

# 2002 WOODRUFF DISTINGUISHED LECTURE TRANSCRIPT

## The Engineer in the Public Arena

Given by  
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Former Governor of New Hampshire, and  
Former White House Chief of Staff

At the  
Georgia Institute of Technology  
Atlanta, Georgia  
April 11, 2002

The George W. Woodruff School of Mechanical Engineering Annual Distinguished Lecture was established in 1990 to honor an engineer who has made an outstanding contribution to society and to provide a forum for that person to address the Georgia Tech community.

Support for the lecture is made possible by the generous endowment made to the School by the late George W. Woodruff: an alumnus, influential Atlanta businessman, civic leader, and philanthropist. It is the mission of the Woodruff School to provide the finest education possible so that our graduates can be leaders in society.

### Distinguished Lecturers

- 1990 Donald E. Petersen, Chairman and CEO, Ford Motor Company
- 1991 Samuel C. Florman, Author and Professional Engineer
- 1992 Chang-Lin Tien, Chancellor and A. Martin Berlin Professor of Mechanical Engineering, University of California, Berkeley
- 1993 Sheila E. Widnall, Associate Provost and Abby Rockefeller Mauze Professor of Aeronautics and Astronautics, Massachusetts Institute of Technology
- 1994 Roberto C. Goizueta, Chairman of the Board and CEO, The Coca-Cola Company
- 1995 James J. Duderstadt, President, The University of Michigan
- 1996 Norman R. Augustine, Chairman and CEO, Lockheed Martin Corporation
- 1997 Charles M. Vest, President and Professor of Mechanical Engineering, Massachusetts Institute of Technology
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- 2000 William A. Wulf, President, National Academy of Engineering
- 2001 Euan Baird, Chairman of the Board, President, and Chief Executive Officer, Schlumberger, Limited
- 2002 John H. Sununu, President, JHS Associates, Ltd., Former Governor of New Hampshire, and Former White House Chief of Staff
- 2003 John B. Slaughter, President and CEO, National Action Council for Minorities in Engineering (NACME)
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I have the urge to grab a piece of chalk and start lecturing. It's nice to be back on campus and nice to have a chance to talk to an audience with the kind of focus and perspective that this audience has. It's nice to talk to engineers and friends of engineers.

I would like to thank very much everyone involved in this lecture series for the opportunity and the honor to come here as a Woodruff lecturer. I have gone through and examined the list of my distinguished predecessors and I really do appreciate being included among those that were there.

I have had a very lucky life. I have been able, first and foremost, to practice a profession I love. I can't remember a time in my life when I didn't want to be an engineer. I was lucky enough to lay out an agenda that got fulfilled, and there is nothing more satisfying in life, I think, than knowing what you want to do and having a chance to do it.



I've been an engineering consultant with great clients. I have been a faculty member, a professor, a dean, a governor, and a chief of staff. I have often said, though, that I do not want to die an old politician. I would like to die an old engineer. My kids tell me I am going to die an old fogey, but besides that I would like to die an old engineer.

Whenever I get a chance to talk to folks, and it happened at our lunch today when I was talking to students and faculty from the mechanical engineering school, the question comes up how and why did I get involved in politics. If I had a profession I loved, if I was practicing as an engineer, if I was making a good living as an engineer, raising a family, enjoying it, loving the academic community, loving the opportunity to be both an academician and a consultant picking my clients, really if you had asked me at a very early point in my life what my ideal would be and where I wanted to spend the rest of my years, I had reached a point where I was loving it where I was doing what I thought I would love to do and I was loving doing what I was doing. But an odd set of circumstances came along and I had an opportunity to take a step and do something that I had never really thought I had any interest in.

It was almost the equivalent of a life experiment. I wanted to test this new environment. Although, frankly, I think I was motivated by something nobler than that; I think I was trying to save the world from the lawyers. Like most socially unacceptable diseases, it looks like lawyers will be here for a long time.

In a way, as harsh as that sounds, that is truly, I believe, a roundabout way of defining the motivation that I hope at least some of you might walk away from this lecture with a feeling that you want to give some of the special skills that you have as engineers, some of the special perspectives that are part of your education and your profession because, in fact, we as a profession have failed to participate actively enough in the process of making public policy.

I used to tell a joke for about ten years on and off that talks about three particularly different professions, and until the end of last year it was just a joke, but I really do think it defines a set of different perspectives and defines why I think it is so crucial

that we as a profession do more than we have done in the policy arena.

