PRESENTATION OF DR. EDWARD DAVID, JR.
SEPTEMBER 12, 2005

DR. AVERY: Welcome to what looks like a great turn out for a wonderful evening conversation with Dr. Edward David, Jr., who was a science advisor to President Richard M. Nixon from 1970 to 1973.

My name is Susan Avery. I am the interim provost here at the University of Colorado at Boulder, and for me it's a special pleasure tonight to see this effort put on by the CIRES Science and Technology Policy Research Center come to fruition. This particular center was one of the -- probably the last things I did as CIRES director before going up and moving up to administration on the Boulder campus, and so it's really a pleasure to be here.

I'd also like to recognize two sponsors, internal sponsors, of this particular series, both the graduate school and the provost office. So it's a real pleasure to be here.

Just a few words about the Center for Science and Technology Policy Research, it was initiated in CIRES, which is a joint institute between the University of Colorado and NOAA -- we're focusing on environmental sciences -- in the summer of 2001, as a contribution both to CIRES' goal of promoting science in service to society, and to the University's vision of establishing research and outreach across traditional academic boundaries. The Center's own mission is to conduct research, education, and outreach to improve the relationship between societal needs and science and technology policies.

And it falls -- the work of the Center generally falls into sort of three categories. One, in terms of evaluating the relationship between societal needs and science and technology policies; secondly, providing new policy alternatives for science and technology policy decision makers; and third, for developing tools for science and technology policy decision making.

The Center really focused on launching this particular series of conversations with the presidential science advisors to explore the role of science and decision making at the highest levels of the federal government, and the series will host six science advisors in order to discuss how presidents use science in making decisions or make decisions about science, such as what to cut and what to fund. Pretty important here.

The series is really highly topical to this particular community, because we receive a lot of federal science funding in the CU community here, and in fact, in fiscal year 2005, the total amount of awards, federal awards, awarded to CU Boulder, was nearly $250 million dollars. You add that to the health sciences campus, which generates about $300 million dollars, and you see that the University is quite significantly funded by the federal government for our work. And, of course, this relates very importantly to our graduate education mission, as well.

In addition, a 2002 report estimated that the federal labs that we have here locally, that's NIST, the National Institute of Standards Technology; NOAA, the National Oceanic and Atmospheric Administration; and NTIA, the National Telecommunications and Information Administration -- this is acronym soup here -- will produce nearly $350 to

$400 million dollars in a net economic benefit to the City of Boulder between 2001 and 2005.

So the labs also provide not only partnership opportunities with the University of Colorado, but also provide stability to the local economy and also act as an incubator for other high tech companies.

This series is also intended to place the current Bush administration and its actions in a particular historical perspective. It is modeled after last year's highly successful series, which brought together secretaries of the interior, and was sponsored by CU's Center of the American West. In this particular series, we're going to have participants from the Johnson administration up to the current Bush administration. Last spring, John Marburger, the current science advisor, and John Gibbons, Clinton's first science advisor, spoke here at CU. And this fall or winter, in addition to Dr. David, we are going to host Dr. Neal Lane, which is Clinton's second science advisor, Dr. Donald Hornig, the science advisor to President Lyndon Johnson, and Dr. George Keyworth, the science advisor to President Ronald Reagan.

Before we go and introduce Dr. David, I think it's important to have a little bit of background on what is a presidential science advisor's position. And I think this is important for particular our speaker tonight, because he was a science advisor in a very unusual era.

A 1950 report recommended to President Truman that he appoint a full-time science advisor to assist at that time in mobilizing science for defense purposes and provide high-level oversight of the entire federal science organization. That's sort of when the science advisor position came into first recognition.

Truman established the scientific advisory committee to the White House, which really focused on defense mobilization, but it did not -- but he did not create a full-time science advisor position then.

In the aftermath of the Soviet launch of Sputnik in 1957, President Eisenhower made the science advisor a full-time position. The first full-time science advisor was James Killian, Jr., who was the then president of MIT.

In 1962, President Kennedy established the White House Office of Science and Technology, but President Nixon later abolished the science advisor position and the Office of Science and Technology after some of his advisors spoke out publicly against his plan for funding the super sonic transport and the anti- ballistic missile system. This will be obviously some topic of conversation here tonight.

Congress resurrected the position in 1976, and created the Office of Science and Technology Policy, or OSTP as we know it today, which is obviously still in existence. The presidential science advisor serves as the director of OSTP, and OSTP's mandate includes advising the president and others within the executive office on the effects of science and technology on domestic and international affairs, leading an inter-agency effort to develop and to implement sound science and technology policy and budgets, and working

with the private sector, state, and local governments, the science and higher education communities, and other nations toward this end.

So it's quite an important position for many of us in the science arena for sure.

I really appreciate and thank you for joining us tonight. I'm going to turn the podium over to Roger Pielke, who is the center director, who will now introduce Dr. David and outline tonight's format. Roger? *(applause)*

DR. PIELKE: I'd like to join Susan in welcoming Dr. David to Boulder. I had a wonderful day today meeting with students and faculty members. Dr. David is very gracious with his time and energy in putting up with a lot of questions. This is the fourth event, and as I looked at people coming in, I recognized some faces, people I don't know, but who I've seen now four times at our events, and I think I've recognized as a category of science advisor groupies that are out there, and we may have an award for anyone who makes it to all seven of these events.

Before we get on with the program, I do want to acknowledge all of our sponsors. An event like this pulled off over more than a year involves a lot of resources, and we're very thankful for the major support from CIRES, Cooperative Institute for Research in Environmental Sciences, underwriting the project. In addition, we have support from the graduate school and Office of the Vice Chancellor for Research, the Provost's Office, the College of Engineering and Applied Science, the College of Arts and Sciences Dean's Fund for Excellence. And from outside CU, we have support from the Southwest Research Institute, the Colorado School of Mines, and Boulder-based ICAT Managers.

I'd also like to give a special thanks to Bobbie Klein who is standing over here, who conceived of this series and has really made it all possible, and Ami Nacu-Schmidt, who has also been instrumental. There's a few other folks I haven't mentioned, but thank you, as well.

I would encourage you to take a look at our website you can go to. You'll see the website in the program. If you missed John Marburger's talk or that of John Gibbons, or even that of Bob Palmer, who is a recently retired chief of staff from the House science committee, you can find transcripts, audio and video, from their talks on line. And we'd welcome your feedback.

