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***Election Reform***

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I don't do this often, but I came here for the weather. We had a full three weeks where it didn't get above freezing: Minnesota weather in Boston.

As Steve mentioned, I was brought into the Voting Technology Project by then-president of MIT, Chuck Vest, in December of 2000. He brought me in to "keep the engineers honest." As a social scientist, I knew very little about designing machines and so forth. So I had to read up – very quickly.

Election reform today has a lot of interesting technological aspects and a lot of interesting social science aspects. For me, it carried a lot of lessons about the American politics and also history of elections.

Let me say a little bit about the Voting Technology Project up front. We really have equal parts engineering and social science. On our team is one of the nation's leading computer security experts Ron Rivest. If you know anything about the computer world, he is the founder of RSA Security. We also have a couple of faculty in the Media Lab, which is really a crazy, far out place. And the social scientists on the project drew from economics and political science.

What was really nice about this project was that everybody came in equal. Everyone left his academic baggage at the door. If you were an assistant professor you

were on the same level as someone who was an endowed chair. We really had a common project because we knew that this was going to happen — election reform — was going to happen very quickly. It was going to unfold extremely fast, and it did despite some of the pessimism we heard from some of our colleagues.

At the same time that this project got started there were a few other projects around the country that cropped up, but they didn't have quite this interdisciplinary flavor. We had a distinctive goal, too. We didn't care who won the 2000 election; we wanted to understand what could be done and to provide information about technology to the public debate that was then unfolding.

If anybody here is an election administrator, a good question to ask yourself is where would you turn if you wanted to find out the consumer report for a voting machine if you wanted to buy it. There is nothing such as the Consumer Reports.

A few of us — there is a project now at Berkeley and one at Maryland — have taken on this role. We think it is an important role and hopefully the federal government takes over.

One of the pieces of election reform that came out of the Help America Vote Act was the creation of a new office. The only involvement that the federal government really had in running elections in the United States was an office that consisted of two people — the Office of Election Administration inside the Federal Elections Commission. It is hoped that the new Election Assistance Commission will be able to create standards, provide information, and distribute funds to make targeted improvements in U. S. elections in the future.

I want to start with a really brief history of voting. When we started our project we pretty quickly set out some goals. What we would like to have is a secure, accurate, easy-to-vote machine. When the project started there was a press conference in December of 2000. David Baltimore, the president of Caltech, thought up the project, and at the press conference stood up and said we are going to make an easy-to-use machine that is perfectly secure and completely accurate and reliable. He concluded – and these are words I have heard repeatedly over the last several years – “If we can put a man on the moon surely we can figure a way to develop . . .”

I think he hit the right notes. He hit the notes of we want security. We want accessibility. We want accuracy. We want some degree of confidence and trust in the system. It needs to be put back in. He had the wrong problem though. You see, it's not just the machines, voting is a system. There are a lot of component parts and it is administrated in a very localized way.

I want to start in the 1750s. When I was in England, several years back, I was touring some of the more obscure museums. In one, the Sir John Soane Museum, I saw four paintings that I absolutely loved by William Hogart and they are called *An Election*. Two of them in particular highlight some of the important aspects of voting.

One's *The Entertainment*. All sorts of things are going on in this painting. There's music, there's drinks, there's gambling, there's women, there's somebody being clubbed and so forth. These were the qualified electorate. A very small segment of the election was qualified. People went to great efforts to curry favor with them.

The fourth of the paintings is called *The Polling*. There is a lot of activity in the painting, especially on the steps of the building and underneath the eaves. There is the

actual voting going on and it is chaos. There is a line of people being brought up to it. There is someone who is very sick and blind. There is a dead person. This is rural England. There is a soldier wearing a red coat. He has a wooden leg so he has lost a leg and he has one hand and the election judges are in a heated argument as to whether or not he can actually swear that he is a qualified electorate because he does not have a hand. In the background in her carriage with the wheels off sits Britannia shouting for help but everyone is distracted by the election.