The joke goes as follows: The CEO of one of the most important corporations in the world has a very critical question, so he calls in his three key advisers. He asks his chief engineer, his chief lawyer and chief counsel, and his chief accountant to come in. (This is all pre-Enron. Maybe it was Enron.) The CEO says, "I have a critical question." He turns to the chief engineer and he says, "How much is two and two?" And the engineer responds quickly. He says, "Two and two is four; it has been four, is four, and always will be four." That's the end. A very clear, concise statement of reality and fact. He turns to the chief counsel, the lawyer. He says, "You know, that's a quick answer. I need something more profound." And the lawyer says, "Well, there are many jurisdictions in which two and two is considered if not four a close approximation of the number. There may be others, however, where that is not accepted. I will put a team of lawyers on it, it will cost about a million dollars, and when we come back I can guarantee you we will be able to file a lawsuit either way that it is or isn't four."

The CEO turns to his chief accountant and he says, "How much is two and two?" The accountant jumps up, pulls down the shade, locks the door, opens the drawer, puts the telephone in it, shuts the drawer, and takes the CEO into the corner and says, "How much do you want it to be?"

I swear to you this was all pre-Enron. But in an odd way that really is a message of why engineers have to get more involved. We have a quantitative sense of reality. We understand the difference between just being able to talk technical words and what we mean by technical words. We have a sense of how to take a problem from the beginning, analyze what the situation is, break it down into its parts, and bring it to a point where we can draw a conclusion. That process is not commonplace in policy making.

## Engineers Can Make a Big Contribution to Public Policy

One of the discussions I had at lunch today Ñ somebody asked me a question and I pointed out how different what we do as engineers is from what is done by the legal profession. Not in any devious way by the profession but because it is the code of their profession.

Lawyers are taught that when their client comes in the door, when they adopt a client, they adopt the conclusion of supporting their client. They come to the answer first and then go back and rationalize it. And it is an approach that unfortunately is considered acceptable in policy making.

Most of the politically correct conclusions that we know in our heart and in our minds are wrong quite often are conclusions that were drawn only because they were easy to make, politically correct to do, and then a strong effort to rationalize takes place. We must bring to the system the fact that engineers do things differently. It is critical that people understand that there has to be a more rational way of making hard decisions in a society in which technology continues to move forward at a rapid pace, a more rapid pace than ever, and in a way makes the kind of changes that we enjoy the benefits of, but also create complicated situations in which we, both in terms of law and ethics and in terms of morality as well, have to establish policies that govern the way society will deal with these issues.

Psychologically, I think the very same things that inspire us to be engineers sometimes are the very same things Ñ those aspects are the very same things that keep us from being involved publicly. We like to take a look at a problem. We like to sit down quietly and examine it. We like to go either into a lab or into an office, grab a pencil and a paper, or a piece of hardware, and try and determine what is the right way to take the next step. We're very introspective and making public policy demands a much more extroverted personality.

I used to be warm, quiet, meek, and mild, and then I got involved in public policy and I'm a much different person, although I maintain I am still a pussy cat. We understand that technology provides a tool that can be used in many ways. We understand that technology defines a potential and in itself defines limitations as well. We know it gives us power and it adds responsibility,

and I think we have a better feeling than folks that we have sat back for too long Ñ folks we have sat back and let others make those decisions for us.

I think if you stretch your definition of the 535 members of the U.S. Congress Ñ House and the Senate Ñ there's a handful that you can say that any time in their life have had a working relationship with science or technology. It's an amazingly small number, one percent, and yet we are dealing with policies affecting telecommunications, affecting biotechnology, affecting power, affecting high technology defensive systems, what can and can't be done, what can and can't be a short-term result, an intermediate-term result, and a long-term result, and we're letting folks that can't balance their checkbooks make financial decisions and technical decisions for us. And we, for the most part, are comfortable merely being advisers to them as if presenting both sides of an issue in front of somebody who doesn't even understand what you are saying is a sufficient way to get a correct decision.

Let me tell you how convoluted the process of policy making is. I'm not knocking the system. I'm knocking our failure to participate in it. But the process of making decisions and policy making in the policy making venues for the federal government, for example, have built into them, probably for the right reasons, some very wrong and perverse results. You go to a committee or a subcommittee hearing. They're going to listen to an issue. I think I used this example today: Suppose the issue is, does the sun rise every morning and are we going to make a law requiring it or not requiring it.

I guarantee you if that were going to be examined, they would make provisions for roughly three people who said yes and three people who said no. It's the only fair thing to do. Both sides then come to the table, and if the individuals that are judged have to judge and develop policy really don't understand the details of the issue, it appears to them that the world is divided evenly on this issue and they hear glib arguments presented in a glib way by people, notwithstanding the fact that they probably have to make 2,000 phone calls to find someone to come in and take the other side.

Now, it gets more perverse than that. If you have ten crazy issues being examined before Congress, and I'm taking extreme examples, but if you have ten crazy issues, it probably turns out that the only wackos you can find to take the odd side are the same ones, so the same person shows up talking about Issue A, Issue B, and Issue C. What's the conclusion the media draws? This must be the smartest man in the world. You get a Ralph Nader. That is how the system functions because we quite often are too polite to argue in any aggressive way about how inane those who don't know, but proclaim they do, really are.