Tonight's format is going to have three parts. I'm first going to invite Dr. David to come up and give some prepared remarks, and after that, I'm going to give a brief interview up here on the stage and ask some questions, and then we're going to turn it over to you guys to ask questions. And we'll go for a while, and see how long we have interesting questions and so on, and if everyone has enough energy to keep it going tonight.

I have been instructed to point out that you will find in your program a little white sheet with two sides. We would love to get your feedback. And if you would like to receive by email announcements of talks, round tables, and other things that the Policy Center puts on. And you can hand that to me or any one of the folks you saw as you were coming in.

So now let me introduce Dr. David. Dr. Edward David received his doctorate in engineering from the Massachusetts Institute of Technology, and served as president of the Exxon Research and Engineering Company from 1977 to 1986. He was also executive director of Bell Telephone Labs from 1950 to 1970. Dr. David is a past president of the American Association for the Advancement of Science, and was the U.S. representative to the NATO Science Committee for 16 years. He is currently president of Edward E. David, Incorporated, a company that advises industry, government and academia on technology, research and innovation. Join me in welcoming Dr. Edward David. *(applause)*

DR. DAVID: Well, it's a great pleasure to be here. It's not the first time I've been to Boulder. I've been to Boulder many times, and have always enjoyed it, always found interesting people, and always had a lot of fun. I suspect that's why you're here, too, to some extent, but also to do some important learning.

Let me briefly talk about, before we get into a discussion back and forth, about science advising in the Nixon administration. And what I'll try to do is to draw some conclusions from my experiences there.

I'll put these in the form of vignettes; brief accounts of events regarding such issues as politics versus science and engineering, the representative aspect of the science advisor's job, the ways of science and political thought, and the differences between them, the lack of compatibility between science and politics, and the narrow line between intellectual integrity and political expediency.

Then, too, I'll have some comments about presidential attitudes toward science. Let me say I will mention the names of several persons involved in such matters, and I don't mean to criticize their honesty, integrity, or capabilities. You can draw your own conclusions.

Before setting out on this agenda, I want to spend a few minutes telling you about where I'm coming from in terms of my ideas about science and technology and research. My career has been really based on -- hasn't really been research-based as long as I can remember. My work at Bell Labs, as president of Exxon Research and Engineering, and my publications, have always had an element of moving technological innovation forward. And that implies an integration between science and engineering with the broad range of national policies and needs. That integration requires a process for transferring research achievements from labs into the marketplace, where they can benefit the public and the commercial world.

The U.S. is at a point in all of this where public benefits and commercial progress are the expected outcomes of science and technology programs. Indeed, these such expectations have been satisfied in many instances, but the role of clear purposes by researchers, and consideration of priorities, are less well registered as essentials in the process.

By bringing purposes and priorities into the picture, the efficiency and effectiveness of R&D, can be increased, and perhaps even assured.

At one time, I called these ideas the "integrity of purpose," and I still believe that clear purposes by researchers yield an integrity of research and its follow along activity; namely, technological innovation.

Now, my sensitivity to these matters, or to this matter, I guess it's only one, was instilled in me by my time at Bell Labs through my mentor -- many mentors there. So, all that leads me to be enthusiastic about purposeful activity as opposed to spontaneous action. The idea is much more widely held today than by scientists and engineers than it once was. It means that it is prudent to ask in response to a research proposal, "Why?" But also, "compared to what?" And it reminds me of somebody who asked me not so long ago, "How's your wife?" And I said, "Compared to what?" And that sort of upset everybody.

But are you really -- there's no reason you shouldn't ask, "Compared to what?" because if you haven't compared what you're proposing with what the other possibilities are, you're likely to make some mistakes.

You know, and there are not enough resources, money, basically, but also good people and a surface of ideas mostly unevaluated and with uncertain outcomes, that's the time to consider purposes and priorities. So you see my bias toward R&D with high priority and outcomes.

And there's one other matter that ought to be mentioned in this preamble, and that is the interpersonal relations necessary to bring all success beyond just purposes and priorities. Personal relationships are critical to successful outcomes, and most of the things that I've done that I consider successful, I really credit to other people because they've given me ideas and helped me with my own activities.

These outcomes -- successful outcomes, are particularly important in matters where science, engineering and politics come together, so I'm always looking to see if people involved in these things are adequate, whether they are communicative, and whether they are flexible enough to adapt to the unexpected events which usually occur in research and politics.

There's still another necessity. That is education, and this is the right place to mention that, including schooling, college-level education, post- graduate learning, all dependent, at least in part, on research universities such as those here in Boulder. Accomplished people have a very high regard for education based on such institutions.

Now, none of the above what I've said is going to be any surprise to you; you know about all of that. But so now, we can revert to the subject aforementioned; namely science advising and the president. But I think I'm going to tell you where I was coming from with all these comments.

I joined the Nixon administration in September of 1970, after first being contacted about the job in the spring of 1970. I was appointed after certain dissatisfactions with Lee DuBridge, the president's science advisor at the time, were aired publicly. It was the White House staff, and not the president, who was dissatisfied or disaffected. I didn't want you to think that I was or the president was. I think Lee DuBridge and the president had a very special relationship, but it didn't protect him from the ravages of criticism from the White House staff. That's something that you should keep in mind.

Now, that episode illustrates an important source of tension for all science advisors; namely, that the job has a certain representative aspect. In this case, the White House staff viewed Lee DuBridge as a representative of the academic community. His concerns about academia and its fortunes stem from his career, which was capped by his presidency of CalTech. At the time of his stay in the White House, the academic community was causing the administration discomfort over issues such as the ABM, the anti-ballistic missile program, the super-sonic transport, and other subjects. It was clear that a representative of that community, which was causing a pain in the White House, was unacceptable within the White House itself. And that is really the source of a lot of what you've seen of the turmoil in the White House over the science advisor, whether it was Lee DuBridge or me or other people there.

In addition to that, there had been several leaks of information from the -- that the White House staff considered private. And that's, of course, not unusual in Washington, but that nevertheless just added to the difficulties.

Furthermore, the White House staff desired science advice that was more broadly representative of industry and technology as opposed to pure science. And I have just told you what side I'm on there. I'm more on the side of industry and technology than I am of pure science. But nevertheless, and that doesn't say that I don't think pure science, if you can define it, is needed. I do. But, I want to say that I was the first science advisor from industry, and I think the last. I don't know what that means. But maybe it's worth saying in any case. After talking to a number of people in the White House about the job which I was offered, including Henry Kissinger, John Ehrlichman, Peter Flanagan, and the president, I took the job on the condition that it was administration policy to further science and technology in the national interest, including basic research in the universities. It seemed that they were very strong on that, but you know, thinking back on it, I should have been a little more skeptical.