There are many themes that are very common, getting the military to vote. Absentee military voting is a big problem. It was a very big problem and controversy in Florida. Should we count ballots that came in too late from overseas personnel? We don't have a very good system for doing that. Out of all the election reform that happened from 2000 to 2004, that is the one segment that we really didn't fix. There was an attempt to fix it with internet voting and that got scotched.

Let us fast-forward to the United States. A lot happened between merry old England and the 1870s. A lot of problems of corrupting the votes remained.

This is a Thomas Nast cartoon of Boss Tweed. The cartoon shows him in all his glory. This is a ballot box up there, says "The Ballot," and the caption reads "in counting there is strength." Having localized administrative control over elections might make it very easy to perpetrate fraud and to have systematic corruption of voting – such as stuffing the ballot box.

The first big wave of reform we get in elections in the United States came at the beginning of the twentieth century. Part of that reform was the introduction of the voting machine.

The first voting machines were lever machines used in the 1890s in the United States, and they were really designed to capture the many components that we desire from the voting system, from election reform. They were secure. How many people voted on a lever machine? They weighed 900 pounds. They weren't going to show up in the river. When you walk into them it is as if you walk into a safe. It is all steel. You pull a curtain behind you. There is something that is nicely mechanical. At that time — if you put yourself back in the 1890s — this felt like pretty advanced technology. It was all mechanically lever driven, with switches and it felt like you were doing something useful.

In my town, Newton, Massachusetts, I would go to lever machines up until three years ago and I always wondered when I pulled that big lever, Did that work? What happened here? What happened inside that lever machine? What really went on?

I found these two great magazine titles. One is *Popular Science* and the other is *The New Yorker*, both from the 1950s. They capture where the voting machines fit in terms of the universe of technology. The first, from *Popular Science*, shows a person making decisions and going through choices and pulling the levers. The second, from *The New Yorker*, this shows the counting. This really captured the counting procedures for lever machines quite well. There are a couple of policemen, one here and one here. This was common that there would be policemen at the precinct overseeing the counting of the votes. There is somebody who is reading dials. There are little dials in the back of the lever machine and then there are a couple of people transcribing. This guy is transcribing numbers here and there are a couple more people watching. The lever machine really made the process quite stable. You couldn't lose the ballot,

couldn't stuff the ballot very easily though we heard stories about Philadelphia warming up the lever machines before the election. It was all so observable. These people were probably party poll watchers. Poll-watchers became a regular part of our scheme of election administration in the 1930s. Parties would send a few people just to watch to be sure things were going well.

There were a few problems with these and we discovered a few of them in Massachusetts. We found in some elections just reading down the list of votes for different offices and it looked pretty good, but then you get down to some race and 67 percent of the people or so would have not voted in that race. What would happen was the person recording the vote just read the dials. These dials are not labeled except with numbers and letters, like column 22, row A, and there's nothing that helps to translate those numbers into "this is the Proposition B election." So the people conducting the count would just err in reading the dials and all the numbers for all of the elections would be incorrect. So there were some problems in just recording votes, so there was some insecurity. Also this was a very slow process and what really starts to happen in the 1930s in the United States is the desire for a much speedier count.

For another project that I am involved in, I have been going back through old newspapers and finding old election machine reports. In Louisville, Kentucky — anyone from Louisville? The *Louisville Courier* has excellent reports from the 1930s and 1920s and so forth. Six people killed, all the shenanigans going on, ballot boxes found in the river, but it took about ten days to really get the vote in. A lot of suspense with elections came after the elections with what would the ruling tally reveal. The next set of reforms we had got rid of that.

**From the audience:** We got to vote much quicker when we had those than we do now with the punch cards because computers always break down.

There are other problems with those. So the next reform came in the 1960s and the first punch cards came in 1964. This was actually an adaptation by a political scientist at Berkley named Harris. He endowed the Harris Center at the University of California from the profits from creating the punch cards and selling them to IBM. But as we all learned in 2000, there are problems with punch cards. There is difficulty in determining what the voter intended, tabulator failures and so forth. For those of you who learned to program computers in the 1960s or 1970s you are familiar with punch cards. If you put those cards in the wrong way, you get the wrong count. If you accidentally drop the box on the floor, you could make a little mess of your election tally. These are not uncommon occurrences with punch card tabulations today.

