THOM DUNNING: Let me once again welcome you here to the University of Illinois and the National Center for Supercomputing Applications. We’re delighted you’re all here with us on what is really a truly momentous occasion. We are in the process of bringing up one of the largest supercomputers in the world, a supercomputer that was designed to solve the most challenging problems in science and engineering, whether those problems are compute-intensive, memory-intensive, or data-intensive. It is truly a unique computing resource that over the next decade, or over at least the next five years, we’re going to see tremendous progress that’s been made--many breakthroughs will come out of the use of Blue Waters.

One of the things I did as I was preparing for this, I got to thinking back over my career in computational chemistry, and I realized that it was exactly 50 years ago today that I used a computer to solve a problem in chemistry that I couldn’t have solved without a computer. I was at a science and technology university in Missouri, actually the same one that Dan Reed was from, the second director of NCSA. I was taking a course in quantum mechanics, wasn’t a good enough mathematician to solve the equation that was presented to me. The university had just been touting that it had acquired one of the fastest computers in the world for technical computing. So I thought, “well, what the heck, I’ll go over and I’ll teach myself how to program the computer and I’ll solve that equation on the computer.” I did that, and much to my amazement the answer was exactly the same as you get when you analytically solve the equation. That convinced me that computing was going to be an important part of science, because although there are some equations that you can solve analytically, there are far more that you can’t solve in a closed form. And that’s where computing comes into play, where equations just get to be so difficult that no matter how clever an applied mathematician you are, you’re not going to be able to solve those equations, and you’re going to see some examples of these kinds of activities later on in the program.

So I’m delighted to have all of you here. We’re going to have several welcoming remarks to all of you, and I’m going to begin with Trustee McMillan.

[applause]

ED MCMILLAN: Thank you, Thom. Thanks for sharing that perspective. I was thinking back, to first exposure was doing punch cards. I was in the College of Ag at the time and we were trying to do feed formulations and we were trying to do it through the punch card process—Bob Easter’s come a long way since that time.

On behalf of the Board of Trustees it is certainly my honor to welcome you all and to express my deepest thanks to everyone—and I know there are lots and lots of people who had a hand in bringing us here today.

There’s no overstating what Blue Waters means to the University of Illinois, quite frankly to society. And as both a trustee and as a very proud graduate of the University of Illinois I hope that the entire U of I family shares the pride that I have of being a part of this today. The lightning fast supercomputer has again shone a global spotlight on our great university, adding a new tool and nearly unmatched power that’s unlike any on a college campus anywhere in the world. That’s quite a statement. Today’s launch is, in my opinion, only the beginning. Our university, our state will share an enduring link to the life-changing breakthroughs of Blue Waters and what it can yield, discoveries that hold promise for things like accelerating medical advances, predicting catastrophic weather events (like the snowstorm of Monday) [laughter from audience], or, something that hits home to me, the challenge of producing enough food and fiber
for this growing population, which is approaching 9 billion people. Challenges that I think Blue Waters is up to delivering.

Blue Waters symbolizes one of our core missions as a great land-grant university. We are an incubator where ideas become innovation, and that they serve the state, our nation, and our world by advancing society, driving economic growth, and paving the way to an even better tomorrow. My special thanks to the National Science Foundation for its confidence in us, to the State of Illinois—a big support in providing the support to get it going—to everyone who helped add this new chapter to our very rich legacy as a global leader in discovery and innovation implementation. It’s an investment that will pay dividends for my kids and grandkids and great-grandkids and all of us in here. To think of the long-term benefits it will provide.

Now it’s my pleasure and distinct honor to introduce the president of the University of Illinois, Mr. Bob Easter. Before he comes up here I just want to recognize that Bob has become the 19th president as of last July, capping nearly 40 years at the University of Illinois—he’s not that old, but he started very young. He started as a graduate student in swine nutrition and concluded his distinguished global career as a professor of animal nutrition, as a department head, as a dean, actually as an interim provost, interim chancellor, a little period as an interim president, but today I’m grateful for his leadership and I’m honored to introduce to you a man who’s committed to this university, Mr. Bob Easter. Bob.

[applause]

ROBERT EASTER: Thanks, Ed, it’s always a pleasure to stand at this podium. But I can tell you—and I’ve done it a few times over the years—I’ve never been happier than I am today. This is truly just one of those wonderful events that we need to pause and take time to celebrate.

Just a few months ago, we hosted another celebration marking the 150th anniversary of the Morrill Act, the landmark bill that was passed by our Congress early in the Civil War that created the great land-grant universities, like the University of Illinois. The sesquicentennial celebration touched off a year of reflection across the country, looking back at the impact that act of Congress had and the countless contributions to our nation’s social, technological, economic progress and growth that have resulted from the universities that were created more than 150 years ago. Blue Water is a perfect example of what a university can do. This powerful supercomputer symbolizes a 21st century application of a core mission that has guided the University of Illinois for a century and a half—using our power, the intellectual power within our faculty, staff and students to forge discoveries that serve the needs of our state and our nation and in the process advance humankind and our society.

But Blue Waters also stands for something else, and it’s important to say this here today: The value when government, private industry, and committed members of a consortium of scientists come together to do something truly transformative. Cray Inc. deserves our special thanks and appreciation for responding to a critical time for this project. Blue Waters would not have been completed in a timely manner without the reliable industry partnership that we’ve enjoyed. My interactions with Cray representative and the National Science Foundation leadership were professionally rewarding and truly a highpoint for me in my period as interim chancellor of this campus.

I also want to commend the University team here on the campus and especially at the National Center for Supercomputing Applications—Thom Dunning, Danny Powell, Bill Kramer and a host of others—for keeping us all focused on a successful outcome. It’s clear to me, and it became very clear as this project moved forward, why they have earned the respect and trust of national and state officials. NCSA delivers on its promises.
To say that this project is truly transformative is not merely hyperbole. The possibilities, it’s already been mentioned, are almost without limit. With its power of computation the demand that will be here as this machine works around the clock over the next five years. I believe that every breakthrough will add a rich legacy of discovery to the field of science, whichever field that happens to be, whatever discipline it occurs to; it will add to the legacy of this great campus, where the plasma screen, MRI technology, the Mosaic browser and a host of other technologies were brought into existence. And it will add to our own ability to see into the future and plan the next step in this field of technology. Each of these will add to a long tradition of service to society and a commitment to progress that has guided us since Lincoln’s pen was applied to that act of Congress 150 years ago.