Let me give you some other simple perspectives on this. There's a sense, I think, among those who are vested with the power and the right to make rules and regulations that we ought to make regulations that follow the technology of instrumentation. Historically, if we had expected limited things to a certain number of parts per thousand, when we get better instrumentation that can measure parts per million, they're eager to write the law in terms of parts per million. If I took one part per thousand and now it's one part per million and if low and behold we get technology that measures parts per billion, well, if it was good cutting it from parts per thousand to parts per million, let's cut it to parts per billion having absolutely no sense and idea what quantitatively they are doing, no sense at all that it may not even be a linear increase in cost and complexity, just a factor of a thousand, it may be worse; and yet there is this mentality in the system that says we have to do things as well as we can without anyone arguing that it is wrong to try and take specifications to a point that are completely unrelated to any beneficial side on the issue.

## **Misperceptions Created by the Media**

Frankly, if you don't know enough technically, if you are not quantitative instinctively, as a policy maker you will never have the courage or the capacity to stand up and say this is wrong. So you bend to political correctness and you end up doing something foolish. I don't blame them. I blame us, because we are not aggressive enough to stand up and deal with these issues.

Let me give you an example. We fall into lockstep sometimes believing what eventually becomes the language of the debate as promulgated into the media, by the media, and through the media; we fall for it and we begin to believe it. For example, in the debate on nuclear power, people talk about how terrible nuclear waste is because it has a half-life of a thousand or 10,000 years and that eventually scares the hell out of us until someone – I hope someone reminds us that all of the real poisons of the world, all of the bad poisons of the world, the arsenic and the leads and the mercuries and all those compounds have infinite half-lives, they never change, and yet we have let ourselves become scared when we hear something has a thousand year half-life instead of saying wait a minute, what does that mean, and why am I letting that distortion shape public policy.

I'll give you another example in an area that I wouldn't expect us to be instinctive about. It's become very popular nowadays to talk about gridlock. The press writes how terrible gridlock is in Washington, D.C. And, you know, we've begun to believe that gridlock is terrible. Yet I remind you, go back to your high school civics lessons, it's called checks and balances and it's good. It is, in fact, the heart and soul of the strength of the system we have, and yet because those who know better about that are equally as unwilling as we may have been in our area of expertise to talk about it, we let this system that has a value to it be characterized as having a negative to it and we shape major decisions based on our fear to attack this false, this pernicious, legend that gets promulgated.

There are dozens of examples in areas that we ought to be involved in, where big policy decisions are being made that we can't, as a profession, let people misrepresent. We sometimes get lazy. We sometimes jump on the politically correct bandwagon. We sometimes feel I don't want to make a public spectacle of myself. Why do I want to raise my voice? I've got to go do problem set number 4 or correct problem set number 4.

Another question from lunchtime is about global warming. I suspect that there is a very long-term trend that we have to concern ourselves about, but I suggest to you, those of you who care about global warming, take a look at the difference between the press publicized summaries of the recent important reports and the body of the reports. The body of the reports really does express extreme uncertainty, both in terms of the trend in the data and even the science behind it.

When I was Chief of Staff, I got pilloried in the press because I questioned the validity of the models. The models were two-dimensional weather models, the first ones in the late eighties and early nineties modeled by – to try and project over long periods of time – of course, these were the models that can't tell us whether it is going to rain next Tuesday – and they have now projected the time frame, done wonders with the time set.

And those of you who know the problems of modeling know what happens to the stability and accuracy of a solution when you play that game. They take this two-dimensional model which is designed to evaluate the promulgation of energy on, in essence, a horizontal surface as the model is and then try and make predictions of important parameters that, in fact, are varying in the third nonmodeled dimension. When I expressed skepticism at the results they were forcing, I got all kinds of grief that I am not paying attention to the important scientists of the world.

Let me tell you how bad the models were. I'll give you a couple of quantitative realities. You know the issue of global warming is the changing of the average temperature of the atmosphere above the earth over an annual cycle. That has to do with the thermal response of the atmospheric mass. It has some spatial distribution, but, in essence, one of the important parameters is the thermal capacity of the atmosphere. The thermal capacity of the top meter for the ocean is just about as large or larger than the total thermal capacity of the atmosphere. The top one hundred meters of the ocean are well mixed thermally, which means there is a big thermal capacitance, a blob, well coupled to the atmosphere sitting at the bottom that must be modeled in this third dimension one hundred times as large as the thermal capacitance of the atmosphere. If you put it in the model, you don't get what they've been getting.

