Rip, Mix, Burn, Sue: Technology, Politics, and the Fight to Control Digital Media
by **Professor Edward Felten**

Shirley Tilghman: Good afternoon everyone. It gives me great pleasure to welcome you to the first of this year's President's lectures. For those of you who've been to these lectures in the past you know these are an opportunity for those of us who live in the Princeton University community to hear from some of the most, brightest stars in the firmament, which are members of our own faculty, often the folks who we hear the least from in terms of public lectures.

Before I introduce Larry Peterson who's going to introduce today's speaker I just want to point out that there are two additional lectures scheduled for this year. On December the 2nd at 4:30 will be Professor Alan Krueger's lecture. Professor Krueger is not only here in the audience today, but he was actually the person who suggested this lecture series to me in the past and I'm delighted that he's willing to give one of these lectures later on this semester. And then in the Spring, the chair of English and professor of English Claudia Johnson, who's field is 19th century literature will be speaking again here. I also want to remind everyone that there will be a reception following the lecture.

So today's lecture is indeed a very timely one, as it will address a topic that is much in the news and is of interest to faculty and students alike. And that is the question of how the Internet, and the broad dissemination of personal computers have affected the use of media, such as film and music, and the legal and the political struggles that this use has caused. Professor of computer science Ed Felten is an expert in this field of computer security, and I've asked his chair Larry Peterson to introduce Ed formally. Larry has served as chair of the Computer Science Department since 2003. In his primer for undergraduates called "Life in the Department of Computer Science: A Guide for the Humble Undergraduate," which I don't think actually characterizes any of our undergraduates, the department representative gives one of the best definitions I've heard of the department chair: he is the one who's got the official answer. Larry is also the director of PlanetLab, a consortium hosted by Princeton made up of universities and industries who've taken on the difficult task of overhauling the Internet. PlanetLab is designing a network that allows researchers to develop and test powerful new types of software that are not confined to a single computer but are run on many computers at once, treating the global network, in a sense, as one large widely distributed computer. Among the benefits such a network could yield are faster downloads, more powerful search engines, and better security, answers perhaps to some of the questions that Ed will pose for us today. Larry.

Larry Peterson: Thank you, thank you. So it's a great pleasure to have the opportunity to introduce one of my colleagues, Professor Ed Felten. Ed came to the department in 1993 as a fresh PhD from the University of Washington, and for the first five or six years built computer systems that were of extreme interests to other computer scientists but I don't believe in that time had too much of a chance to cross paths with lawyers and politicians and the FCC and so on. Then- it's sort of strange how one's career takes turns at one point or another, back in 1997 he and his students explored some of the security flaws in Java, which is a programming language that sits behind your web browser, and that obviously got a lot of people's attention, that this technology we were depending on was in fact, flawed in some ways and that attention from the research community and others need to be paid attention to it. Well, that's certainly has happened since then and that effort got Ed recognized by the Department of Justice as an expert in web browsers and so his next venture was one of being an expert witness for the Department of Justice in the Microsoft case as you are probably, may be familiar with, and I could talk at some length about that but we'll move on. One of the next things that happened in his career is that he became a lightning rod for- is that a fair characterization[?]- for a lot of activity surrounding the Digital Millennium Copyright Act, so we have digital, the protection of digital media on the one hand and we have freedom of speech and fair use on the other hand. And there've been a whole series of things like that but one of the first was a challenge put down by the record industry who say "yeah, we've now protected ourr digital media, see if you can break it" and of course Ed and his students immediately broke it, and that gets you into a bind of how you tell people about that or whether you can tell people about that. Since that time he has gone on to become a consultant for the Electronic Frontier Foundation, who's very interested in these sorts of issues, he's presented testimony before Congress and the FCC and others about issues having to do with, about security and IT policy and so on. He's been on numerous national studies having to do with security again and issues related to digital media, and I recently have learned he's maintaining a weblog entitled "The Freedom to Tinker" which I believe is going to appear in some form or another as a book in the very near future. We hope. So without further ado, Ed Felten.

Felten: Thanks. I want to tell you a story. A story about what happens when the irresistable force of changing technology hits the immovable object of copyright policy. It's a story that has a number of twists and some interesting and diverse characters, including these: [as names are announced, images are shown on the screen forming a Brady Bunch-style-esque montage] Sandra Day O'Connor, Big Mouth Billy Bass, Mr. Rogers, Jar Jar Binks, John Philip Sousa, the Boston Strangler, Senator Ernest Hollings, a kung-fu fighting hamster, and references to the deity [music].