The issue of being in the White House, and representing a constituency, rather than serving the president, is still before us. It has reappeared in the issue of stem cell research and the availability of stem cell lines. Also, there's the controversy over global warming, its credibility, and what should be done about it. That leads to questions of energy supply and demand and hydrocarbon burning, and I won't say more about that unless you ask about it, because you know what that controversy is about.

But it is worth noting, a recent article by Dr. James Schlessinger, who is a good friend of mine, who was in the White House at the same time I was. Former secretary of energy, I guess in the Clinton administration. The recent article he wrote is entitled "The Theology of Global Warming." It appeared in early August in the Wall Street Journal, and it contrasts political theology with scientific evidence. That's worth reading, because it takes a very different view of that whole picture than most people do.

One of my early contacts with the president illustrates another important point. At that time, aircraft hijacking was becoming a nuisance to the country. Planes were being hijacked to Jose Marti Airport in Havana. People were wanting to join the early Castro government.

Out of the blue, I was called to the Oval Office to discuss the hijacking matter with the president, with John Ehrlichman, with Peter Flanagan and Henry Kissinger. The president, in effect, asked me how science could be used to stop these incidents. I had the distinct impression that he expected a final solution to be laid on the table immediately, but I'm afraid I told him rather unwelcome news, that the situation was extremely complex and there was neither a sure fix or any technological magic that I could conjure up to solve this problem. I pointed out that the problem was mostly sociological, not technical.

I did suggest that handguns could be magnetically detected and that baggage could be searched or X-rayed fairly expeditiously. That all seems so routine today, but those ideas seemed outlandish then. The group I met with in the Oval Office decided my suggestions were not practical and certainly did not have the gravitas the public expected from the White House.

Nevertheless, that meeting eventually yielded today's security measures at airports.

Before the equipment in airport security we're familiar with now were implemented, federal marshals were put on flights to prevent hijackings. When that recommendation was made, I objected. I thought it was more dangerous and much more expensive than just having an unscheduled stop at Jose Marti Airport. However, the president decided that air marshals were just what the situation demanded and, of course, they did prove effective in deterring hijacking.

Now, in my mind, this episode illustrates that presidents tend to look upon science and technology as tools with which to execute policy rather than as activities to be valued on their own. The issue also remains -- this issue also remains before us today. Unfortunately, some technical people have tried to take advantage of presidential naiveté regarding science in order to accomplish their own ends. Gee, I'd like to count the number of people -- I don't have the number of fingers and toes to count them.

The so-called "cancer cure program," which was begun in 1971 by the Nixon administration, and many of you would remember it, is an example of this in my opinion. As I recall, one of the president's lay supporters, Mr. Bebe Rebozo, and some of you may remember him, and also Mary Lasker of New York, lobbied the president to establish and support this program.

I'm reminded of Lord Keynes statement to the effect that it's not difficult to bamboozle a president, but it's very difficult to de-bamboozle him. Which I tried to do and it didn't work.

Another interesting situation I found myself involved with was the Apollo program. When I arrived on the White House scene, two Apollo missions had already been canceled. They were Apollo 18 and 19. There were originally plans, as I remember, for 20 and 21, but 21 never really got off the drawing board. The possible cancellation of Apollo 16 and 17 was in the wind, it was talked around, even though those two missions were slated to provide important scientific information about the moon, and they were basically the payoff of all of the efforts that went into the Apollo program. Most of the man-hours on the moon came during those two missions. In fact, most of the scientific measuring equipment the astronauts placed on the moon at that time are still there and many of them

are still operational. So there's an awful lot of data coming in. Now, after examining this issue closely with the help of the President's Science Advisory Committee, which was called PSAC in those days, and specifically the help of Professor Tommy Gold of Cornell, who some of you may know, I wrote a memo to the president saying, in effect, that the nation had bought everything for these trips except the fuel, and that we ought to go ahead in light of the potential knowledge to be gained. That memo had some effect, and Apollo 16 and 17 proceeded, and Apollo 17 put the first scientist on the moon. And he's a good friend of mine now.

The interesting aspect of all this was the reason for considering canceling 16 and 17 in the first place. That reason was essentially political. It focused on the timing of those two launches vis-a-vis the 1972 presidential election. Apollo 17 was slated to launch about a month before the election day, early in November, 1972. The big worry by the political forces in the White House was that if there was an accident of Apollo 17, it would bear heavily on the election outcome negatively. I suggested that Apollo be postponed, however, until December after the election, a month after it, and that Apollo 16 was too early to have much influence on the outcome, we did win that day for the final two moon missions. This shows you how science hangs by a string in such situations. It illustrates that political thinking is very different from scientific thinking. Anyone coming to the science advisory post without considerable experience in politics is in for some rude shocks.

A further point is raised by the infamous Supersonic Transport tussle which went on in 1969, 1970 and 1971. The SST program, as it was called, began as a federally-subsidized Boeing project. The issue of continued federal support for that program, an essentially commercial venture, precipitated a major fight in Congress. Lee DuBridge had commissioned a PSAC, Presidential Science Advisory Board, study of this project, presumably in order to advise the President. Dick Garwin, who is an old friend of mine, and a person now who is a distinguished investigator at IBM and has been for a long time, Dick Garwin, maybe some of you know him, was the chairman of that committee on SST. The report was not made public, but the conclusion, namely that PSAC was opposed to the SST, was leaked. Congress wanted the report, but the administration balked. Where have we heard that before? So legal action was instituted to force the administration to release this report. All of that was really nothing more than a foil. Dick Garwin testified against the administration program on Capitol Hill and that infuriated the White House staff, as you might imagine.

The real issue, I think, was two-fold. First, was there some concern that the SST was a white elephant, that it was not economical as an operational aircraft. Second, there was the argument that the feds were getting involved in commercial activities where they had no business, and didn't know anything, and the program was a subsidy for Boeing. Garwin and other scientists felt very strongly that the SST was an expensive boondoggle. They also worried -- something that I still worry about, that not with respect to the SST, but with other things -- that a large expenditure or commitment of the kind that the SST required, would unbalance the U.S. science and technology program. In other words, so much money would go into one effort that others which were just as important or more important might be completely neglected. You are familiar with that logic, I'm sure.