The fact is that we put together a one-dimensional model to show it, and the legend and lore amongst the politically correct Kyoto supporters is that I am simplistic enough to think that a one-dimensional model is sufficient to model global warming. Well, I am not, but I am smart enough to know that a one-dimensional model shows that their two-dimensional models are not enough to deal with the reality of the situation. And I cannot believe that we are forcing policy makers who have absolutely no

idea about what I have just said, no matter how many times I tell it to them, we are going to ask them to make policies that are trillion dollar per year policy changes. Every trillion dollars you take out of area one is a trillion less you have for social programs and health and the budget.

These are important issues and more of us have to get into the loop so that we can at least put in some sand if the system is making decisions in the wrong decision and put some sand in that progress and let's understand what's going on.

## The Grand Recipe: The U.S. Constitution

Let me give a little diversion here and talk a little bit more about the broad system we have, not as an engineer but just as one who has watched it function. It's interesting. We have a system based on a recipe, a government recipe, that can be written in about a dozen, two dozen pages. It's called the Constitution. If you look back at the history of how the Constitution was written and really look in detail about what happened, it is really one of the most amazing stories you have ever seen.

First, you have to recognize that we have a formula that works and there are dozens and dozens of countries around the world aspiring to copy our formula. It's not hard to plagiarize, here it is, and yet they can't because they are unwilling to make the compromises and the balances and create the tensions that are inside that document.

In September of 1991 President Gorbachev asked Bush the first whether I would go over with a couple of folks from the White House staff and talk to them about the difference in managing an executive branch in a dictatorship versus a democracy. President Bush says Sununu can go either way, so you will have to tell him which one you want. But the fact is there is a difference. At least you've got to start answering the mail when you move from a dictatorship to a democracy.

So, we went over. Before I went I asked the CIA to translate The Federalist Papers into Russian. We took a few hundred volumes and we gave them out and each night as we would meet with folks they would go home and come back the next day and they would have devoured this cover to cover and they were astounded that the issues they were struggling over then, the issues of the relationship between the legislative branch and the executive branch, between central government and local government, who taxes, who controls the Army, who controls the judiciary, who appoints the judiciary, who can remove the chief executive, all of these things that are built into our constitutional structure were the issues that were being debated at the time they put the Constitution in The Federalist Papers. They were the same issues they were struggling over then.

The tragedy is they are exactly the same issues they are still struggling over and have not developed a structure to deal with. Now, the point I am making is that what we have is a system that has all these checks and balances in it, but in order for them to function the system demands the participation of a smart and educated electorate. We are part of that electorate and we must participate not just in casting a vote, not just in seeking representative government, but we must not allow our slice of society, our professional aspect of society, to be underrepresented in the midst. Yet unfortunately we have done that.

There's a great book, by the way, on what happened in Philadelphia. You know, they went to Philadelphia a couple hundred years ago plus just to tweak the Articles of the Confederation and every delegation from every state went with strict instructions. The agricultural states were worried about the manufacturing states, the large states were worried about the small states, the coastal states worried about the inland states, high population states worried about low population states, all with instructions not to yield an inch on the issues that were important to them. But when they got there they did a couple of things.

First, they did a brilliant thing. They voted not to talk to the press. They actually did. And they held with it. Then they sat down and they realized that tweaking the Articles of the Confederation wasn't enough. So in ten days roughly, one hot summer in Philadelphia, they wrote this magic recipe called the Constitution that has worked so well. You know what they did Ñ they all yielded to compromise and they all created this formula that amazingly balances.

All of these constituencies, large states given the rights in the House of Representatives by population representation, small

states protected in the Senate by two per state, all of these wonderful combinations that magically work, tension between the legislative branch and the executive branch, the capacity Ñ the deliberate, conscious, and purposeful capacity for gridlock as a function that allows this system to wrestle over big issues for a long time until they come to a decision, a system that needs everybody's voice in the national perspective, and an educated set of inputs to give us the right results.

We must come to the table in order to help make it work as technology gets more and more important in the decision making process. You know what all the issues are. There are the issues associated directly with technology like auto emissions and safety, nuclear power and energy, drilling versus no drilling, and the biomechanical sciences and the ethics of cloning.

All these issues have technical aspects that directly need our inputs, but even beyond that, what I talked about as being our capacity to solve problems, our capacity to watch from the beginning and work through the details, list things in an orderly manner, piece them back together and construct a solution. That's the best way to put budgets together. That's the best way to organize or reorganize structures. It is the best way to establish complex policy. It is the best way to create a framework into which lawyers can drop laws that make sense, but it isn't there unless we're there and we have to begin to get more involved.

I'm talking about participation, by the way, not just at elected levels of the federal government. We all get an opportunity to participate locally or within our state and, yes, even the role of advising is a critical one as long as we're obnoxious enough to insist that people listen to what we're talking about rather than merely say they heard us. We have to be willing to consult for people who really do understand what we are saying instead of merely memorizing what we are saying so they can repeat it to others. There is a difference, and it is critical if we are going to participate that we try and establish rules between ourselves and those we help. If we can't get a set of rules, then we ought to try to be much more directly involved in what we are doing.