So I’m proud to join Trustee McMillan in thanking NSF, the state, and countless others who have helped add this extraordinary new tool to our world-class research facilities. And, many thank Thom for the opportunity to be here with you today. Thank you.

[applause]

THOM DUNNING: It gives me great pleasure at this point to introduce our new chancellor; she’s not quite new any more, but still is rather new to the campus and we’re delighted to have her here. We stole her away from the University of Washington. So we’re very pleased to have her with us.

[applause]

PHYLLIS WISE: So before I get started with my remarks I wanted to read a letter than Thom you received today from the White House Office of Science and Technology:

Dear Thom,

I write to offer my thanks and congratulations for your service to the University of Illinois and the research community at large. During your eight years as director of the National Center For Supercomputing Applications, you oversaw the center during a time of incredible growth. Under your leadership, the NCSA obtained over $390 million in federal grant funding. This funding enables the NCSA to provide support to thousands of scientists and engineers around the globe. The completion of the Blue Waters supercomputer not only represents the development of a state-of-the-art resource available to researchers, but it stands as a tribute to your successful tenure at the NCSA. As your service draws to a close, I hope you will take time to reflect on your many accomplishments. Thank you for your dedication and service and best of luck in all your future endeavors.

Sincerely,
John Holden
Director of the Office of Science and Technology Policy

And I have a copy of the letter for you.

[applause]

It is not accident that we are one of the preeminent research universities on the planet. It’s the result of almost 150 years of investment, hard work, vision from our faculty; the drive to learn and achieve from our students; and continued strategic investment from the government, from industry, and from the academy. Discovery and innovation is part of our DNA, whether we’re talking about theoretical physics, whether we’re talking about chemistry or computation—it’s
not isolated moments of inspiration; this is all a fabric that is really part of what IS the University of Illinois at Urbana-Champaign.

There are no shortcuts to breakthroughs. You never can tell when they’re going to happen. But when people work together and have the kind of infrastructure and the kind of computing power that Blue Waters will enable, you can’t help but to know that there’s great promise in the future.

Blue Waters and the petascale computing facility represent the next link in this long chain of events. Today we face challenges more complex and on a grander societal scale than at any time in our history, whether you’re talking about food security, whether you’re talking about information, whether you’re talking about energy allocation, whether you’re talking about just chemistry and math and physics, there are no simple answers that are not able to be better enabled by computing. These challenges are on a scale that is beyond the capacity of any single researcher, and in fact any single university. What this computer will allow us to do is to collaborate with colleagues around in a better way than could ever happen without it.

So I thank you for being here today and celebrating with us this really wonderful moment, the culmination of a great deal of work and the beginning of a lot more.

And so it’s my privilege right now to introduce the governor of the State of Illinois, Pat Quinn.

[applause]

PAT QUINN: Well thank you, it’s an honor to be here on a special day and I think it’s so meaningful that we are gathered together at our flagship university, the University of Illinois, the university that really was envisioned by Abraham Lincoln when he signed the law 151 years ago called the Morrill Act that set up land-grant universities across our country. And this was during the Civil War.

Lincoln believed in big things, building a railroad across America, the Transcontinental Railroad, again during the Civil War. But he understood how important it was to have education for everyone, not just for the elite, and to have great institutions of education. And he was not able himself to see the beginning of the University of Illinois in 1867 after his assassination, but I’m sure if he was with us today he would be so proud of our announcement and our initiative that we are embarking upon for the 21st century.

Lincoln was always intrigued by the technology of his day, the telegraph and many other things, but he couldn’t possibly envision what we’re talking about with this supercomputer. And it was a team effort, with the federal government and our state government—we built a building with about $60 million of Illinois taxpayers’ money to house this special machine, this computer.

We want to thank all of those who were involved at the university, those who are with the National Science Foundation who know what this can produce in terms of research for not only our country but our world, for the many advances in science and engineering and medicine that this can provide for all of us. I think it’s really very, very special.

I want to thank President Easter for leading this great university. I last year went to Brazil with Chancellor Phyllis Wise—the University of Illinois is known all over the world. I was with President Easter before when we were in China, and the University of Illinois has literally thousand, tens of thousands of graduates, alumni in China, the largest population on earth of any country. And so it’s important that we understand that today is a special day for our planet. And we owe many, many people and companies a great deal of thanks for their efforts, I would say their persistence. There are always in great endeavors sometimes challenges, air turbulence, and we were able to overcome that air turbulence and be here today for this announcement.
But I want to salute Cray company, Cray Inc.—and I know Pete Ungaro is here—I used to spend quite a bit of time in Chippewa Falls, Wisconsin, and I’m actually on the hall or the uh family tree of the Leinenkugel beer company, located in Chippewa Falls, Wisconsin. But one of my, I guess you would call in-laws was a very good friend of Seymour Cray who started Cray Inc., who saw the possibility of these very large, very complex machines that could literally change humanity for the better. And he’s no longer with us but we certainly thank Seymour Cray and all those connected with Cray for coming to us at a very key moment to come forward and help complete the mission, to complete the machine that our people of Illinois had invested in the facility to house the machine, wanted to make sure that supercomputer was completed. Thank you Cray, and thank you for all the people who worked with the company.

I saw when he came in a moment ago, Congressman Tim Johnson for his commitment to this idea and this mission. It’s said in scripture that where there is no vision, people perish. We have vision in Illinois. We are not perishing. We understand that our state in the middle of the United States, the heart of the heartland, is a special place.

This university in particular with its tremendous advances to human knowledge and research and great products—I was here not too long ago and I would want to say every day I’m here Nick Holonyak, professor still in the labs here at the University of Illinois, he invented LED lighting, and just yesterday I was in Forest Park, Illinois, and the mayor told me their entire community is the first LED community in America. They took all their lighting in the whole community and converted it to that technology, invented here, right at this university.

And I’m sure with this supercomputer and all of its applications, we’re going to find many innovations and applications and opportunities for teachers here in our state and all over the world, I imagine, to find innovations and inventions that will make our world better. So this is very special.