You have to remember that at that time the federal R&D budget was well over sixty percent of the total U.S. expenditures on R&D, so it would have been a big effect. The

SST lost in the Senate by one vote. Can you believe it? Fantastic. It was a shame in some ways. Hundreds of millions of dollars had been spent on developing the prototype aircrafts, two of them were housed at Boeing. They were almost ready to fly. Only a couple million dollars separated them from actual flight testing. Boeing argued that further production of that plane would be based on commercial orders. In other words, the federal government would have subsidized only the research and development that went into developing the plane. But that would have worked only if the aircraft was economical to buy and operate. Clearly, the airlines were not going to buy an aircraft that was not economical over the long run. If it wasn't economical, the opponents were convinced, and I think they were right, that further federal funds would be forthcoming to subsidize the cost of the airplanes so that the program would not look like a total failure.

What does this flap tell us about science advising? It tells us that the way of science, which basically includes argumentation and discussion of alternatives and analysis, is not the way of politics. It tells us that science advice in a political setting is part of a larger picture that sometimes overwhelms the scientific view. The implications of these points, I think, are profound. On the one hand, I think that if Dick Garwin had been given a shot at the NASA shuttle program, which he didn't have, we might have ended up in a sounder position than we are in today. Perhaps we would have a mixed fleet of reusable and expendable vehicles. Actually, we do have something like this, with the help of the Russians -- it's shocking, isn't it -- and their Soyuz capsules.

On the other hand, we have to realize that without federal support, we would probably not have jet aircraft at all. Neither would we have communication satellites, super-computers and a whole list of other things that we now have. Where does all of this leave us? It means that the science advisor must walk a very narrow line between intellectual integrity and political expediency, if there is any such line of that sort.

The conflict between politics and science was illustrated for me by a confrontation between me and a gentleman whose name you'll recognize, Pat Buchanan, now a well known commentator and writer for the press and the media. At one time, you may remember, he was a candidate for president. The confrontation between David and Buchanan concerned earlier science advisors and a few distinguished members of PSAC. It had been established by tradition earlier that previous science advisors and some thought leaders such as Dr. Edwin Land of Polaroid fame, who were former members of PSAC were routinely invited as ex officio guests at meetings of PSAC.

I intended to continue that practice when I came to the White House. Pat Buchanan heard about that and he showed up in my office to denounce the idea on political grounds. My explanation that invitees of this caliber could be invaluable in carrying out studies and making judgments about S&T matters. That argument was to no avail, and John Erlichman called me later and agreed with Pat. And this incident showed me that science, engineering, and politics are often incompatible.

I should make it clear that not all members of the White House staff took such a hard nosed view of maintaining political purity. Recall that two of my colleagues at that time in the White House were eminent gentlemen, eminent people, George Schultz and Pat Moynihan. Both took a more sane view of how to raise science and engineering advice in a political surround, and I consulted them often.

I could continue with more stories about the Nixon administration and my experiences there, but they all indicate that the science advisor can be in an untenable position. Politicians, and I should add many executives as well, are little interested in science except as it can be used to further short-term immediate goals. To put it succinctly, the time constant of science on one hand, and politics and business on the other, are wildly incompatible. Maintaining options rather than long-term commitments is the currency of politics and business.

Reflecting this axiom is the fact that the science advisor's office, the Office of Science and Technology Policy, has no formal function -- no formal function in the White House at all. The activity is only what the science advisor makes it and what the White House staff allows it to become.

When I left the White House in January of 1973, I wrote a recommendation that the office be given a function. I suggested that it be allowed or asked to approve all of the agency and departmental R&D budgets before they went to the Office of Management and Budget in the White House. In other words, it would perform a function akin to the authorization committees of the Congress. Then OMB would do the analog to appropriating funds. Such an arrangement would permit OSTP to pull together federal programs across all of the government as well as to see that sound technical programs go forward and unsound technical programs do not.

The chances, however, of such a proposal ever being accepted are absolutely nil. OMB is not likely to give up any turf, and the agencies and departments would look on OSTP as merely another barrier to jump over. This takes us to the point of asking that fundamental question, do we need a science advisor and his supporting OSTP? This latter thing, OSTP, is now mandated by legislation, so whether you need it or not, it's going to be there, although it doesn't have to have any money and it doesn't have to have people. That's not a requirement.

But what you have to recognize is that neither one of these, either the science advisor or the OSTP, has a generally recognized function. The political environment is basically hostile. Scientists and engineers are not so adroit at managing conflicting interests, and yet they are the people that the Office of Science and Technology has, and the science advisor.

The time scales of R&D are not compatible with federal budget or political time scales, the science advisors have great difficulty in getting into step.

The situation is becoming worse rather than better. The old style science advisor, the distinguished person whom the president looked upon as his house intellectual, to be listened to on the complex and new issues, at that time, of course, of nuclear arms, nuclear defense, advanced technologies, infectious diseases, and so on, is not likely to recur soon.

Science advisors in the 1960s and the early 1970s, came from a community of scientists that had supported government policy unflinchingly. That was the legacy of World War II. Today, the community has basically detached itself and is a critic, not a friend, of the administration. That went for Carter, Johnson, Nixon, Reagan and Clinton.

There are additional trends that make the science advisory task increasingly oblique to national policy. The federal government is no longer the principle support for U.S. R&D. Industry is becoming increasingly dominant in that sphere. The latest figures that I've seen indicate that industry supports about sixty percent of the total R&D expenditures in the United States. The federal government supports about forty percent, and a small part additionally comes out of other funding, such as the state programs.

Basic research is losing its identity as international competitiveness becomes a prime goal. Defense sees research as part and parcel of national policy, and the Strategic Defense Initiative is the prime example there. Industry-university couplings are increasingly sought, not only by NSF, the National Science Foundation, but also by state and local governments in the service of economic development. In other words, the traditional activities and viewpoints of science and research are becoming increasingly submerged in the wider goals reflected in government and business.

Another indicator of this trend is the popularity of emergent enterprises and entrepreneurship, particularly small business innovation. Witness the congressionally mandated "set- aside" for such activity. It's probably one of the only real "set-asides" that has been passed for the last 25 years. How much further are these trends going to go? Where will R&D be 10 – five to 10 years from now, or 10 or 12 years? I think it's clear that technological ventures, for example, small business start-ups and small business generally, will become a larger and more recognized part of R&D and science policy. That stage is emergent today and will grow further. People, both in government and industry, will begin to look upon small business enterprise start-ups as a part of their R&D activities. On the federal side, DARPA has actually long ago adopted that viewpoint.