I hope that in giving me a chance to spend some time with you today I can convey to you not just this sense of an imperative that ought to be something that tickles at least a few of you in this room to do something directly, but I hope it creates in you a sense of obligation to participate more vocally at the social events we run into.

Nothing is more discouraging than to stand at a reception or a cocktail party and listen to people mouthing off on the issues of the day and be standing there with half a dozen people that know better and just seeing their face with this look of resignation of, I don't want to get into an argument about this or about that. Yes, I know they're wrong, but I'm not going to try and straighten them out. Understand that the longer we let those misperceptions be conveyed that way the longer and more difficult it will be for us to get answers and to get policies that make sense.

I started off by saying I've been very lucky. I've had a chance to practice my profession, to teach my profession, to try and administer a little bit to make my profession able to be taught a little better, and then I had the chance to get myself elected governor three times and serve as chief of staff to a president who I really think that history will be much, much better to than the press ever was.

I can tell you that of all the things I've done what I love doing the most was being a practicing engineer. But I can also tell you what was the most gratifying, satisfying experience I had were my experiences in public life because you really can make a difference and there is nothing more exciting, nothing more stimulating, nothing more self-rewarding than knowing that you moved something from being wrong and improper to being right, productive, and effective.

So if I can make any single promise to those of you that might pay any attention at all to what I have said here, I promise that if you get involved you will find it the most satisfying, rewarding experience you ever had.

I'd like to thank you for giving me a chance to come and be a part of this series. As I said at the very beginning, I am honored to be on the list of those that have come before me and those who I know will come after me. I thank you very, very much for paying a little bit of attention to what I have said. I hope that if you do get involved that you, too, will get to a point where you are able to make the choice and in making the choice will say that you would like to die an old engineer, not an old politician,

but only after you have tasted both worlds. Thank you very, very much. I will either take questions or go away quietly, whichever you prefer.

## QUESTION-AND-ANSWER SESSION

(Edited Material)

**Q:** I'm in Nuclear Engineering, so this is of particular interest to me. When an industry participates in the formulation of regulation, as is typically done, there's always a subset of the population that cries that it's like putting the fox in charge of the hen house. When an industry petitions legislative bodies for regulation, reform, or modifications because something has not been formulated in a fair or appropriate way, there's always this whispering that we're the evil special interest group trying to subvert the overall function of government to protect public safety.

When we as members of an industry try to impact government and are viewed in these negative ways by opposition, how can we overcome this perception that we're being selfish and self-serving and that we're not?

**A:** I wouldn't even worry about it. Just keep doing the right thing. In fact, the only measure of success you have Ñ not the only, but one of the best measures of success you have is that if you are doing the right thing and getting the right result they are going to squeal louder and louder, so go home and enjoy it. Let them suffer and do the right thing.

The fact is that it is better Ñ it is better for you Ñ in fact, in an odd way, that's the problem. That is why quite often people get discouraged from being involved to do the constructive thing because it becomes painful in the press for them to receive all that criticism, just using the gridlock example.

The press has absolutely no idea what reality is and over a long period of time they may misrepresent it, but the system itself will continue to function if you continue to participate. It is in fact the reality that participation by those who understand from the outside is the only thing that has kept the system functioning even slightly in the right direction.

Sometimes industries shoot themselves in the foot in doing it, sometimes they go overboard, but that's just because they've done it wrong. Sometimes they not only shoot themselves in the foot, but they go through the grotesque exercise of putting the foot to the temple first and then shooting themselves, but you have to keep trudging, and nuclear power is the perfect example.

I was talking today about what is happening at Yucca Mountain, and, as you know, Nevada is protesting dramatically that, heaven forbid, if they put the stuff in Yucca something might drip into the ground and over a geological period ooze its way through the thousand feet of protective geology that is there and next work its way to Las Vegas, Nevada, miles away.

It astounds me that they are talking about this without stopping to remember that between Yucca Mountain and Las Vegas is Frenchman's Flat. You remember what Frenchman's Flat was? It was the site of nuclear testing, atomic weapons testing, open air atomic weapons testing, and all that stuff has been sitting there with no evidence that what they are worried about comes from a secure Ñ geologically secure repository further out would be even remotely related to what is happening at Frenchman's Flat and Frenchman's Flat is so close Ñ relatively close to Las Vegas and yet they have been emotionalized on this and the industry itself is not even talking properly about dealing with this issue.

That's why we have to stay involved and not let them get you down. You're absolutely right. The more you talk about it constructively the more the anti whatever Ñ I'm not just talking about antinuclear Ñ the anti of anything will be out there giving you a hard time. Frankly, I think you just have to have a perverse personality and give yourself credit for driving them crazy.

**Q:** You mention that companies should be left alone regarding international sanctions. Regarding sanctions against Iraq, for example, what difficulties or challenges has that posed to Schlumberger and how has Schlumberger overcome such reality?