Let's begin. Chapter 1: Justice O'Connor saves the fast-forward button. Our story starts in 1976, with the introduction in the United States of this product by Sony [screen shows a picture of a VCR]. This is the first Betamax VCR. It cost about forty-two hundred dollars in today's money. And you couldn't do much with it because there were no video stores yet. So all you could really do was tape TV shows and watch them later. And yet people wanted it. They wanted it because it put the consumer in control of the experience of watching television. People could watch a show when they wanted to, rather than when a network executive said they could. They could take a break and get a drink or go to the

bathroom when they wanted to by hitting the pause button, rather then when someone else decided to put in the commercials. Consumers loved it because it gave them more control.

But the broadcasters lost corresponding control. And they didn't like that. They didn't like it, in part, because let's face it everybody likes being in control. But they also didn't like it because the loss of control, they feared, would translate into a loss of revenue. They worried that they would lose revenue because consumers would collect libraries of shows, and watch the shows in their tape library over and over, and not be able to see fresh commercials. They also worried that consumers would just use the fast forward button to skip commercials. And of course broadcasters make their money by selling commercials. And they can't be in business, you can't be in the business of free over-the-air broadcasting unless you can sell commercials. And so the broadcasters were not entirely wrong to be concerned. The tie between control over media, control over the use of media and revenue, is one of the things that underlies the theory behind our copyright law, which runs roughtly like this: copyright grants limited control over the use of content to a coypright owner. Note limited control. The control can be leveraged into revenue by the copyright owner, by saying "you may not this movie unless you pay." "You may not copy this book unless you pay." And that revenue creates the incentive to create works of art in the first place. That's the theory behind our copyright law.

And so the broadcasters had a point when they worried about the loss of control and the corresponding loss of revenue. And it's not much of an exaggeration to say in fact that the movie studios freaked out over the VCR. [Image of Jack Valenti] Jack Valenti, the head of the Motion Pictures Association of America, testified before Congress, and if you've seen him before Congress he often looks like this, and he said in 1982 to the Congress the following: "The VCR is to the American film producer and the American public as the Boston strangler (the notorious serial killer) is to the woman home alone." Now that's pretty strong rhetoric. But it's not unprecedented in the history of copyright and technology in this country. When the phonograph was invented we heard the same kind of complaints from the music industry of the time. John Philip Sousa went before the Congress in 1906 and he said this: "These talking machines (meaning phonographs) are going to ruin the artistic development of music in this country. When I was a boy in front of every house in the summer evenings you would find young people together singing. Today you hear these infernal machines going night and day. We will not have a vocal chord left." And he went on to explain the dreadful consequences of our vocal cord atrophying. Jack Valenti, the man that we saw before, testified before the Senate in 1972, when cable TV was the new technology. And he said this: "If Congress lets cable systems retransmit local broadcast stations it will not only be magnifying and sanctifying a terrible injustice, but it will have created a huge parasite in the marketplace, feeding and fattening itself off of local television stations and copyright owners of copyrighted materials. We do not like it because we think it would be wrong and unfair."

So there's a long history, in fact, of copyright owners objecting to new technologies that let people experience media in different ways. And the story of objection to the VCR is essentially that story over again. Now, movie studios, being unhappy with the VCR, did

what any red-blooded American would do if they were unhappy with something that was happening. They filed a lawsuit. And they argued to the court the following: that recording of television shows is copying. When you record a television show of the air you're making a copy of that show. And copying, without the permission of the copyright holder, is illegal. It's copyright infringement. Therefore when home consumers were taping TV shows they were infringing copyright. And, the studios went on to argue, that makes the VCR nothing less than a tool for infringement, which ought to be banned. In the lingo of copyright law they argued that Sony was a contributory infringer.