And it took an effort not only of Congressman Johnson but Congressman Dan Lipinski, who worked at the federal Congress to get the funding to make this possible. I want to thank State Sen. Mike Frerichs, the senator from this area, who understood how important this message was for the university but also to our whole state of Illinois. And Rep. Naomi Jakobsson, who voted for along with Sen. Frerichs, our investment in infrastructure in Illinois.

If you don’t grow and build there is no way to have a strong economy, and we understand that in our state, that there are no Republican road or Democratic roads, there’s no Republican supercomputers or Democratic supercomputers, they belong to the people. And when we work together as a team in investing in things that are good for everyone, it’s amazing what human beings can accomplish when no one worries about who gets the credit. And that’s how I look at the world.

And I think it is important also to acknowledge our mayors, who are part of the Urbana-Champaign communities that are housing the university. I want to thank Mayor Laurel Prussing for her great support over many, many years and also Mayor Don Gerard.

And finally the acting director of the National Science Foundation Cora Marrett.

I want to thank everyone who was involved in this project. There’s a lot of things to do in Illinois, especially now; we have great challenges to our state and in the area of finance. But I thought today was very important for the governor of the Land of Lincoln, almost 13 million people in our family of Illinois, to come together, salute all of those involved in this initiative.

Together we’ll make the will of the people the law of the land. Thank you very much.
PHYLLIS WISE: Joining us today from our Illinois Congressional delegation are the current Congressman Dan Lipinski and former representation Tim Johnson. Congressman Lipinski has represented Illinois’ 3rd Congressional District since 2005. He’s been supportive of higher education and our mission because he’s very familiar with it. Prior to serving in Congress Dan served on the faculty at the University of Notre Dame and the University of Tennessee. In both his professional and congressional careers, he has long supported investing in innovation and scientific research at universities, national labs, and has been a strong supporter of the NCSA mission and of grants such as the Blue Waters project that support the long-term economic growth and allow the United States to compete in the global marketplace. Please join me in thanking Congressman Lipinski for his strong support of research and strong support of higher education, and also thank you for joining us today, Congressman Lipinski.

DAN LIPINSKI: Thank you, Chancellor Wise, for the introduction. It’s great to be here today on a day that’s important not just here for the university, for the state, but for the nation. Supercomputers like Blue Waters have traditionally been a strength of the U.S. investment in research, but today our technological lead is being challenged. While the U.S. is home to roughly half of the 500 fastest supercomputers, as measured by the TOP500 report, the Chinese have gone from 10 such computers five years ago to 72. I know there are problems with particular lists, but it helps to make the point that America needs to keep investing to maintain our technological advantage. And Blue Waters is a vital investment that helps keep our nation at the top.

Now some might ask, especially with all the budget problems, why is this so important, and why do we need to keep this investment up, why is the Blue Waters investment so valuable? Well as the governor said, he mentioned the quote from Proverbs, “Where there is no vision, the people perish.” That is up on the wall of the House Science, Space and Technology Committee in Washington, D.C. Blue Waters is more than just a science project. For one thing, computers such as Blue Waters can be used to give American manufacturers an advantage over their international competition. Computing power allows American companies to develop prototypes faster and at much lower cost than international competitors. That means more manufacturing jobs here in the U.S. Blue Waters can also be used to model weather and climate systems in much greater detail than ever before, as Trustee McMillan talked about.

But also by building supercomputers we can extend the frontiers of computer technology; we can make processors smaller and faster than ever before and develop new architectures that utilize multiple processors in parallel. The benefits can be seen in smartphones. Now something that really gets down to our pockets—smartphones. They have now today more computational power than in the fastest supercomputers 30 years ago. This also means jobs. Because people who know how to build the fastest systems with the best technology are ready here in the U.S. And by doing this at a university, we have the added benefit of getting students involved, training the next generation of computer experts.

In 2010, I wrote the section of the America Competes Act that authorized programs at the National Science Foundation that fund computers. I’m proud to stand here today and see the fruits of efforts such as that. I want to thank everyone here at the University of Illinois, including President Easter. I want to thank the NSF, we have Acting Director Cora Marrett here with us today. And I want to thank Cray for all the hard work that made this possible. And everyone else who was involved, both at the federal level and in the state government. For me it’s a reminder that it’s time for Congress to get back to work on another America Competes bill so we can keep
America at the head of the pack. I look forward to working with all of you, and again, congratulations on this great accomplishment. It took many years to complete, many roads that you had to travel down, but after all these years it’s great to see this done. It’s going to do so much here locally, the state, the nation and, as the governor said, around the world. Thank you.

[applause]

PHYLLIS WISE: We’re also really fortunate to have here today a long-time supporter of the University, Congressman Tim Johnson. This is truly a homer. He was born and raised here in Urbana, graduating Phi Beta Kappa, receiving the Bronze Tablet as an undergraduate here, and then going on to graduate with honors from our College of Law. In 1971 Tim won his first public position and was elected to the Urbana City Council. In 1976, he moved on to the Statehouse and won the first of 12 terms as state representative in East Central Illinois. And then in the year 2000, Tim was elected to his first term in Congress, the 15th Congressional District in Illinois. In his United States Congressional career, Tim as a constant advocate for both the University of Illinois and science in general, he was one of our best friends. He has always been a strong voice for the NCSA program, including Blue Waters, and has helped to coordinate the support of the Illinois congressional delegation for this project. After 12 years in Congress and after 40 years of public service, Rep. Johnson did not see re-election in 2012. He’s returned to a law practice and is also serving on the faculty of Illinois State University. Please join me in recognizing and welcoming, Tim Johnson.

[applause]

TIM JOHNSON: Well thank you Chancellor Wise for your kind words. Also thank you for the superlative service that you provide us in your capacity as chancellor of this great university. Dan Lipinski’s and my mutual friend Adam Smith from the University of Washington, before you even came here, told us what an outstanding addition you’d be to this university and he’s been if anything understated. And I would be remiss if I didn’t also say that President Easter combined with Chancellor Wise and the other folks here at the University provide us with a human infrastructure that is without peer.