The move has been to speed things up, to make things a little more stable and so forth. The next innovation to improve further on the speed and accuracy of counting was the optical scanner. Unisys came in to the voting business in the 1980s and developed a scanning ballot. There are two varieties, but the common one is you fill in a bubble next to a name and those are quickly read by an infra-red scanner like you see in the check out counter at supermarkets. Very, very fast.

The current debate is over electronic voting machines. If we vote on computers we can eliminate all the paper and speed up the counts even further. This slide shows a warehouse storing a large number of electronic voting machines and the computer scientists really hate electronic voting machines. The computer scientists see lots of

vulnerabilities. They see these machines taking over and what is lost is voter's intentions in the process.

I want to talk a bit about the reform more generally. What I've discussed so far is the machines, how the machines are involved, and what problems they've answered or not. But the bigger part of the process is really the things that surround the machines, the casting of the votes. Probably the most important piece that we discovered was registration. Making machines more accessible and so forth is quite important but actually getting people the right to vote and securing it and making sure that the registration rules are accurate, complete and that people are not discouraged from voting because of registration is quite important.

This is a photo from the Civil Rights era. African American leaders today remain very upset about election reform in the United States. The Congressional Black Caucus has been probably the most active part of the Congress on these issues. They have fought a generations-long battle for fair elections. Also very active in election reform after 2000 was the League of Women Voters, representing another group traditionally disfranchised from the system.

Reform today. I'm going to talk a little bit about first what we did and how Americans voted. When I took over the project I looked around and decided there was no information about how anything in the election system in the United States was working. Are we doing well? Are we doing badly? How badly? Where can we make some improvements? So the first thing we set out to do was to collect some data on machine performance. Are we having large problems with the machines we are using? Do I know if the lever machines are good or bad? Do I know if the punch cards are

good or bad? I don't know any of that information. We collected data very quickly and were able to write a report in January of 2001.

About that time my university president, Chuck Vest, asked me to go down to Florida to meet with his friend, Thad Foote, because Mr. Foote had just been asked to take over the Florida Election Reform Commission. I told him I would love to come down but one thing I am not going to do is come in and tell the people of Florida what they should do with their voting machines. I just went down and listened to three separate hearings.

He invited me to lunch at the first of those. He said, boy, I sure wish we knew what worked, electronic machines or optical scanning machines because what was going on in Florida in 2001 was not rapid data collection or anything like that. They were being inundated by vendors. Vendors saw this as an opportunity to sell a lot of machines. I said, "Well, Mr. Foote, I actually have the answer to that question, which is the only thing we have done so far in this study, and it says that the optically scanned paper is doing much better than the electronic voting equipment right now in terms of just capturing people's votes and recording and tabulating them in a reliable way."

What also turned out to be true in the data was that the most reliable system we have is hand counted paper. It is the slowest system we have, the easiest way to capture a voter's intention. Voters can do all sorts of things and they do on a ballot. On punch cards they'll circle things, write all over them. On an optical scan ballot they'll say lots of comments and on paper ballots they'll write what they felt about the candidates. On the paper ballots it's obvious what the voter intended. If you read something through an optical scanner, that ends up invalidating that ballot.

Lever machines had many of the interesting problems we talked about earlier. If you have poor vision, or if you are in a wheel chair, it's really difficult to vote. The city of Boston kindly delivered to my office a voting machine. I wanted to play with one of these to see if I could break it and so forth. It was a handicapped accessible one. It had a little wheel chair printed on the outside of it. It was a standard voting machine but it had a stick. You could sit in your wheelchair and look way up there and pull down the lever. What was meant by accessible many years ago is not what we mean by accessible today. Electronic voting has the promise of overcoming a lot of these successfully, especially for blind persons. Blind groups have been extremely active on this issue. I think the biggest disappointment in our initial report was that electronic voting was performing almost as badly as punch cards. That was a shocker.