**A:** Well, in the case of Iraq, I think the situation is very different from the normal sanction problem. I think the ones that are the most problematical are the unilateral sanctions.

Today the United States of America has some sort of sanction against 42 countries in the world, and for not particularly good reasons in my opinion.

Now, in the case of Iraq, I believe and we believe that when the international community decides that one of the effective ways of dealing with Saddam Hussein is by sanctions, we very naturally comply with those sanctions, even though I feel uncomfortable about the method and not particularly hopeful that it will do any good.

I think one thing we can be sure of when we apply sanctions in that way is that the groups that will really suffer are the average persons -- this we can be sure about. How it will influence the politics of the country is not at all obvious, and I think there is a perfectly good case indicating that the sanctions have strengthened the hand of Saddam Hussein, not weakened it.

But anyway, that's a very difficult judgment call. When the United Nations says we're going to make it an international protocol we follow it.

**Q:** There's a perception that industrial engineers are more people engineers, if you will, that they deal more with people and processes and so forth. Do you think that a particular engineering discipline is maybe especially more adaptable in a public policy environment?

**A:** : I can tell you that mechanical engineers are the sexiest. I say that as the father of eight children.

The right answer I think is that, as a group, engineers in general are a little bit more introspective, but certainly personalities within the field are Ñ I mean we're all different people, so I think the differences amongst personalities are probably sharper than the differences amongst slices of the engineering profession. But I think what reflects the difference that might be perceived is that in the practice of industrial engineering you may spend more time with people and hone your people skills more, but I think it's merely the result of interactions rather than fundamental differences. I stand on my first statement.

**Q:** In light of our current war on terrorism, homeland security, and a host of pending legislation, what do you think is the future of our constitutional checks and balances?

**A:** You know, it is an amazing document. It may not be perfect, but that's why we have the amendment process. But over the years I think it has had within it this tension between the different slices of the Bill of Rights, the rights of individuals, the rights of the press, how far search and seizure can go, and all of that, and these broad principles get honed constantly by court decisions and Supreme Court decisions, and certainly as technology changes, the time window for crisis changes, as society changes, you get an adjustment that reflects those things.

Certainly the Founding Fathers could not have anticipated privacy on the Internet, but they did anticipate the fundamental privacy issue and so the fundamental issues have to be converted into rules and regulations and laws and legal decisions with precedents that apply to those. I think in terms of what you just asked that in the post environment there has been, if you will, a compression of requiring recognition of change which historically might have required decades for all these adjustments to take place and we are now forcing the system I think to react quicker. I do think, though, that the system is capable of making these more rapid adjustments, but it is important that we participate.

There will be issues of how perverse technology can be in terms of privacy, technical observation. There will be issues of how accurate technical identification is. You know, there is now biometrics identification being used and is it accurate enough for us to rely on it to make decisions on search and seizure. All of these things Ñ I don't know enough about biometrics, so I can't

make a statement. But there are people out here who do and they should be participating and saying it either is or is not good enough in order to make these adjustments on the utilization of technology in a modern way to respond to these times, but it is a good example.

Your question, in fact, is a good example. Because we have to do things quickly we can't sit on our hands and let the legislative bodies and the nonengineers and nonscientists making policies learn about these things because in a short period of time in which there is the demand for action they will never be able to learn what is necessary to make good policy.

**Q:** As a lifelong liberal Democrat

**A:** You'll get over it.

**Q:** I haven't yet, but I'm surprised that I'm going to say that I believe in ninety-eight percent of what you said and agree with it wholeheartedly. A comment and a question. One, I was very happy to hear you speak in favor of compromise in the formation of the Constitution, but a little surprised given the Gingrich revolution and the Contract with America and the seeming lack of willingness to compromise. The question is, as you know, most of our engineering colleagues are very reticent about speaking out in public, much of a don't rock the boat attitude. How do we get them more motivated to go out and do the kinds of things you've spoken about today?

**A:** It's really hard. In an odd way some of it is from the misperception of why should I go out and expose myself to that Ñ it's not going to make a difference. And so part of what I am trying to say is it is going to make a difference Ñ you can make a difference.

I'll give you a trivial example. I got pilloried with Dick Darman who is not an engineer but is an extremely bright guy. We got pilloried about six months into the administration because we cut the funding for high-definition television that DARPA wanted to fund. The reason we cut it off is because the guys at DARPA got it in their heads that they were going to pick the winner. It turned out to be an analog system that was going to go nowhere.

Seven or eight months later, after we got reamed for doing that, the digital systems completed their development and were orders of magnitude better than what these guys wanted to dump millions and millions of dollars into. So you've got to take the abuse knowing you're right and eventually you will make a difference and do something constructive. The important thing I can tell you is the pain is worth the gain. There is a gain to compensate for the pain.