It’s always good to be home here at the University of Illinois. I see a lot of friends as I look around the audience today. And I too would like to add my congratulations to Director Dunning, and to NSF Director Cora Marrett, and to the entire University of Illinois community for the opening of the Blue Waters project. Since the initiation of the first supercomputing centers back in the mid-80s, NCSA and the University of Illinois have been at the very cutting edge regarding research and computer performance. This Blue Waters project will also include far-reaching educational, economic, and workforce development programs, and I think I’d be remiss, since most of here are residents of this community if I didn’t point out the astounding effect, economic and otherwise, to the greater Champaign-Urbana area of what we’re doing here today and this center. Dan and I had dinner last night at one of the local restaurants together with numerous other businesses in the community that have a direct or indirect benefit from what we’re doing here. So I think that is not irrelevant to anybody in here, it’s certainly not irrelevant to somebody who has served this area.

When I was elected to Congress in 2000 the Illinois delegation was already working in support of NSF programs for advanced computation research, in partnership with Denny Hastert, the speaker, the Senators Durbin, Fitzgerald and then later Sen. Obama, now President Obama, and my fellow House members at the time including Mark Kirk and Judy Biggert and my very, very good friend Dan Lipinski we worked together to support agencies, programs, and projects, like NSF, NCSA, and Blue Waters. I will say, I was on the Science Committee, Dan now plays a critical role on the House Science Committee together with the new chair of the Science
Committee, Lamar Smith. And I think we’re going to see even greater things emanating from that committee, and specifically from Rep. Lipinski.

Our efforts were and continue to be, and I emphasize, bipartisan, with numerous delegation letters and measures in support of such projects. And I strongly encourage Congress, the state Legislature, and otherwise to return to those bipartisan efforts in support of science, innovation, and education. What we’re doing here is not Republican or Democrat, it’s not conservative or liberal, it’s human progress. And I emphasize the extraordinary significance of working together, both at a federal level, a state level, and for that matter at a local level to realize the progress we’re here. The University of Illinois and the students and faculty here are worthy of our very, very best efforts. I’m proud of my partnership with the university, and I’m sure, absolutely sure, that Blue Waters will take us to even greater heights in research, science, and economic development.

I would be remiss if I didn’t say that not only events like today but also the whole process by which we juxtapose NSF, appropriations, committee hearings, and otherwise—there’s a legislative shop that the University of Illinois has, Terry McLennand and his colleagues in the legislative office do an extraordinary job and get very little recognition for what they do. But not only days like today but this whole project doesn’t come together without Chancellor Wise, President Easter, and a legislative shop who work with legislators, who work with the process to make it work. I think those are sometimes under-recognized heroes in the process, and you certainly...you Terry, and your colleagues in your office, do an extraordinary job and make my job, Dan’s job, Mike’s job, Gov. Quinn’s job, frankly, a whole lot easier.

So thank you again for letting me be here. I’m honored to be here, I’m honored to be a part of the process, and I want to do everything I can to continue to work with this wonderful university and this wonderful area for continued progress on the part of humanity. God bless you all.

[applause]

ROBERT EASTER: Thanks Congressman Johnson, and thanks very much for your long years of service and support for the University of Illinois.

Gov. Quinn was on a very tight schedule today as you might have noticed, but he did ask that I read a proclamation on his behalf. And I’ll read the opening “whereas” and then the “therefore.”

Whereas American innovation in science and technology fueled by public and private research investments have created economic prosperity, improved our quality of life, and united to those who serve our state and nation....Therefore, I, Pat Quinn, Governor of the State of Illinois, do hereby proclaim March 28, 2013, as Blue Waters Supercomputer Day in Illinois and encourage everyone in the Land of Lincoln the important role that innovation and technology plays in the future of our state.

It’s signed by Gov. Quinn. Thom, I’d like to present this to you.

[applause]

I also would like to recognize some other elected officials who are with us today. Sen. Frerichs was with us until just a moment ago and he had to leave for another commitment. And I think I also saw State Rep. Chad Hays in the audience and he also had another commitment. But our local representative Naomi Jakobsson is still with us, if you would raise a hand. [applause] Rep. Jakobsson, thank you so much for being with us. Mayor Gerard from Champaign was with us earlier today, I think Mayor Prussing is still with us, thank you so much for being part of this
event here today. From Sen. Durbin’s office, Justin Cajindos is up front here. Justin, thank you for being here. From Congressman Rodney Davis’ office, we have several: Andrew Flach, Kayleen Carlson, Jen White and from the office in Washington, Bobby Frederick—please raise your hand and we’ll acknowledge you. Thank you for being with us. Congressman John Shimkus’ office Deb Detmers, and from Congressman Randy Hultgren’s office, Kevin Smith. I visited with Kevin just a few minutes ago. Thank you so much for being here. Thom?

[applause]

THOM DUNNING: It’s my pleasure at this point to introduce the vice chancellor for research here at the University of Illinois, Peter Schiffer. Peter Schiffer is, in effect, my boss, because I report to him, but as you know in a university nobody is truly anybody’s boss, but it’s good when you have bosses that you really get along with. We’re really pleased to have Peter here; the university lured him away from Pennsylvania State University. He’s a well recognized physicist in his own right. So we’re delighted to have him here, and I’m delighted to have him as our vice chancellor for research.

[applause]

PETER SCHIFFER: I actually count Thom as one of my bosses. [laughter]

So on behalf of the researchers at the University of Illinois, thank you all for joining us on this historic day. As some of you know, and as Thom just said, I joined the university community rather recently, so I really can claim no responsibility for bringing Blue Waters here. But I can, however, claim tremendous pride and excitement as I think about the scientific challenges and the technological improvements that Illinois researchers and others from around the country and truly around the globe will now be able to tackle thanks to this phenomenal machine.

Blue Waters joins a long and distinguished line of cutting-edge scientific tools that allow researchers to deeply probe the natural world. First microscopes that allowed biologists to observe microorganisms now allow us to observe individual atoms; the gene sequencers that started out by trying to understand the structure of DNA in general and can now routinely sequence thousands and thousands of individuals’ genomes every day. Technologies and the scientists and engineers behind them are essential to pushing forward the frontiers of human knowledge. And now Blue Waters joins that long history and does the same for us today.