Why was electronic voting performing so bad? What was it that people were having difficulty with it? Was it the unfamiliarity with ATM, because many of these were like ATM machines. Was it the poor formatting? Then what we discovered was an enormous array of minutia, where little tiny programming, not errors, but choices, could make it more difficult for you to vote on electronic voting machines. The system of electronic voting is fairly complicated and it's fairly new. There are a lot of glitches still to work out. Our second report came out in July of 2001, and I think the most important thing we discovered there was just how badly the system was doing overall. We estimated that somewhere between four to six million people in the 2000 election tried to vote but ultimately didn't vote because they had difficulty. The question is what was the source of the difficulty? Where were the problems?

The machines were one source of problems, and I estimate the machine difficulties account for about one to two million lost votes. Polling place lines were another source of difficulty of about one million lost votes from the data. Registration was about two to three million lost votes. People would go to the polls intending to vote and there had been some foul up. Their name was not on the registration polls or they had walked to the wrong polling place and as a result they were not allowed to vote. The questions were, how can we solve these problems? In that report, it was called *Voting Ways, What Could Be*, we came up with a set of recommendations and working with our friends who were working for the Ford-Carter Commission we developed model legislation. Most of it became what is now the *Help America Vote Act*. The *Help America Vote Act* requires a few things to try to solve what we saw as the obvious problems.

First, buy out the old machines. If you just got rid of the lever machines and the punch card machines, things would be a lot better for that number of one to two million lost voters on voting machines, and that's practically accomplished. There are a few states, Ohio is one of them, where there's been some obstinacies, not wanting to do it. By 2006, if they want any federal money or if they've taken any federal money so far, they have to do that.

The second thing is just to provide some simple back up. When you go in to vote and you are not on the registration, allow something to be done with you. Has anybody gone in to vote and not been on the registration rolls or something like that?

**From the audience:** Very promptly taken care of.

Good, what did they do?

**Audience person:** They called the courthouse and got it all straightened out within a few minutes.

What about you?

**Audience person:** It was about twelve years ago and I had moved and failed to register at the new place but that's part of security — you didn't register in the right place and you don't vote.

My colleague, Tom Palfrey, who is running the Caltech end of the Voting Project went to vote his first time after this project started, so April 2001 he went to vote. He is an economist so his probability of voting is small already. He went to vote and they said sorry, you're not on the registration rolls. Why don't you try the precinct over there? So he drove over there and tried that precinct. They said why don't you try that precinct over there and he drove over there. After five precincts he was eventually led back to the original precinct and there he was. They just misread and told him to go away.

What we tried to think of was some simple way to fix this problem. The simple way is something used in about nineteen states at the time and that is called the provisional ballot. If you insist on being on the rolls and you are not on the rolls, give somebody a ballot that they can fill out. It will vary from state to state depending on what day, which offices they are going to allow count it. Seal that in an envelope, fill out on the outside what your registration information is and the election office after the election can check the registration validity and count the ballot if you're a valid registered voter.

L. A. County uses provisional ballots. In about two-thirds of the cases the vote is valid, even though the person was not on the registration list at the precinct. There is some error, clerical error usually, where somebody's name is left off the registration rolls. The problem with calling the election office on Election Day is that it takes a poll worker out of processing other workers and as soon as you do that, poll worker staffs are already thin and as soon as you do that it creates lines. When you create lines you create another source of lost votes. The original ballot itself will alleviate a lot of these problems in the short run.

There is another interesting thing I heard when I was down in Florida, which is Orange County, Florida, is doing a very interesting little experiment where they completely computerized their registration rolls, just in the county, and they gave the precincts lap tops. They let the lap tops beam in and check the registrations whenever there was a question like this. This is something that can be done on something cheaper than a lap top linked to the state registration database. The problem is registration databases are not computerized in the United States. Most local government databases aren't and they're just paper in large catalogs that are inspected so when you call the election office somebody in the election office actually has to go check through the rolls. In large cities this is a real nuisance. The thought and hope is that by computerizing election registration databases you can eliminate or alleviate these problems still further.

So what's happening now and the next big goal for election reform is to computerize all registration databases by 2006. Only about three states have done this so far. Michigan led the way. When Michigan did this, out of their eight million or so

registered voters in the state, they discovered a million duplicates. So a million names that were on the rolls, that weren't the valid address when you moved, if you'd registered again, they probably wouldn't have removed your name. They would have just left it there. If you had wanted to vote multiple times, you probably could have and were unlikely to get caught. But more likely the problem is that it's just creating a mountain of paper that's increasingly difficult for the local state election officials to manage. The hope is that the Help America Vote Act alleviates those two problems — of obsolete voting technology and registration.

