's a problem, and we should also recognize that time's a problem, so I'm going to go for the next question. But I'm not trying to, in any way to belittle you. I'm just saying I have no special insight into that, and I'm worried about time. But it's a very good question. All we do is — once you recognize the problem then I think we can address it. It's a very good question, and actually what I was trying to say myself, now is a quick —

*Pat Sherwood: Hold up. One more question, and then by all means, we're around for dinner and drinks, and we get hours to continue this discussion, and we should. We can take one more question.*

Dr. Kealey: Yup, there was a gentleman in the back, I think. Yeah.

*Question: We all recognize there's a problem, not necessarily the science, but with the scientists that perform the work within. In the U.K., you have the Research Excellence Framework, which is supposed to — supposed to ensure that the sciences produced at universities is of the highest quality, reliable — repeatable — which almost nothing is repeatable these days. But how would you recommend that we try to fix this problem? What's ground zero for taking a step forward? Because I know that the REF is painting a nice pretty picture around the impact of these kinds of things. It doesn't really tell the story of science and give us good ...*

Dr. Kealey: Yeah, I'm going to answer your question, sir, much as I answered this lady's, because once you recognize the problem, then — but I'm going to say something about the REF, which is very, very interesting. And I'm going off-piste here. I'm taking the opportunity of saying something in public that I wasn't expecting to say, but I'm gonna take advantage of it because you've said something very, very interesting. So, I'm going to answer your question, then I'm going to take the opportunity of two minutes extra.

So, to answer your question, we do have a problem with science. I think the job of myself and these two speakers is to recognize we have a problem and that we have to solve it collectively. I'm not going to say any more than that, which is not to belittle your question. It's just to say I have no particular insight into the solution, but I do claim insight into recognizing the problem. However, I want to grab your question about the REF, because it's so interesting. And for those of you who don't know, I'm going to tell you a very interesting story.

I'm in my late 60s now, and all my life, the best universities in the world in the rankings year after year after year are the American universities: Harvard, Yale, Princeton, always — all my life. Last year, for the first time in the rankings — at least the rankings we get in England — the top universities were Oxford and Cambridge. And this year, again. And actually, I think there was a recognition that British universities — I mean these aren't silly rankings. These are really serious rankings. Now, the REF is an integral part of that. There are two things that have really done that. When I was a young man, British universities — I cannot tell you how terrible they were. I never worked in a single department that didn't have at least one passenger. When I say passenger, I mean someone who came in once a week to change before playing a game of squash but was on a full salary.

I mean every department I ever worked in in Britain was like that. And that was all changed by Margaret Thatcher, who changed so many wonderful things. And she insisted on a number of things, but to cut it short, the injection of market forces

into British universities, and so now students have to pay fees, and universities have to actually meet student requirements and sort of teach and things. And the other thing is the research excellence framework, which has nothing to do, I'm afraid, with what you've suggested. It, it the — it's a misnomer. What the REF is really is the way of the British government saying, "We're putting all this money into British universities. How do we know it's any good?" And because of the REF, people now, if they get money from the government agencies, now actually have to show on an annual return basis, or the REF's every five or 10 years, that they've done good work. And the course, the British universities have bitterly resisted the REF just as they bitterly resisted all these regulations, and they bitterly resisted the marketization of British universities, but the result is Oxford and Cambridge beat Harvard and Yale, which I think is a very, very good thing. And the REF is simply a way of saying — and here, I'm afraid, I'm going to say something sad — there is nothing to stop the Harvard School of Public Health coming top in every REF exercise. They publish from the top nutritional journals, which are edited by their friends, which are — their papers are peer reviewed by their friends, and they do the same to their other friends. And we actually had an example of this in Britain.

So, there's a — there's a man called Ben Martin, who's professor of science policy in the University of Sussex, and he and I have long been enemies, but in a very English way, because he believes that governments should fund science and I don't. But he was the one who exposed the cartel of radio astronomy. It turned out that the Manchester radio astronomers and the Cambridge radio astronomers had a deal. And in — and in the REF, they would always announce to the government that the other astronomers, they were just spectacular. And so they would publish each other's papers, and come top in all the journals, and everyone, but — what Ben Martin showed was actually the Cambridge lot — I'm a Cambridge man — were brilliant, and the Manchester people — and I'm not against Manchester — that were actually no good. To the point about the REF, it's actually ultimately as subjective as any other form of science. But on those subjective things, it's been fantastic for British universities, but I can assure you that paper of Dr. Feinman's, which was one of the worst scientific papers ever written, would have done very well on the REF, regrettably.