Worth injecting here is the preponderance of research and development is aimed at the commercial world and commercial competitive world. The federal government takes a remote view of this world with some exceptions. Federal interests tend to focus on military and defense matters, on health and the life sciences, on environmental preservation, on the nation's infrastructure to assure adequate transportation, and the necessities of life, including education and energy across the board, all under the banner of infrastructures. All of these matters and much more were evident during my stay in the White House. None of this comes as any surprise.

It is interesting and significant that much of what occupies science and technology policy today began over 30 years ago, in the twilight of World War II. The energy matter arose when OST, that was the name before OSTP was initiated in 1976, when OST was considering new technology programs, looking around at what new programs could be brought into being. This effort was started by Bill Magruder, an assistant to John Ehrlichman, in late 1971. No new programs or technologies actually came out of this effort, but one of the candidate projects was a large parcel of energy R&D activities, including solar energy, nuclear energy, wind energy, and so on. OSTP was involved heavily with all this, but the point is that early efforts in several core fields were spawned in 1972 or before, yet the important matters of cost and price of alternative energies, for example, was not mentioned.

Let's get back to the science advisor. We might ask -- we need to ask what does the White House believe it needs in the way of science advice, because that's probably what it will get. It clearly needs a professional capability to analyze the technical dimension of issues and to make recommendations. That capability must be politically astute; don't ask me what that means. Not so that he can tell the president what he would like to hear, but so that the view can be convincing and timely. The White House needs to be able to tap the movers and shakers outside the White House for research and analysis of complex topics. Furthermore, the ability to canvass those on the outside and to do the analytical work in-house, requires longevity.

Just let me cite an example of how effective long-term tenure can be in the White House. We have the case of one Mr. Hugh Loweth, and most of you, maybe all of you, have never heard of him, L-O-W-E-T-H, Loweth, he was associate director of the OMB for many years. He had science and related budgets as one of his principle responsibilities. Through his actions and insights on what was good or bad for science, engineering, and new technology development, he has, in effect, guided policy beyond what any science advisor could possibly have done. That's mainly due to his longevity there. He knows how that damn system works and he knows how to make it go.

In closing, let me reiterate that the trend today is away from fundamental research as a good to be pursued for its inherent merit, and I think there is inherent merit in a lot of it. Rather, the objectives of economic development and defense against terrorism are in the minds of most R&D sponsors. This has already led to new federal programs and others sponsored by the states individually. One of these where I was involved was here in Colorado under the control of the Colorado Advanced Technology Institute, which they told me today was merged with some other activity some time back in 1999. Some of you will remember the effort in any case.

State programs are now widespread around the country, and provide a diverse framework for R&D funding aimed partially at local interests. The effect of this trend on our R&D activities and the advice for the highest levels of government is bound to be profound. How does the president get access to these state programs and stay informed about these programs? It's not a simple question.

Careful thinking on this situation may very well bring us to a different concept of science advising in the future.

I thank you very much for listening, and I'd be glad to discuss these and other matters with you further if you so desire. *(applause)*

DR. PIELKE: The first question is -- I'm going to look back to when John Marburger, who is the current science advisor to President Bush, was here last February, and he emphasized, in his prepared remarks, the role of the science advisor in preparing federal budgets. And just recently in a news article, he was quoted as saying science policy is budget policy, and in many respects seems to have adopted that authorization committee model that you recommend.

DR. DAVID: I said that first.

DR. PIELKE: But the question is, after Nixon abolished the office and the position, and Congress, in its wisdom, decided to put the office back in statute, do you think they got it right? If you could tinker around with the structure of the science advisor's role, or the Office of Science and Technology Policy today, what sort of recommendations would you make?

DR. DAVID: That's a difficult question because it seems to me that once you get a structure like that, a government structure like an imposition, then people understand what it is supposed to do and have some loyalty to it, to change it in any drastic way, is quite destructive and may destroy all of the confidence it could build up over the years. So it's not a good thing to change, just for the sake of changing. You have to have a reason for it. I think the reason I had was that I didn't expect it to last. The present OSTP is lasting, what, at least 10 years, 15 years.

DR. PIELKE: Longer, yeah.

DR. DAVID: And I think to fool with that at the moment is fool-hearty.

DR. PIELKE: Well, let's push that a little bit and talk about the qualifications for the science advisor. You noted that anyone who is in that role should have a good understanding of politics and some political experience, and just looking back over who has filled that role, they have all been physicists of one sort or another. What sort of job qualifications would you recommend, let's say, to the next president, president Hillary Clinton or Condoleezza Rice, as they're looking to fill that successor to John Marburger?

DR. DAVID: Remember, I commented about the importance of interpersonal relations. I would say to her or him, find somebody you like and somebody who you have confidence in, who you believe has access to the smartest people in the country in science and technology, and are willing to call on them to help you. If you can find that person, that's the person who should be science advisor.

DR. PIELKE: Do you think the discipline makes any difference? Could there be a biologist, a social scientist, an economist?

DR. DAVID: Not too much. I would opt for a physicist. Physicists are pretty bright people. *(laughter)*

DR. DAVID: I mean, I'm an engineer; I shouldn't be saying things like that. But, I think that that's certainly one possibility. But, if you look at the progress of science, the most startling things that have happened have been in biology and then in medicine as a result. The whole business of RNA, DNA, and all of the things that have gone on there, are really been the major -- well, they've been the major prime movers of science in the last 10 years or so. It started when I was in the White House, I knew a lot of biologists because I worked in biology myself to some degree, and I knew a lot of them. And it was perfectly obvious what was going to happen. And I think you have to keep that going to some degree, but on the other hand, I think maybe what you really need to do is to find somebody impressive, if there's going to be one, really should find the person compatible, find them informative, find them willing to talk any time of the day or night, and willing to

address the issues that concern the president and the White House. That's the issue; not the question of what kind of scientist should you get.

DR. PIELKE: You mentioned you were trained as an engineer, not a physicist. And also of note is that you're the only science advisor, I think, that comes from a background in industry. And could you say a bit more about what you think about the role of industry providing guidance to the federal research enterprise, given that industry makes up the majority and a growing share of investment in research and development in this country?