I think the biggest thing though to happen in election reform was the adoption of a new set of laws in most states just to clarify the simplest things about elections. Florida had on its books no law stating what a vote was, so in the event of the election controversy they had no guidance. They had no procedure for establishing a recount and so the Secretary of State had to make up the rules as she went and that only fueled the controversy. Almost every state now has clarified what a vote is and how it is to be recounted, what the processing procedures are. Those will make future controversies — and there will be future controversies — much easier.

Where do we go with the election reform movement? Well, there are a couple of things on the horizon that have not been solved and a couple of new problems or concerns that have emerged. The big new concern is electronic voting and security. Why is electronic voting a security problem? Basically these are computers like we use and trust in all sorts of situations. The difficulty is that election registration is something that has been handled entirely by local election officers. These are not highly professionalized offices. Usually in rural areas it's a part time employee who handles

elections. To use electronic voting in most counties in the United States will require giving over the managing of elections to a private firm. The questions that computer scientists have raised is whether or not having in place a system through which we can trust the private firms to run elections, codes in the computers be open and so forth. These are all issues that are being hashed out right now but there is a huge quandary over electronic voting. Computer scientists have actually created their own social movement. It's a beautiful thing to see a Stanford computer scientist start a social movement. But what happened is that they really slowed down the development of electronic voting.

The second thing that I see coming is Internet voting. There is increasing demand for convenience in voting. In 1972 about five percent of ballots cast were absentee ballots. In the last election a little over twenty percent were absentee ballots. People want to vote while they're on the road, or whatever they're doing. They don't want to go to the polls anymore. For some particular groups, especially the military, there is a real need to have a very good absentee voting system and we don't currently.

The Defense Department wanted to create such a system using the Internet and computer scientists really threw a lot of sand into the works and slowed that down. However, we have had two public elections on the Internet already. Arizona and Michigan ran Democratic primary elections over the Internet. Fifteen thousand ballots for the Democratic Primary in 2004 in Michigan were cast over the Internet. So in some ways the genie's out of the bottle. The problem is we don't have standards for governing these elections. We don't have procedures and rules for governing these. We don't know what to do in the event if some student at MIT accesses these systems

and that will happen. I know these kids. So these are the issues that I think are really front and center and issues that we will continue to address. It's an evolving system. It's a system that evolves to facilitate our needs in our society as we come to demand more convenience in various transactions, as we develop private contracting for government services and so forth. This system will continue to evolve.

What is it that you can do now? That is the most common question I get. There's a sense when I talk about this material or when you hear it on the radio, that it's something that's way up there, it's decided by somebody else, and run by somebody else. But in fact, elections are not way up there and run by somebody else. Elections are run by us. There are about 700 thousand poll workers in the United States and they're the ones that make the system work. Concerned about security, they are the frontline in security. They make sure that the ballots or the voting machines are managed properly. They make sure that things are started correctly. If you are concerned about reliability or machines breaking down, they're the frontline service providers. If the machine breaks down in a polling place, it is the poll worker that has to go and try to solve that problem and they are the ones who educate the voters. When someone comes in and they're confused about how to vote, how do I use this machine, it's the poll worker who does that. They're the ones who solve the registration problems. They're the ones who have to get involved and try to figure out what to do. So it's very important to have a very good pool of poll workers in the United States. Across the country right now the most common complaint I heard from election administrators is that they're losing poll workers fast.

**Audience question:** Are there any suggestions on how to get people to be poll workers who don't have to start before the polls open and physically stay there until after they close?

I'll tell you what I do. I insist now that all my students be poll workers. Whenever an election is going on they must train to be poll workers, although many of them are not registered voters so they can't be official poll workers, however, they can be poll worker volunteers and work part of the day. They can work four hours and that's true in most places. It's just you're not allowed to be an official poll worker and do the whole day stint.