Now science is rarely limited by imagination, but it’s often constrained by the tools that we need to see further and go deeper and learn more. Blue Waters helps change this, and it opens new doors for discovery. By placing Blue Waters at the heart of our university, we are immersing it in the land-grant tradition of ground-breaking scholarship across multiple disciplines and support of the nation’s economy through applied research and partnership with industry. This wonderful new tool will enable researchers at Illinois and everywhere to be more productive, to generate knowledge and understanding that would otherwise be out of reach. We are deeply grateful to our partners for their support in bringing Blue Waters here, and I’m personally very, very grateful to the staff on campus, at Cray, and in the NSF and state government for their heroic work in bringing us to this day.

I’m sure all of you will share my feelings of excitement and anticipation about the outcomes of this tremendous investment that we’ve made in our nation’s future. Thank you again for helping us in celebrating this day.

[applause]
THOM DUNNING: I have the distinct pleasure at this point of introducing somebody that, I think it was maybe 20 years ago that we first met, this is the president of Cray Inc., Peter Ungaro. When I was at Pacific Northwest National Laboratory, we were a group of computational chemists figuring out how you can solve some of the problems that were really important in the environment. We needed the computing tools to do that, and we started talking with Peter, who at that point was working for IBM [laughter]. Fortunately, he didn’t remain at IBM, [laughter] he switched to Cray, and came riding in on his white horse when our former partner in this project decided to bow out, and we’ve been tremendously grateful for the really the strong partnership that we’ve had with Cray in this process. Peter likes to say, sometimes when people are working together you didn’t know who was Cray and who was NCSA, because they really were a team. Peter.

[applause]

PETER UNGARO: Thanks, everyone, and welcome to all of our distinguished guests.

I couldn’t be more excited to be here today to celebrate this amazing project. At Cray, I think the thing that gets us up in the morning to come to work every day is the knowledge that our systems, when put in the hands of amazing scientists and engineers, have the chance to change the world. And I cannot think of a better place and an opportunity for that to happen than the Blue Waters project. I’m thrilled that in this remarkable setting the largest supercomputing and storage solution that we as a company have ever built will be put to use across a very important set of scientific problems.

As the world talks about high-performance computing and simulation to achieve national competitiveness, as we look at virtually every company on the planet right now trying to figure out big data, and how to apply that and how that’s going to impact their future and how to best architect a solution for that—at Blue Waters, you’ll be living that today.

At Cray, we’re a company that prides ourselves on performing some of the leading-edge engineering to build key technologies to enable some of the fastest computers and big data environments in the world. And so being part of a project like this is really a very, very big deal to us, and something that we take a lot of pride in, as I know all of you also do.

So I simply want to say thanks to the National Science Foundation, to government leaders at both the state and federal level, and of course to the University of Illinois and NCSA—in your vision and leadership in making all of this possible. And of course in your confidence with Cray.

Gov. Quinn spoke about Abraham Lincoln, and I’ll end with a quote from Abe. He once said that the best way to predict the future was to create it. And at Cray, we couldn’t agree with that any more. And we’re thrilled to be a partner with you during these very, very important times for our nation. So on behalf of our entire company, I want to say congratulations and all the best as we begin our partnership. It’s going to be an amazing ride. Thanks very much.

[applause]

THOM DUNNING: When we were awarded the award for the Blue Waters project in 2007, the director of the National Science Foundation at that point, Arden Bement, was a member of the faculty at Purdue University. Purdue University was part of the Great Lakes Consortium for Petascale Computing, and therefore Arden had a conflict of interest in dealing with us on this project. Fortunately, he had a very able deputy that he called on that we interacted with over the years. And I have to say, Cora, we greatly appreciated your support. So with that, I’d like to introduce the new acting director of NSF, Cora Marrett.
CORA MARRETT: To the trustees, President Easter, Chancellor Wise, Rep. Johnson, all the distinguished guests and colleagues who are here today, I want to thank you for your long-standing support for the development of what is an extraordinary facility. Let me also acknowledge and thanks appreciation to all of the university, to NCSA, to Cray, NVIDIA, for your dedication and agility—and that has been agility—the agility you have shown to make the Blue Waters supercomputing center a reality. I do want to single out Rep. Lipinski, for your presence today, for your support of this activity, and for your continuing unwavering dedication to the vision that undergirds the National Science Foundation. Thank you.

This in an important day for all of us, and the National Science Foundation is proud to have played a role in the Blue Waters partnership. NSF helped lay the groundwork for the entire field of computer science, beginning with the funding of computer science in numerous universities in the 1960s. NSF was also and early supporter of high-end computing, establishing five supercomputing centers in the 1980s—that includes NCSA. In the 1990s, NSF led the multi-agency digital library initiative that helped the burgeoning field of accessible interfaces. This is simply to say, we’ve been at this for a while and appreciate the chance you’re giving us to continue the kinds of investments. NSF we like to think of as being at the epicenter of the U.S. science and engineering innovation ecosystem. It’s not just about the investments but about investments for innovation. Because that ecosystem is the bedrock of our economic prosperity and national security. How do we do this? It’s not by the people who are in the buildings that house the National Science Foundation, but rather it is by engaging the scientific curiosity of literally millions of scientists, engineers, researchers, educators around the country. And we are so fortunate to include in that number the outstanding scientists, engineers, educators, researchers from here at the university. We can draw on our decades of providing funding for leading-edge multidisciplinary science and engineering. And for all of these reasons I am proud. I’m proud to be able to stand here today on behalf of the 1,500 people who are at the National Science Foundation and who work extraordinarily hard on a daily basis to make the vision that undergirds the Science Foundation, to make that vision a reality. And I’m joined by other colleagues here today.

With reference to Blue Waters: Blue Waters is a prime example of NSF’s commitment to identifying challenges, identifying these early, and seeking to make sure that the best tools are in place to support the exploration of those challenges. Blue Waters, as has been clear from all the comments made already and everything that will come later, Blue Waters will be an important proving ground for testing new ideas and new techniques. It will enable scientists and engineers to tackle a wide range of challenging issues, from predicting the behavior of complex biological systems to simulating the evolution of the universe. It will expand our capacity to fuel discovery and innovation in a broad array of fields. All with the goal of enhancing life and expanding scientific understanding of our world.