It is not comfortable to stand up. You are going to be criticized in some cases by colleagues who don't have the same point of view you do, but it is the public debate between the educated that I'm looking for rather than the public debate between the uneducated. I believe public debate between those who know will produce a policy that is correct, but if we just leave it to those who don't understand to judge between us, it's going to be awfully difficult.

And thank you, the last two percent comes when you grow up.

**Q:** How would you define the engineering mind and how would you define the political mind?

**A:** I really do think the engineering mind is part of what we come with instinctively and why we fit in engineering and part of what we learn. It is a capacity to break problems down into small pieces, to start at what Ñ it may not be easy to find, but what we eventually find is the beginning of the problem and work our way through it and then we construct a solution as the solution to lots of the pieces put together.

I think too much of our political process to date has been governed by the legal profession. I think that at one time ninety-four

percent of Congress was lawyers. It's gone down, thank God, since then, but as I said in my speech, I think the legal profession unfortunately comes with the self-discipline, the education, and the modus of operation in the profession of deciding where they want to go first and then trying to rationalize it. That's what I think is the big difference we have to bring to the table.

This problem solving capacity, this starting, analyzing, and then concluding versus concluding first and then rationalizing and that to me is the most important Ñ that and a quantitative sense and the capacity to bring quantitative judgments and evaluations into the equation are the two most important contributions we would make to change the current political process.

**Q:** Thank you for coming out, first of all. I want to know for young engineers who are interested in politics and public policy, do you think it's a good idea to jump into it immediately or should we go off and get experience like what you did?

**A:** Great question. I had it in my notes and I couldn't read my handwriting. Now I know what it said. I really do think you ought to practice your profession first, for two reasons: One, you really don't know what you're talking about until you've suffered a little bit of failure and humility in the profession, and by practicing that happens quickly and is important, but, two, then the success part is your greatest asset. The greatest asset I ever had is after I got elected I could always say to them, you know, you may not like what I'm doing, but I'm doing what's right and the worst thing you can do is send me back to a profession that I know I can make a living at and that I love. Once you have that confidence both in terms of knowing what you are doing and knowing you don't have to get re-elected in order to survive, it allows you to do things a hundred times more effectively than otherwise. So your question is a perfect question and my answer is, be successful first in your profession and then go take your professional skills to the policy making arena.

**Q:** Governor, thank you for coming to Georgia Tech. Mine is more of a broader question and, that is, as someone who was in the room where the tough decisions are made, inside the White House in the Oval Office, what was your biggest surprise? And, two, how can anybody get involved in the process? You talk about this involvement, but what are some steps to really making a difference? What's the path?

**A:** Well, first of all, the biggest lesson I learned Ñ I won't say the biggest surprise Ñ I learned as governor and it's somewhat Ñ it's consistent with what I have been trying to say. I went into government as governor with the objective of trying to bring efficiency to the system, trying to make the policy process happen quickly and effectively and efficiently.

Certainly the delivery of services from the bureaucracy should be efficient, and I'm not talking about that, but I'm talking about decision making and changing things for the better quickly. I learned very, very quickly. The biggest surprise I had is that I not only discovered but felt comfortable with the thought that one of the great strengths of the system is its inefficiency.

If you had a perfectly efficient system you would have government by weather vane. You know, if the public wants this, it goes that way; if the public wants that, you have to change it that way. So you've got to have a lag in the system, otherwise it is government by weather vane; and I discovered that I like long lags. I was really surprised that I recognized the value of the long lags.

All of the most important changes we have made as a nation over time, the debate has really been long and hard, unfortunately bitter in many cases, but it has not happened quickly, but when it does happen, then it happens in the right way at the right time and quite effectively. That was really my biggest surprise.

What was the second question?

**Q:** The second one is, you talk about getting involved.

**A:** Oh, getting involved. Well, you should run for governor and get elected.

**Q:** There are not enough states for all of us.

**A:** We can fix that. You know Ñ this just popped in my head Ñ when I first got elected, the governor of Texas Ñ he was a really nice guy. He was a Democrat, but in spite of that he was a nice guy. He came up to me and said, Governor, you know, Texas is as large as all of your six new England states put together and I said, yes, I know, but we were smart enough to divide into six and get twelve senators.

You should probably jump in at a higher level than you normally think you ought to. It's surprisingly easy. You may not succeed at first, but politics is a game of attrition and you will wear them down eventually. You can do it at the city counsel level. You can do it if you're living in a town that has selectmen or budget committees or legislative bodies.

Believe it or not, it isn't that hard to get elected to a state legislature or state assembly and so I wouldn't have any objections in suggesting to anybody who feels aggressive enough and has enough friends who could help them financially to run the campaign to jump right in and do it. You'll love it.

The experience is wonderful. Even if you don't win, the experience is wonderful. Educational and wonderful, but believe it or not, on a random basis, I would say you have one chance in three at winning and you might as well try and just keep at it. It really is easier than you think.