DR. DAVID: Well, I think what you've got to do, again, is to look at the whole question of where you're trying to go with science and technology. What are you trying to do? If you're going to try to outdo the Japanese in automobile manufacturing or the Koreans, you really need not only a physicist, although a physicist can sometimes do this, you need an engineer who can look at the way we manufacture automobiles and recommend changes so that we can compete. It all gets to be a matter of competition in the international scene, and that's not something that's easy to mastermind from here, but it can be done. We've done it in the case of Japan and some of the things we were maybe behind on supposedly, and now they're behind us on those things. So I think it's possible to overcome the backwardness of some of our activities and emerge as leaders again, and I think that's what's at stake here.

DR. PIELKE: The Bush administration has been criticized, for example, its energy task force, or the role that it has given industry in providing guidance to government, and I wonder if you might say something about the potential conflicts and how they might be dealt with between special interests and the broader public interests involved when you have companies involved, such as you said, Boeing is a good example, and has recently been criticized by the Europeans for its subsidies from the federal government for research. How do we manage those sorts of conflicts?

DR. DAVID: Well, let me just comment about Boeing. The idea that they get – that Boeing gets subsidies and Airbus doesn't is ridiculous. Absolutely ridiculous. They get larger subsidies than Boeing ever got or is getting now. The notion that we can help the Europeans by disadvantaging Boeing is just absolutely ridiculous in my view. They are an important part of our capability, both in aircraft and in rockets and a number of other activities, and it's important for the U.S. to have that capability and to be an international leader in that. I would not walk away from that. I would re-emphasize leadership in the fields that Boeing represents. Now, there are a lot of other things that you can do, but that's certainly one thing that I would be very much for. And I never worked for Boeing and don't own any Boeing stock.

DR. PIELKE: Well, I would just sort out the broader challenge of industry participation and guidance in government. So, I think the U.S. Congress has agreed with your view about the importance of Boeing as a provider of jobs and so on, but what about the criticisms of the Bush administration for corporate roles in their energy policy development and so on? How do we sort out -- I mean, certainly if the private sector supports sixty percent of research, they ought to have a pretty strong voice in advising the government. But how do we know when that's appropriate or not appropriate?

DR. DAVID: I don't think that's right, what you're saying. I don't see why industry, because it is putting money into R&D, for its own uses by the way, not for R&D for the government, but for its own uses, I don't see any reason why we should hold still for that. I think that the best you can say is that if you can prove that what you're trying to do in research, and this is a "why" question again, is going to be useful to people in the society, that's one thing. If what you're saying is that it's going to make one company competitive, that's no reason to put it in unless that one company is so critical to the defense of the U.S. that they should have to do it. But I think that's the exception, not the rule.

DR. PIELKE: What do you think about the role of the federal government in developing the science and technology workforce that supports these companies that are investing in research, doing research for their own goals, they have to get their employees?

DR. DAVID: A place to educate people in the beginning is right here at universities. How many research universities now that must be, how many, must be 60 or 80 or 100, something like that. We have more of them than anybody else in the world. I mean, Japan -- I mean, China is just happy that it's got three or four of them, and I'm not even sure they've got that many. I know two or three, because I've visited them, but I think – I just think our -- to help our country, to help our economy, the health of our science technology, all resides basically in the research universities and the way that they have carried the role when government pulled back, and it always pulls back occasionally, maybe more often than they should. But, companies always find ways to improve their output and to make their activities more relevant to the needs of society, and that in spite of the fact that the government is not a constant source of energy or a constant source of money, or a constant source of anything else.

DR. PIELKE: You mentioned this in your talk, and I'd like you to say a little bit more, how does the science advisor, or how should the science advisor, balance the needs to represent, in some respects, the R&D community and academic research broadly inside the White House, and also put forward the president's political agenda, which may not -- these may not overlap always?

DR. DAVID: Well, I don't think the science advisor ought to put forth the president's political agenda. I just don't think science advisors in general have enough wisdom to do that. They don't know what's good politics and what's bad politics. They don't have the background to do that. So I wouldn't contrast those two things. I think the best you could say is that the -- well, what were the things you were asking about? The first part of that?

DR. PIELKE: Well, as the science advisor is looked by the academic community as their voice in Washington.

DR. DAVID: It's all right to do some of that, but, you know, the universities and the scientists who are working in critical scientific areas, have to be their own voice. That means they've got to spend a little more time in Washington talking to the politicians, particularly in the Congress, but also in the White House. And that aspect of it has been badly neglected by practically everybody in the scientific community, with the exception of a few people like Bill Baker, Sy Ramo, and people like that who had business with the government. And my feeling is that the science advisor should not get into the politics of

science at all. I know my friend over here will disagree with me, but that's all right. I think disagreements are healthy.

DR. PIELKE: Well, this raises the question, and this came up today in some of our discussions about the role of scientists in politics, not just the science advisor, but rank and file scientists, and we talked today about the group Scientists and Engineers for Change, mobilized in the 2004 election, and you commented that there's been others. What sort of advice would you give to scientists as far as identifying themselves professional and getting active politically?

DR. DAVID: Don't become a groupie. That's what you shouldn't do. If you want to, you know, engage in politics, do it as an individual, not as part of a group because groups too often go off in unimaginable directions and I don't trust other people to express my views. I suspect a lot of people here wouldn't either. I don't like the idea of groups of people getting together and espousing political activities -- political points of view, or engaging in politics to elect somebody to a job in Washington or not. I just think it's not appropriate for people who should be paying attention to their science and to their technology and doing things which they think are going to be useful. That's really the trouble card for the politicians.

DR. PIELKE: There's a well known anecdote in one of the stories you didn't tell in your prepared remarks about President Nixon involved in a spat with the president of MIT. I wondered if you might just relate that to us?

DR. DAVID: Well, the president of MIT at that time was Jerry Wiesner. Jerry Wiesner was my thesis advisor and I was his first doctoral student. You can imagine we had a very close relationship, and I got a call from the White House and went over there, and John Ehrlichman was there and other people were there, and at the end of the discussion, the president said, "Ed, I want you to go back and cut off all the funds from MIT." *(laughter)*

DR. DAVID: I just sort of sat there dumbfounded, because you know enough about the government that that's completely impossible, even if you wanted to do it. And, so I went back in my office, sat down in the office puzzled about this for a while and didn't do anything. And then suddenly my phone rang, and it was John Ehrlichman. I said, "John, what did you think of the president today and what he had to say about MIT?" He said, "Ed, my advice is don't do anything and it will all go away." And I didn't do anything and it all went away.