I am very impressed, again, by what can be done by the kinds of commitments made to this particular effort. And its extraordinary computing power, as you’ve already heard. This means we’re at a significant milestone in advanced computational infrastructure, pushing boundaries that we could not have even envisioned a while ago. But we at the National Science Foundation are also pleased that Blue Waters includes a far-reaching educational and workforce development program. The program will impact students from K-12 to through post-graduate education, reaching out to geographical areas and communities that historically have been underrepresented in science, technology, engineering, and mathematics in general and in supercomputing in particular. All of these efforts will be critical as we work to create the technical workforce so important for the advances, the leadership needed for the 21st century.
This is a unique catalyst. A catalyst, an activity that holds the promise of producing profound breakthroughs in the years to come, fostering significant advances, advances in science and engineering for future generations. Thus as I said at the beginning of my remarks, this is an important day for all of us. And I am personally grateful to have had the chance to be a part of this development and to be able to stand with all of you in celebrating this dedication, and in being here on Blue Waters Supercomputing Day. What an honor! So let me again say, thank you for granting me personally the privilege of sharing this important occasion with all of you.

And with that I’m going to turn to my colleague, one of my colleagues, from the National Science Foundation, Dr. Farnum Jahanian, who serves, who oversees our programs on computer and information science and engineering. This particular part of the foundation now includes what had been the Office of Cyberinfrastructure, and we’ve made the change in order to strengthen what the foundation can do. A bit about Dr. Jahanian, he holds the Edward Davidson Collegiate Professorship in electrical engineering and computer science at the University of Michigan, and in fact served as department chair for computer science and engineering from 2007 until we were able to lure him to the National Science Foundation. Let me then welcome to the stage, Dr. Jahanian.

[applause]

FARNUM JAHANIAN: Thank you, Cora. It’s good to be with you this afternoon. Rep. Lipinski, Congressman Johnson, President Easter, Trustee McMillan, Chancellor Wise—this is what happens when you’re last in a sequence—distinguished guests and colleagues, it’s a great pleasure to be part of this historic event this afternoon. And on a very personal note, it’s great to see so many collaborators and colleagues from various departments at this university and also from NCSA. As Cora mentioned, I’m a faculty member from University of Michigan so it’s great to see all of you.

Echoing Dr. Marrett’s remarks, I want to thank everyone here for your many contributions to Blue Waters, one of the most powerful supercomputers in the world. In the world of advanced computational infrastructure, Blue Waters is a game changer. It adds to our nation’s computational infrastructure by offering sustained petaflops performance and fast and massive storage and by supporting parallelism across thousands, perhaps hundreds of thousands, of processors. With these capabilities Blue Waters will allow researchers across the world, across the nation, access to the most powerful computational resources available today, promising further research at the frontier of computational and data-intensive science and engineering—again, across all disciplines. Think about the possibilities, and others have alluded to this already: providing insights into the behavior of complex biological systems, from cells to ecosystems; the fundamental nature of matter; the design of new materials at the atomic level; as well as the behavior of earthquakes, hurricanes, and tornadoes; enhancing our ability to model climate change and predict disasters.

Before I go any further, on behalf of my colleagues at the National Science Foundation, I want to take a moment to acknowledge Thom Dunning’s leadership, and his team at NCSA for their talent, unique combination of technology foresight, exceptional operational expertise—and let’s not underestimate that part of it—and deep understanding of scientific processes and workflows. As was mentioned, before coming to NSF I was in a neighboring state northeast of here for a couple of decades as a faculty member. I must tell you that I watched a great work here at the University of Illinois and NCSA with great admiration over the last few years. You folks have left no stone unturned in garnering institutional support, engaging the research community, and in partnering with terrific private sector, including Cray. Thank you so much for everything you’ve done.

[applause]
I also want to acknowledge very quickly my colleague Alan Blatecky for his leadership of the cyberinfrastructure division at the National Science Foundation, and also his team at NSF, especially Irene Qualters and Barry Schneider for significant contributions to advancing cyberinfrastructure for our nation’s science and engineering. Thank you, folks. We appreciate that.

[applause]

In the remaining moments that I have, let me offer some context, why this facility is so important to our nation. As Cora mentioned already, U.S. science and engineering innovation ecosystem serves as the foundation of our economic prosperity and national security. We are entering a new era of science and engineering. It’s anchored by the era of observation, and transformed by the new era of computation and data. Access to advanced cyberinfrastructure—including computational resources, storage capabilities, high-speed networks, software—has increasingly become a critical component of the science and engineering ecosystem. It’s transforming the culture and conduct of scientific discovery and engineering innovation. In this new era, that’s pushed by advances in computation and data-intensive techniques, and pulled by the expanding complexity, scope and scale of today’s national and global priorities, we have a unique opportunity to accelerate the pace of discovery and innovation in nearly all fields of inquiry. Breakthroughs enabled by the extraordinary computing abilities of Blue Waters will catalyze many areas of science and engineering. It will allow researchers across the United States to open new windows into phenomena as vast as the universe and as small as nanoparticles.

In closing, our investments in research and education have returned exceptional dividends to our nation. A thriving innovation and discovery ecosystem is the foundation for sustained economic prosperity and national security. It serves as a key driver of U.S. competitiveness and sustainable economic growth, particularly in an increasingly global market. And it’s crucial to achieving many of our national and global priorities. Our world today stands at the threshold of profound breakthroughs in science and engineering that offer solutions to society’s most vexing challenges. Realizing the enormous potential of cyberinfrastructure requires a long-term, bold, sustained, comprehensive approach. The work done here at NCSA using Blue Waters will help us cross that threshold and insure a better world for generations to come. Again, thank you for the opportunity to share this very special occasion with you.

[applause]

THOM DUNNING: Before we go on with the program I thought I would take this opportunity to thank Dr. Marrett for the advice and counsel you gave to us all throughout this project. It was much appreciated, and I say this on behalf of the entire Blue Waters team as well as the administration here at the University of Illinois. Thank you.