**Q:** I'm currently a master's degree student considering getting a Ph.D. and my question is what type of degree do you think an engineer needs in order to effectively get involved in public policy?

**A:** I don't think you need the degree as much as you need the experience and the confidence and can convey credibility. If you are extremely glib, almost loyal-like in your capacity to communicate, you can do it with a bachelor's degree. If you are a little bit more reticent, the credential always helps give credibility, there's no question about it. So there's some combination thereof and you have to make a judgment in your mind where you fit if that's what you want to do.

If you are serious about making a long-term career in public policy, I would say you at least need a master's. Probably if you force me to pick one of the three degrees, I would say a master's, but I can argue that for certain people the bachelor's is sufficient and for others the doctorate is necessary.

**Q:** I'm with the School of Civil Engineering and I applaud you on your comments here. I have been involved very actively with organizations that are global in nature that are trying to get engineers more involved in shaping public policy.

One of the obstacles that we have found is the perception or misconception that exists between what is engineering and what is science, and when you start looking at scientists as diverse as engineers are diverse they seem to have been able to coalesce as a community a lot stronger than engineers have. They seem to be the ones that get invited to the table and even when you ask that engineer for an invitation it seems like the doors are closed because they already have the scientists who will give us all the answers. What is your perception on that aspect and what have they done that we as engineers may not have done?

**A:** I think scientists come to the table, and, again, I think it's a slight nuance of their profession, but they are much more willing to take a risk on professional opinion. Whether they're right or wrong they like to speak with certitude and they will do that, and I mean that as a plus, not as a minus, and they are willing to suffer the pain of a colleague criticizing them because it seems to be much more Ñ let me tell you what I think the difference is.

When an engineer is wrong in his profession sometimes somebody gets killed, and we don't like being wrong. When a scientist is wrong in their profession, he has to write another paper to correct his mistake. That is a gross simplification, but it's the

psychological difference I think that we bring to the process. We are much more careful and we carry over that carefulness into our willingness to say things. I think that's what happens to us when we come up against the situation you're talking about.

**Q:** This is sort of an engineering ethics case study question. Have you ever been forced to support someone or some issue that sort of contradicts your better engineering judgment due to your party affiliation?

**A:** No, not on technical issues. There are some obnoxious Republicans I have supported and there are some nice Democrats I have opposed, but the fact is on the technical issue, no, I've never really had that problem. And, frankly, that doesn't mean that every Republican I've ever supported I've quizzed on every technical issue and made sure but none that had a glaring position.

When I was governor, Seabrook, which ended up being the last nuclear power plant built in America, was being built in New Hampshire. At the time I didn't realize it, but as governor for three terms, the only political issue anyone ever attacked me on was my support of Seabrook.

They let me have whatever budget I wanted, they let me make whatever changes in government I wanted, they let me build whatever highways I wanted, they let me make changes. I was allowed to do anything because they all thought what they were going to attack me on was Seabrook.

I didn't appreciate it at the time, but I would suggest to somebody if you're going to run, find a real hot issue like that, that they think they are going to nail you on, and then do everything else you want to do.

But the reason I bring that up is there were Ñ when I ran in 1986, in all of New England Ñ not just New Hampshire, in all of New England, there was not a single political race, whether it was the sheriff, town selectman, treasurer of the State of Massachusetts, Governor, Senate, Congress, there was not a single race in which people were not either absolutely opposed to Seabrook or if they were in favor of it they were afraid to support it. I was the only candidate I think in six states supporting Seabrook. Now, I had to support some Republicans and I was irritated that they wouldn't stand up and support me, but I never forget and I took care of them at a later date. But that's as far as it goes. It was personal resentment at not being supported on an issue that I believed in. When they find their children, they will understand.

Thank you very much for letting me come today.

## ANNOUNCEMENT

*The George W. Woodruff  
School of Mechanical Engineering  
Is Pleased To Announce That The*

**2003 Annual George W. Woodruff  
Distinguished Lecture**

Will Be Given By

**Dr. John B. Slaughter**

President and CEO National Action Council for  
Minorities in Engineering (NACME)

Thursday, April 10, 2003

3:30 P.M.

Van Leer (ECE) Auditorium  
Georgia Tech Campus

The Woodruff School of Mechanical Engineering is the oldest and second largest of ten divisions in the College of Engineering at Georgia Tech. The School offers academic and research programs in mechanical engineering, and nuclear and radiological engineering/health physics. The enrollment includes almost 1300 undergraduates and about 675 graduate students. Studies are directed by a full-time faculty of 78 professors, 20 research faculty, and four academic professionals, who are supported by 47 staff members. The George W. Woodruff School of Mechanical Engineering is the only educational institution to be designated a Mechanical Engineering Heritage Site by the American Society of Mechanical Engineers. .

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