DR. PIELKE: With some of the anecdotes you told today and some of the stories you heard from John Gibbons and some of the discussions we hear today about the Bush administration suggest that politics and science are closely interrelated. There's really no separating them, but I was wondering if you might be interested in offering some comments on the current controversies involved with the Bush administration and the Union of Concerned Scientists has put out a report, just another criticism, saying that the Bush administration is a more egregious offender in the politicization of science, and if you have a good perspective on it?

DR. DAVID: I'd like to know what the metric is for that, because I don't think there is a metric. You have opinions, and that's okay, everybody's got an opinion. But the idea that

you can prove by any write- up that the Nixon – that the Bush administration is worse than the administration I worked in or the administration that his father was in, is sort of ridiculous on the face of it. You can't make the case. I mean, you can cite instances, but the instances will go away. My advice is John Ehrlichman's advice: Don't do anything, and it will go away. And it will.

DR. PIELKE: A few more questions here, and then we're going to open it up to the audience. Could you address how the Vietnam War affected your job and what role the war had in your role as providing advice to the president?

DR. DAVID: Well, the war was winding down when I went there. When did it start? It started in the early -- late 1960s and dragged on for a while. And when I left, it was all over. I mean, the peace treaty had been signed, the helicopters had left Saigon with the troops that they could carry, and so forth. All of that was past history by the time I could really start considering it. The only thing that I was aware of was that there were large numbers of people in the Pentagon and people who had been hired -- who were hired hands, some of them in the universities and some of them in the industry, who were doing everything that they could to make the war effort in Korea -- in Vietnam, make that war effort successful. You know, I get the same impression now of our activities -- the two wars are very, very different, and I think they're at a different stage than, you know, than they were in the past.

But I rather feel, again, that these sorts of activities can divide the country, they can make the country more difficult to govern, they can cost the government large amounts of money, which they will borrow and spend. It will not be good in the long run for the government, but the objectives which have been stated, I think, are quite understandable and we ought not just ignore them. The idea that we're in a war with the extreme Muslims, is an idea that's been around now for quite a while, and it may even have some level of truth in it. I would not want to say that we ought to consider it a war against another religion, but on the other hand, there are people who feel that way, including some of the Muslims. So, it's another one of these sticky instances in which there's no clean answer, I think, and what you have to do is to try to do what you think is right and you'd better be careful of what you do, because it will have a backlash on you. And I'm not talking about elections.

DR. PIELKE: All right, thank you. I'd like to turn it over to the audience now, and I'll take questions from the top and the bottom. And what we're going to have to do, I think, for the recording is repeat the question. So we'll appreciate concise questions that we can repeat into the microphone. So, all right, way up at the top. *(male asks question)*

DR. PIELKE: All right, so the question is, "What role did the emerging environmental movement had on Dr. David's interactions with President Nixon?"

DR. DAVID: Well, Nixon, as you may remember, did -- his environmental stuff was selective, and he did a lot to forward it. He established the EPA, for example, he signed a number of bills which were pro- environmental, he found it to be extremely useful to him in both politics and in terms of what he was trying to do at the White House, and he liked that activity very much. I was involved in it to some degree. The EPA, I felt at the time it was established, had not been thought through carefully and it didn't have the -- I don't

care to use that word again, didn't have the gravitas that it needed to do the job that was set out for it. And it turns out I think that that's so, but the EPA is not bad. It's not a big negative on the horizon, a big negative on our budget or anything of that sort. And it's probably an okay influence. But I'm not terrifically enthusiastic about it like I am enthusiastic about some of the other elements of government.

DR. PIELKE: Yes? *(male asks question)*

DR. PIELKE: So the question is how Dr. David would evaluate our energy policy, the research and development aspects, I suppose, correct me if I'm wrong, -- *(male continues asking question)*

DR. PIELKE: -- from the standpoint of the "why" question in the priority?

DR. DAVID: The "why" is that we've got to have energy at a pretty high level in order to live the way we live. If you want to change the way we live, we can reduce the demand for energy. I don't think there are very many people in the country who would want to do that, but there may be people here that do and maybe people I know who do, but overall, I think the problem with energy is that it has to be thought through carefully. I believe that there are ways of doing things which would be a very, very much -- could make the energy situation much better. And it doesn't have to do with new technologies or it doesn't have to do with finding ways of getting more oil. It has to do with the second and third steps in how do you use the products of the energy industry in such a way as to get maximum benefit from them, because they are quite dear at this point and I believe that if we tried to answer that question, we might discover some things which would be -- could be a step beyond what we are doing. I think there's not a good -- there never has been a good energy policy, as far as I know. It almost doesn't exist. That's not to say there couldn't be one, but if you tried to get all of the people of the United States to agree on an energy policy, you'd never have one, so it's a real puzzle. By the way, I think the – if you look out to the next 10 years and ask what is going to be the agenda in science and technology, I think it's going to be very heavily pointed toward energy. And that's something that American people like, because once they discover that, there's going to be an awful lot of them trying to do things to improve the energy situation. I was talking to somebody here, I guess it was this morning, about fuel cells and the problems with hydrogen, because hydrogen is the chosen – the government has chosen hydrogen as the element for fuel cells. I think this is absolutely wild. I mean, I know a lot about the oil industry and the fuels industry, and there are a lot better things to do with hydrogen than to put it into fuel cells and draw electricity from it. There are other ways of drawing electricity that you need. You know, you can name one yourself, but I think the interesting thing is that the president wanted to start something, and he asked some people about it, "What should we do?" and he heard the word hydrogen and the fact that it has no -- supposedly has no negative effects on the environment, and he thought that was a good idea, and so that's what you got. Now, it hasn't been analyzed carefully, in my view. For example, they didn't know about something that's been on the market for a long time, which is fuel cells fueled with metal, not hydrogen, metals. By the way, hydrogen is a metal. Are there some chemists in the audience? Hydrogen is a metal, isn't it, so what you're doing is substituting one metal for another and the process inside the fuel cell is not greatly different. But it turns out that if you put zinc or aluminum, like aluminum foil you get out of the grocery store, put that into the fuel cell, what you do is make aluminum

oxide. And then, if you want to recycle it and get the aluminum back, you supply a little electricity, not as much as you got out, but a little electricity will take you back the other direction if you've got the right catalyst. And there have been some discoveries, and I believe that people understand how to find that catalyst and how to use it. So, imagine that you're driving a car or taking a motorbike out, and it's got a roll of aluminum that big around, which slowly unrolls as you drive. *(laughter)*

DR. PIELKE: Let's take a question from the top.