Sony said hey, waitaminute. We're making a tool here and that tool has both legal and illegal uses. Just like the photocopier, which can be used to reproduce copyrighted material illegally, or can be used to reproduce other material legally. Just like the audio tape recorder, which can record copyrighted music or not. And Sony said the courts not ought to be banning the technology just because it might be used illegally. The courts ought to let the technology evolve. Sony also brought in some broadcasters who said that they actually liked it when people taped their shows. And their star witness in this regard was Mr. Rogers, [image of Mr. Rogers and quote on screen] who gave this testimony that could only have come from Mr. Rogers. [laughter from audience] He said that he felt that technology that allows people to tape his show off the air lets people become more active in the programming of their family's television life. And anything that let people be more active and make their own choices was AOK with Mr. Rogers. The section in the middle is particularly priceless about my whole approach in broadcasting. In any case...[laughter from the audience. The middle section reads: "My whole approach to broadcasting has always been 'You are an important person just the way you are. You can make healthy decision.'] Now you know who said that. In fact when I originally planned this talk I was going to read it but I found that I couldn't read that wasn't in a voice that didn't sound utterly disrespectful to Mr. Rogers. [laughter] And so I'll let you do it. Well this case worked its way through the courts and in 1983 it reached the United States Supreme Court. Briefs were filed and oral arguments were held, and after the arguments the Justices got together to talk about the case, as they always do, and a consensus emerged on the court. A consensus that the court should uphold the lower court ruling and ban the VCR. And the preparation of a majority opinion explaining why the VCR is illegal began. But during the drafting of that opinion, Justice Sandra Day O'Connor had second thoughts. Ultimately Justice O'Connor changed her mind, and in so doing she changed the decision of the court. So that in 1984 the court ruled in Sony v. Universal, known as the Betamax Case, that the VCR is legal. And the core of the court's decision is in this passage [passage on screen], talking about how the law has to strike a balance between the coypright holders, in this case the studios, legitimate demand for real protection and the desire of other people to do noninfringing things. And so the court held that the sale of copying equipment does not constitute contributory infringement if the product is widely used for legitimate unobjectional purposes. Indeed, and here is the money quote from this opinion, in order to be legal a product need merely be capable of substantial noninfringing uses.

Now this was a close decision. The court originally was going to find the other way and it only found this way by a 5-4 ruling. And so its worth asking what would have happened

had that decision gone the other way? So let's travel back and explore that hypothetical world. If the court decides this case the other way, the result of the decision is that Hollywood gets veto power over VCRs. You need their permission to make a VCR. And they can then come to you and say if you want to make VCRs you have to meet the following conditions. And it was no secret that they planned to ask for a cash royalty, a payment of so-and-so dollars for every VCR that was made. What's a little bit less obvious but perhaps a little bit more important is that Hollywood wanted as well control over the design of VCRs. They wanted to be able to go to a VCR maker and say "you can't put this feature in" or "you must put that feature in." And I think it's likely that had they won the case they would have dispensed with the fast forward button, which at the time was primarily used for skipping commercials. And so that's how Justice O'Connor in changing her mind and changing the mind of the court saved the fast forward button.

Now there's an interesting postscript to this story, and that is that it wasn't too many years later that the movie industry realized that the VCR was the best thing that ever happened to them. [New image of a pie chart.] This shows the movie industry's revenues from the year 2000 and nearly half come from the sale and rental of prerecorded videos played on a VCR or DVD player. And although the studios fought like crazy to block the VCR or control it, it in fact turned out to be a huge profit center for them.

Now I chose to start the lecture with this story because it not only is an important decision of the Supreme Court and an important choice in the history of our copyright policy, but it also illustrates two issues that are going to recur throughout the rest of the story. The first issue is the struggle for control over technology and the struggle for control over how consumers are allowed to use recorded media. The second issue is the role of multi-use technologies, technologies that have both legal and illegal uses, and how our copyright policy is going to deal with them. Those issues were important in the Betamax case but I think few people realized at the time just how important they would turn out to be. That only becomes evident as our story moves along a bit further.

Chapter 2: A great earthquake. The story resumes in 1982 with the introduction of another product by Sony: the first compact disc player available in the United States, which cost about eighteen hundred dollars in today's money. And look, unlike the first VCR something you might actually want to have in your living room today. This market transition in the distribution and recording of music, transitioned from analog to digital technology, from the old analog system of vinyl records to the compact disc. And that transition from analog to digital and the distinction between analog and digital is important enough that I want to stop, or digress for a minute to explain how, what really makes analog and digital recording techniques different.

[An image of a peaks and valleys sound wave] You probably all seen pictures like this, depicting a sound wave, depicting the changes in air pressure as a particular musical sound goes past an ear or a microphone. And this is the starting point of many musical recording technologies. Now I want to zoom in on a little piece of this picture and extract a curve like this [close up image of a wave], which represents a small piece of that musical waveform. In an analog technology, like vinyl records, you would take this curve

and scrape it into the survace of the record, so that if you looked at a vinyl record under a microscope you would see a curve like this. With a digital recording though you do something very different. You take this curve and you reduce it to a series of digits, and you put those digits onto the disc. Let me explain quickly how it is you take a waveform like this and turn it into a sequence of digits.