[applause]

So now we’re ready for the moment that everybody’s been waiting for, and that is to actually see some science in action. We have picked four of the science teams that are running on Blue Waters to address us. Two of whom can be with us, two of whom can not, cannot be with us. These teams, there are 32 teams in all that have been granted access to Blue Waters. These teams cover a wealth of science and engineering, from studies of the fundamental nature of matter through materials, through severe weather as you heard about, through global climate change, and then on to the cosmos and the universe. So this is really a machine that can truly address the most challenging problems that we have in science and engineering. And we tried to pick these four examples to give you an idea of some of the kind of breakthrough work that is given on Blue Waters.
Have you ever thought about, wouldn’t it be great if we could put the universe into a bottle, and then do experiments on that universe to better understand the cosmos and why it has the structure that it has? Well that bottle is called Blue Waters and we have a team from the Michigan State University, led by Brian O’Shea, who’s doing exactly that. He has bottled the universe, he is putting it in Blue Waters, and he is studying that process. So if we can go to Brian’s presentation … Brian unfortunately cannot be with us today, he has teaching duties at Michigan State, but he wanted to join us anyway and is doing so then by video.

(video)
BRIAN O’SHEA: Hello to all of you at NCSA! I’m Brian O’Shea from Michigan State University, and I’m very happy to be part of the Blue Waters launch celebration. I’m also very sorry to not be able to be there in person. I study the formation of galaxies, in particular how the first galaxies in the universe formed and how they turned into galaxies like our own Milky Way. I work with collaborators at UC San Diego, Columbia University, Georgia Tech, and Berkeley, and we’ll be using Blue Waters to perform the most advanced and highly resolved studies of galaxy formation ever done. Blue Waters gives us the ability to include important but expensive physics into our simulation, physics such as radiation transport, which we know is crucial to galaxy behavior but which has been too expensive to do at this scale before. With these simulations we hope to learn a tremendous amount about how early galaxies interact with their environments and with each other. Now I’m going to go ahead and launch our first Blue Waters simulation. [typing] And with that, off we go! Thank you for your time, and I hope you enjoy the rest of the celebration!

THOM DUNNING: Brian’s simulation is being brought up on Blue Waters as you see it filling up, it’s filling up that section then of Blue Waters. I saw Mike Norman earlier, and Mike is here from the University of California at San Diego, and he’s one of Brian’s collaborators on the project.

We all know that the climate’s changing; there may be arguments over exactly what the cause of climate change is, but it’s very clear to us at this point that there is a change in the climate. We need to understand what that change is, and further we need to understand if there are steps that we can take to mitigate those changes. Because although globally a rise of maybe only a couple of degrees Centigrade doesn’t seem like an extraordinary amount, the consequences for the nation and the world are rather severe.

One of the major activities that will be carried out on Blue Waters will be trying to refine that model of the global climate. All models have inaccuracies in them; as the computers get faster, as our understanding of the problem grows, those models become closer and closer to reality. And with Blue Waters, a group a George Mason University, Christiana Stan and Jim Kinter, will be actually using Blue Waters to understand the causes of the variability in the climate predictions and how they can be improved. If we can hear Christiana’s and Jim’s segment.

(video)
CRISTIANA STAN: Hello, everyone, my name is Christiana Stan and I am an assistant professor at George Mason University and a research scientist at COLA.

(video)
JIM KINTER: And I’m Jim Kinter. I’m also a professor at George Mason University and director of the Center for Ocean Land Atmosphere Studies.

CRISTIANA STAN: We are so happy to be joining you in this celebration and to present our project, which includes climate scientists and high-end computing scientists from four institutions: COLA, Colorado State University, NCAR, and University of Miami. This team will
use Blue Waters to test a new generation of climate models and address the problem of errors and unpredictability of conventional global climate models. Using Blue Waters we aim to produce global climate simulations, and I would like to emphasize the word “global,” with dynamic representations of climate processes at their native scale and eddy-permitting resolutions in the ocean. We already know that a great deal of uncertainty in climate predictions and projections of climate change is due to inaccuracies in representation of cloud and mixing processes in the ocean. The new simulations are expected to reduce the errors due to conventional parameterizations and to narrow the gap between the theoretical limit of predicting ability of the climate system and prediction scale. The ultimate goal of our project is to generate climate predictions that can be reliably used for understanding the impact of climate change at regional scales.

JIM KINTER: We’re very excited to be able to use Blue Waters. We see it as an opportunity to potentially have a breakthrough in our simulation of climate variability and climate change, because we’ll be able to, for the first time, represent fundamental aspects that determine those aspects of climate variability and climate change.

CRISTIANA STAN: And we are now going to launch a job on Blue Waters. [presses key] Bye!

JIM KINTER: Bye!

THOM DUNING: Last July fourth, there’s was a major announcement that came out of Europe, came out of CERN, that the high-energy physicists had seen the first evidence for the Higgs boson. This is one of the most fundamental—I guess I can’t call it a particle it’s more of a field—one of the most fundamental aspects of the universe around us, this is the particle that gives mass to all other particles. That work is complemented by theoretical studies of the elementary particles involved in our world. And Steve Gottlieb from Indiana University is one of the team leaders of a group here that is studying exactly that phenomena. We were extremely fortunate that last year we had Jim with us, or Steve with us, for a very extended period of time, and during that time it actually led to a lot of fruitful side conversations as well as the main thrust of what he’s going to be talking to us about today.

[applause]

STEVEN GOTTLIEB: It’s a great pleasure to be back here at NCSA where I spent a wonderful year on sabbatical, and let’s leave it at that for now. And so you know who I am, I’m representing Robert Sugar from UC Santa Barbara, he’s the PI of our project. Our project is in lattice quantum chromodynamics, and it contains many collaborators from U.S. QCD. This is a national project that involves most of the U.S. researchers in the field. They won’t all be using the computer at once.

We study how quarks and gluons interact to form the particles seen in nature and we’re calculating the effects of the strong interaction on decays of heavy quarks. These calculations are necessary to extract CKM mixing elements from experimental results and to search for anomalies that would be evidence for physics beyond the Standard Model of physics. CKM is short for Cabibbo–Kobayashi–Maskawa. Kobayashi and Maskawa earned the 2008 Nobel Prize for defining the CKM matrix and their recognition that it could be the key to understanding the matter/anti-matter asymmetry of the universe. However, it’s up to experimentalists and lattice QCD researchers like us to determine the actual values of the matrix elements.