DR. DAVID: That hadn't been considered, and I think, you know, that's the sort of thing that you ought to consider because I think hydrogen's got real problems, real negatives to it. *(male asks question)*

DR. PIELKE: All right, that question violates the repetition length, but it has to do with the impanelment of scientific advisory committees, and is there hope of impaneling an unbiased or somewhat objective committee, or are members necessarily selected with their political views in mind?

DR. DAVID: Well, you know, I say again. Go back to what John Ehrlichman said, "Just wait." It's not going to take very long, either. The whole thing will turn around. No, it won't take three years, either. You know, when advisory committees become superfluous, when they no longer are useful, it will turn around because people will ask, "Why is it happening?" and the answer will come out. And that will happen quickly.

DR. PIELKE: Let's go over on this right hand side. *(male asks question)*

DR. PIELKE: I fear this one violates the length. Let's get to the question. *(male continues to ask question)*

DR. PIELKE: Let me restate for the tape *(male continues to ask question)*

DR. PIELKE: So the question is, does Dr. David think that the Bush administration's attitude toward science will do some permanent harm to the scientific enterprise in this country?

DR. DAVID: You've got to realize, I'm not a strong supporter of what the administration has done in science. I'm really not. But, on the other hand, I have to tell you, I don't think that what they're going -- what they're doing or what they have done is going to harm the scientific community. If it did, we would have been very weak in our responses to these things. And we haven't been. And that has been brought to the attention of a lot of people out there, and they will be trying to sustain the scientific community and the engineering community. And that's what I call a "backlash." It's a backlash that tries to correct the things that go wrong. It's like a feedback system, and I -- so though I don't like it, and if I had a chance, I would try to convince the president that he's gone off in the wrong direction, but I don't think I would be very wise to do that. He would throw me out. And in the meantime, I can be trying to do things which are constructive to make sure that the rest of society sees science the way we see it. And I think that that's the right approach. I don't think you try to attack the president and the government of the country, otherwise people will call you a seditionist or something worse. But on the other hand, if you start doing important things that the government is not doing for odd reasons, such as

stem cell research, and you have a big success, that's the best answer. So that's sort of how I feel. I think it's not a question of waiting, it's a question of doing things which illustrate that what's being done at the present time is not constructive and not productive. *(male asks question)*

DR. PIELKE: So the question is Dr. David's views on the SBIR, Small Business Innovative Research project?

DR. DAVID: I think it's been a resounding success, I really do, and I think it has opened the eyes not only of small business people, but of the government people. So I think it's been a very good thing, and I don't think it needs to be expanded much more, but if they did, they might want to experiment to move up the number a little bit and see what effect it has and move it back down a bit and see what effect it has, as an incremental experiment. But I think it's fairly effective at the present time, and the fact that the R&D in government is going down is the only negative picture that I can see. It's definitely not keeping up with inflation and it's not keep up with science. So that's a negative.

DR. PIELKE: Way in the back there. *(male asks question)*

DR. PIELKE: So the question is, let me repeat for the tape, is does Dr. David think that the organized scientists in political campaigns, is that -- *(male continues to ask question)*

DR. PIELKE: -- organized scientist associations becoming political and how effective they can be?

DR. DAVID: You know, I think it's a mixed picture. They can have some influences, no doubt about that. They can embarrass the people that they're commenting on and all that, but I don't think it's a very constructive way to go about it. As I said, I think if you do something constructive along the lines that you think ought to be done, that's the best way -- that's the best answer to something like that. I was -- I knew about some groupie activities by scientists and engineers, and one of them was my boss at Bell Labs and another was Sy Ramo, who was one of the really important people in science and engineering for many years, and they put together a scientists and engineers for -- I think it was for Nixon. It was for somebody. But, in any case, I just don't think it had any effect at all, and I think it causes the people who do it more trouble than they know, because the people who are not recommended of that group, what do you think they're going to do if they get into the government? And there's no reason for it, really, to put together such a group unless you think it can be effective. And I've never seen one that I thought was effective.

DR. PIELKE: Let's take one last question. We have more hands, unfortunately, but why don't we take this person in the middle. *(female asks question)*

DR. PIELKE: So the question is, given that there's finite resources of oil on the earth, how should we manage the remaining supplies that are there? *(female continues asking question)*

DR. PIELKE: So what should we do with the remaining oil supplies?

DR. DAVID: Well, I think you're making a mistake, because you're using the wrong model of the oil resources. The model you're using is that there's a pool of oil there, and lots of people have a straw in the oil pulling it out and using it, and it's going down and down and down and eventually it will all be gone. *(female voice)*

DR. PIELKE: Let's let --

DR. DAVID: That's the wrong model. If you look back in history, and now this is ridiculous, but if you look back at the history of the oil industry and of oil, you find out a very interesting thing, and it's kind of funny. The more you use, the more there is. So the model is wrong. So you've got to find another model which will convince people that they need to take global action against burning petroleum. By the way, I think that one of the main arguments against it, is it's too valuable. After all, a lot of our chemistry is based on hydrocarbons. It's a hydrocarbon world, just as you said, and the idea that they use it promiscuously is ridiculous. We ought to do something about that. And by the way, some in the industry already have done things along that line. If you look at the electrical generator industry, there was a time when it was mostly oil driven. It was oil fired furnaces and the heat was used to turn turbines to make electricity. They haven't done that in a long time. About three percent of our electricity is generated using oil.

Most of it is generated using coal; about fifty-five percent uses coal, and if you don't like that, then go and try to convince people to use uranium because then that doesn't have all these disadvantages. Uranium is the way to go, or is it? You know, that's the kind of thing that has to be decided by the society, but I think, you know, taking the model you've got that oil is about to run out, I think there's no proof of it; absolutely no proof of it. It may be true and it may not be true.

DR. PIELKE: Why don't you join me in thanking Dr. David for a wonderful evening. *(applause)*

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I, Christopher Boone, Notary Public within and for the State of Colorado, do hereby certify: That the foregoing proceedings were transcribed from a digital recording and thereafter reduced to typewritten form under my supervision, and that the same is, to the best of my ability, a true and correct transcription of the proceedings as I was able to hear them on the digital recording made available to me for re-recording transcription;

That I am not related to or in any way associated with any of the parties to said cause of action, or their counsel, and that I am not interested in the event thereof.

In witness whereof, I have affixed my signature and seal this 18th day of October, 2005.

My commission expires August 16, 2006.

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Christopher Boone, Digital Reporter