

ON SOLVING THE GREAT PROBLEMS OF THE WORLD

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I have been observing many meetings on 'Solving the Great Problems of the World' for many years now.

One of the things we are constantly looking for in our meetings, and have been for many decades, is an elusive thing called 'Energy policy.' This is like looking for the 'Holy Grail.' ... Since the early 1970's, there has been much searching for this Holy Grail.

(regarding public, political, and governmental policy)

Now the problem with all of this, and it is not only our problem, it is a problem that I see throughout the world, is that we do not hold cohesively against certain national problems. Or, it takes a very long time to get together a consensus to make a decision.

In energy, we have made decisions in the United States that have lead us in one direction. ... They hold decisions in 'Public Policy' as separate from 'National Policy.'

Now, sometimes a government can act decisively. This is a great quality, and sometimes it is a great error: sometimes it goes the Wrong Way!

Now in science and technology, (I think that we say) that in a rather Ecumenical way, that all science and all engineering and all discovery is good, and it should be financed. And then we break apart into our separate disciplines, and we believe that what we (individually) are doing is good and it should be financed; and that it might be the entrepreneur solution to all our problems. The problem of the commitment with scientists and engineers, is that it tends to be looked at in a one factor analysis and extrapolated out into the future.

(in relating a story told by a senior member on the Science and Technology Appropriations Committee)

**All progress has
resulted from people
who took unpopular
positions.**

STEVENSON ADLAI

"I don't know what to do about these scientist fellows. They come in here and want a million dollars from my Appropriations Committee to discover something. And, well you give the million dollars, and they probably discover something, and then they're back the next year - and they want three million to find out what is that they discovered."

This is another problem in science, and that is that we tend to spend all of our efforts to replicate something that we have, instead of taking that 'Quantum Leap Forward' to the next thing! It is understandable in this situation that that is quite comparable to building a wind machine to make the sail ship more efficient. Instead of taking the power and driving the propeller. We do it all the time!

When Howard Hughes built the 'Spruce Goose', he had a problem: he didn't have enough power for it. He had eight reciprocating engines. He needed a 'Giant Step Forward.' He understood this. There was no point in adding more engines and propellers. He needed the Jet Engine!

Sometimes I think that we are trying to replicate something that we have had, instead of taking a 'Quantum Leap Forward.' And, it is not always clear what that 'Forward Step' is.

(while relating a story regarding a slow train trip during after his first seeing a demonstration of fiber optics:)

... And I was just stunned. It was amazing, this technology.

And I began thinking about electricity, about energy in general, and where is the 'Quantum Leap Forward?' Where is the jump from a copper wire to a fiber or to cable? Where was the 'Leap Forward!' Where was the 'Equivalent' of fiber optics (for electricity)?

Whatever we have done to improve the production of electricity, we have done one tremendous thing: and that is nuclear. We are still boiling water! And we are still using 19th century plumbing. We are still using 21st century technology on top of 19th century plumbing!

We have failed with energy to come up with the 'Great Big Breakthrough!' 'The Major Change.' 'The Radically Different Thing.'

The new technologies (discussed at this conference), such as magnetohydrodynamics, (are coming forth)... and yet these things have not fostered - and we are still left boiling water!

It is theoretically possible that we could at some point take this 'Quantum Leap.' However, (from where I sit and what I see) the evidence is not promising. There us nothing in sight that looks as though it can substitute for the way we do it now.

(about the US love affair with and inside of gasoline automobiles, and about how to advance any forthcoming technology)

We are not going to do it until we deploy some new cars, get running experience, and incremental improvements. You cannot get from Kitty Hawk to the Concord without building some airplanes along the way, and yes, crashing them to boot. You could not have designed from Kitty Hawk to the 747 on a computer!!!

We are restricted, in these days upon this world, in deploying new technologies and think projects. Because we have developed a dismal habit of trying to predict the future - and the risks of the future. We are

All the major breakthroughs come from small guys in back rooms somewhere doing the impossible, because the big guys know it's impossible and they've got this rulebook that says what will work and what won't work.

LES ADAM,
MANUFACTURER

no good at it, and we know that. There is no projection of the future that works!

However, we live in very strange times. And again I find there is an international commonality, that is not particularly American, but that is that our 'Public Policy' is driven by 'Hypothetical Horrors' that we are known (to be fostering). ... 'Hypothetical Horrors' abound: they are on our front pages every day! ... We are driven by these events, not by what is here now, not by what is real, but by what might be! And it is having a deleterious impact on the development of large projects and changes in the way we have done things.

As so often, the United States becomes the first in this sort of grid-lock fear of the future. And that is not confined to us. It is a world-wide phenomena.

Things are changing very quickly. And it seems to me, that the great success of Japan to which they should be promoted and welcomed, and admired, and the last above all these, is that the Japanese have collectively taken on the 'Adventure of Science!' That they have a sense of adventure about science, about commerce, and about engineering - that the British had in the 18th and 19th centuries, and that we had in the latter part of the one and in the early part of this century; and we know that!