Blue Waters is essential to our quest to reduce the lattice spacing in our calculations and to use quark masses as light as in nature. These improvements will allow us to reduce the systematic errors in our calculations and keep up with the constantly reducing errors from the experiments. Without these improvements to the theory the value of the expensive experimental results is
reduced and evidence for new physical phenomenon may be missed. I’m now going to launch a
job on Blue Waters. [types]

[applause]

THOM DUNNING: The leader of the next science team is well known here at the University.
All you have to do at NCSA is mention the name Klaus, and everybody knows exactly who it is
you’re talking about. That’s Klaus Schulten from the Physics Department here who is a professor
of biophysics at the University of Illinois. Klaus has for years been doing biomolecular
simulations that are really key to understanding a number of phenomena, phenomena going all
the way from how it is that viruses manage to invade the defenses that your cells have and get
inside your cells all the way through how can you improve photosynthesis by studying the basic
chromatophores of photosynthesis itself.

So Klaus, I’ll turn it over to you.

[applause]

KLAUS SCHULTEN: I’d like to begin by expressing my gratitude for what is made available
for us here. I realize from the history of science but also from my own experience, 40 years as an
academic professor, that you really depend on circumstance. It’s the hard work and the
generosity of many other people that made our successes possible, and I have proof of that in my
own life. My wife and I came as faculty members 25 years ago here to this university from the
University of Munich. We had no mountains here, but we had NCSA!
[laughter]

And in fact I’m looking forward to this day since the time we arrived here, since 25 years ago.

I want to tell it in the example you see there [gestures to screen], which is the closest view ever
of an HIV virus, of the deadly HIV virus. We worked in a real maelstrom since 25 years to
develop software that we call a computational microscope. We have on our team leading people,
the main leader is Sanjay Kale, a professor of computer science here and a world leader in
parallel computing. But also Jim Phillips and John Stone, who are well known in the
programmer community at large as, I quote, “godlike programmers.”
[laughter]

Our huge effort over the years is reflected also in a huge price tag, namely $20 million that NSF
and NIH have invested into the development of the software that we use today. You might be
worried that that might not be a good investment, but don’t worry. The software is used actually
by over 250,000 users all over the world. So there is great popularity and great use that came out
of this.

But the popularity is a trickle down effect of what we can now accomplish with Blue Waters. We
just succeeded to resolve with Blue Waters the chemical structure of the HIV virus, which you
just see there. To be precise, this is the capsid of the HIV-1 virus. We did this by teaming up
with leading medical researchers in Pittsburgh, and by combining then the most extensive and
best experimental data into the chemical structure that you see. The data were so complex, that
only Blue Waters was able to computationally resolve it into this microscopic view. All other
structures that were done similarly were only about a factor hundred smaller. Nature magazine,
the world’s leading science journal, just informed us last week that they will publish our
experimental computation study in their journal, very soon. And so we can claim already we had
a Blue Waters success, a major breakthrough, just when we were testing it. Though we hope, of course, for more.

Now getting the chemical structure of the HIV virus is just the first step. Now we want to use the discovery for a new era of pharmacological warfare against HIV. Pfizer, the well known pharmacological company, has developed a compound, PF-74, that we think can glue the virus shut so that it cannot release its deadly genetic material after it enters a human cell. Blue Waters can allow us to see if there are weak spots on the surface of the virus where the PF-74 can enter the virus and can shut it. Now the problem is that the virus is a real thing. It has a very uneven surface. It’s not all the same. So we have to look for the weak spots where PF-74 can enter and close the capsid so that it cannot open. And though this is such a huge simulation we needed to do, involving 64 million atoms—that may not mean much to you but I can tell you that’s the largest simulation ever done on a computer—and so we need Blue Waters to do this kind of real-world, real medical study.

So our team can hardly wait to see the weak spots on the surface of the virus with our computational microscope. And so I would like to turn Blue Waters on—and we have actually developed our very popular software not only on the laptop all the way to Blue Waters with the same user interface, but of course using much more power from the various machines, but we even have a prototype on an iPhone [holds up phone]. And so I can now really literally push the button and let it go and [applause] and I can my colleagues really hope that in a few years we really come with a new drug. Thank you very much.

[applause]

THOM DUNNING: Klaus mentioned software that he wrote, he actually did that in collaboration with a professor of computer science at the University of Illinois, Sanjay Kale, and last year they were awarded the Sidney Fernbach Award from the ACM for this software piece that at Klaus said is now used worldwide by biologists and chemists to study the very challenging problems that they have.

Well that’s the conclusion of the science part of the presentation, and at this point, I’m going to declare that Blue Waters is open for business!

[applause]

We actually had canons to do this earlier and we were worried that the governor might stay around and we had a vision of shooting off the canons and having three state troopers land on top of the governor. [laughter]

I had a couple of other things before we adjourn to the reception I wanted to tell you about. A project like this, no single person ever does it alone. I can remember back in spring of 2006, seven years ago at this point, Rob Pennington and I were sitting chatting about the Blue Waters project, and the system that you see delivered today is the system that Rob and I conceived back seven years ago now. Rob, could you stand up?

[applause]

After Rob left us for a stint at NSF, and we were very happy to have him use his expertise at NSF, Bill Kramer joined the project, and I can tell you that Bill, we did a lot of twisting and turning as this project went along. Bill, could you stand up?

[applause]
This wasn’t just an NCSA project, it actually was a university project and we were extremely fortunate to have three outstanding professors here at the university that were co-PIs on the project: Marc Snir—stand up, Marc [applause]; Bill Gropp; and Wen-mei Hwu.

I hate to tell you but even the five of us or six of us couldn’t pull a project off like this. The first time that NSF showed up to do the site review for the project, there were something on the order of 80 people in the room. The comment to me from one of the NSF staffers was, “What are all these people doing here?” And I said, “They’re all part of the project.” Could the Blue Waters staff stand up? [applause]

One of the great things about an organization like NCSA is, there’s a tremendous amount of talent that’s here. Sometimes you don’t realize that you’re going to need that talent in a project until you get into the project. So would the NCSA staff please stand up? All of NCSA. [applause] This is what you get when you come to an organization like NCSA with a project as challenging, as complex as the Blue Waters project is that you can pull in what’s needed to make sure the project is successful.

So with that I’d like to close this part and welcome you to the reception that is outside. Let me again thank all of you for being here. This is a great day for NCSA. This is a great day for the University of Illinois. This is a great day for the National Science Foundation. And most important this is a great day for science and engineering in the nation.

Thank you.

[applause]