We have become rather slow in society, where everybody is looking for some sort of mystical plateau, on which they can serve out their time on Earth. Corporations are looking for this plateau, individuals are looking for it, and therefore anything that suggests change, competition, or different ways of doing things, is very difficult to deal with.

One of the Great Problems that you have as engineers and scientists, and there may be people in this very room who can make enormous contributions to the energy equation, is the slowness, is the slowness, that we have of adopting new technology: 'Technology Transfer.'

Most of the technologies that we now speak about on the Globe have been around for a good while, and were not developed in the manner in which they were invented. Whether it was the jet engine in Britain or Ampex (magnetic) tape in the United States: We are reluctant to transfer technology! Because of disturbing the 'Political Tide!'

We have not solved the technology transfer problem whatsoever. We have set up various crucibles of experimentation, bases, privately funded like the Electric Power Research Institute, publicly funded like the national laboratories in this country, or Harwell in Britain, and on and on and on, but the rate of transfer has is very very poor and very slow.

More productive societies are still looking for their plateau. They have not reached that point of self-satisfaction that is causing us such difficulty as we move ahead.

In energy, we have adopted in this country one of the most destructive public policy options that you could have: We have declared that gasoline could be the next cheapest substance available in large quantities than water. It's much cheaper than Coca Cola, it is

The public is a lot more powerful than special interest groups. But the public is asleep.

DR JOHN O'MALLEY
BOCKRIS, PHYSICIST

much cheaper than Gatorade water, it is much cheaper than all the other silly things - and in that, we are serving a staple to our consumers that is much larger than all of our rhetoric. And we are prepared, apparently, to fight wars, in order to maintain this.

Therefore, there is very little hope for some (new) form of energy policy, while the people are prepared to pay for their largest extravagance in energy, which is gasoline. It is not electricity; it is not crude oil; it is gasoline - petrol. We are sending a signal that this is the way to go!!!

If any of you have gone to purchase a new automobile these days, you will find the salesman as often as not will forget to tell you in the United States, the gas mileage. I doubt that in Italy he doesn't forget to tell you the gas mileage!

That has become our 'policy.' Therefore, we cannot look to 'energy policy' for 'energy policy guidance.' The 'policy' being one of:

'Let It Stay As It Is!'

But we can look to 'environmental policy,' which is more active in the United States than in any other nation.

(on the US electric utility industry)

And it is my belief that a gas turbine is to energy policy that a hotel is to homelessness: a very expensive and temporary alternative.

(back to the US energy policy)

And this mess is going to go on until a point in time. And then something is going to happen that is going to change it - permanently, and differently.

And, this involves a theory that I have. And that is that we like to say that: "You can't just have simple solutions to complex problems. You must have complex solutions to complex problems." So you get: 'Very Complex Solutions' to 'Very Complex Problems.' Until the point is reached where the weight of this thing causes its own collapse - and a 'Big Bold Simple Solution' to the 'complex problem' is required. And when that emergency is perceived, 'Big Bold Simple Solutions' are introduced, and they Do Work! They can be swept through Parliaments, swept through Congress, or implemented by Fear, as often happens. And at some point, as we roll toward the next century, it is my belief that we will again visit (vastly increased) oil prices, oil shorts (shortages), and environmental impact problems. Do not forget that the Green Movement may be driving the (energy) policy, and the environmental impact is quite substantial in that it extends from the extraction, to the transportation, to the combustion (empires). At which time we will look at some of the things that are (waiting) in the wings, and some of the things that may be in the wings!

And if you would go out and invent a new electric generator today, the 'Black Box,' the equivalent of the fiber optic cable, you would find that the most severe opponent would not be from the environmental movement, but it would be the extant of the industry (to not be destroyed or lost), because that is how we operate!!!

And likewise, if we would come up with an electric vehicle that is of the form, or equal to, or was in close relationship with the internal

I like Deng's philosophy about theory, "it doesn't matter what color the cat is, so long as it catches mice." In regard to [new energy technologies], it seems to be clear that nobody knows yet what color the cat is, but it is reasonably clear, from the mice tails on the sidewalk, that there is a cat around. The first task is to bag that sucker and stick him down in the basement to do some useful work. Then we'll figure out what color it is."

MICHAEL MANDEVILLE

combustion engine, your opponents would be worldwide: the automobile manufactures would not be ready to adopt this new technology.

(on the development and introduction of new technologies)

And in order to do that, I believe that you will need new institutions to deploy new technology. That they won't be deployed by the extant of the old institutions.

The Challenge in Technology is to find it, and then sell it, and finally to employ it. After R&D is another D, which is 'Deployment.' The technology that is developed and put onto the shelf is useable.

In the situation that we are in, in the nation, it takes a Professional Society to be their own advocates in their own technology. The corporations are not credible, and even governments are not credible. An individual and individual societies are.

You are in a very exciting situation, because as being scientists and being engineers, you have inherited the mantle of the poets:

You can dream the dreams that only once poets could dream. We too become obsolete.

Thank you very much.