The first thing we're going to do is we're going to draw a bunch of vertical lines evenly spaced [lines imposed on wave] through this curve. If we were making a compact disc then there would be 44,000 of these lines for every second of music. Now every place where the white curve crosses one of our yellow lines we're going to draw a dot. Having done that I can erase the white curve. Because if I just look at the dots and draw a smooth curve that connects them, I can get back that white curve that I started with, or something close enough to it that you won't be able to tell the difference with your ear. Next I'm going to draw horizontal yellow lines again evenly spaced, and if I were making a compact disc there would be about 65,000 of these lines [on the screen] and not 8. But you really wouldn't want to see a graph with 65,000 lines. Now I'm going to take each of these red dots and shove each one up a little bit or down a little bit to get to the nearest intersection between horizontal and vertical lines. They only moved a little bit, so again if I were to draw a smooth curve between these lines, er between these dots we would again see a wave form that sounded just like the original. Now I'm going to label the different levels from bottom to top one through eight. And now I'm ready to write down my digits, to which I'm reducing this curve. What I do is I read across from left to right and I write down the level at which each dot occurs in our graph. So the first dot is on level five so I write down a five. The second dot's on level six so I write down a six. The third dot's on level seven; I write seven. Fourth dot's on level seven, and so on all the way across. Having done this I can now erase our grid, and I'm left with a sequence of digits. And if you think about it you can convince yourself that I could reconstruct from this the initial curve. I could use this- I could draw the graph back up there. I could use this sequence of digits as a recipe for drawing the dots back where they were, and I could then connect them with a smooth curve, and I could get back the initial waveform or something that sounds just like it. So what I've done here is reduced the curve to a series of digits, the digital form. And those digits can then be written on to a compact disc. Indeed if I look at a compact disc under a microscope, I don't see a curve representing the wave form drawn right onto the compact disc. What I see is a representation of a series of digits. And that's digital audio.

Now audio is not the only thing that can be digitized. I can take, for example, a still image like a photograph and digitize that. Digital images. I can take a movie, which after all is just a sequence of images and reduce that to digital form, into a series of digits. Digital video. I can take a document, like this, like a newpaper [sound of a newspaper being picked up in the background] and reduce it to a series of digits. Digital documents. And what's important about this, is that in all cases I'm reducing to a series, to a sequence of digits and the digits are all the very same digits. I don't use different digits, different kinds of digits for representing music than I use for representing video or for representing video than I use for representing documents. It's all the very same digits. And what's more, there are other technologies, digital computers like PCs, and digital networks like

the Internet, which also use the very same digits. And so what this means it that where I previously had separate areas, separate sets of technology, one for music, one for video, one for documents, one for computing and networking, we can now see a great convergence of technology. Perhaps a single network for distributing all of this content regardless of its form. A single type of device for storing it, and so on. A great convergence in the technology. That great convergence, as I'll argue in a minute, will in fact, at this point in our story- remember the convergence hasn't happened yet- that great convergence will cause a great earthquake in the media business. A much bigger jolt than we saw with the introduction of the phonograph, or cable TV, or the VCR.

Now in order to explain to you why it is this particular change in technology would cause such a big jolt and is so different qualitatively and quantitatively from the changes that came before, I need to take another little detour and teach you a tiny bit of computer science. Don't worry, just a tiny bit. And I want to teach you in fact the most important idea in computer science. So if you don't want to take Computer Science 126, perchance. This idea was born about 1936 right here at Princeton University. And it's generally credited to these two gentleman [images on screen], Alonzo Church who was a lifetime Princetonian, Bachelor's degree, PhD and four decades on the faculty, and Alan Turing, who was a graduate student working with Church. Turing is generally said to be the father of theoretical computer science and the most prestigious award in computer science, sort of our equivalent to the Nobel Prize is the Turing Award.

In the late 1930s Church and Turing hatched an idea which has percolated over the years and has come to be known as the Church-Turing Thesis. And restated in modern terminology, it says essentially this: An ordinary digital computer like you have on your desk can be programmed to do absolutely any operation on digital data. Anything, and I mean literally anything, anything that you might want to do with digital data or information can be done on a digital computer, if you merely know how to write the right program. Now I'm leaving aside here things that are impossible to do, like say using the contents of the Betty Crocker Cookbook to predict the outcome of next year's Superbowl, right. No machine, no method can do that. But if leave aside the things that are just flat impossible, a digital computer, an ordinary one like you have, can be programmed to do absolutely anything that one might want to do.

That makes the digital computer a universal machine. A machine which, in the digital realm, can be all things to all people. And to realize how remarkable this is, we need only compare it to other areas of human endeavor. Let's think for example about wheeled vehicles. If I want to go down a steep and bumpy and narrow mountain path, I want a mountain bike. If I want to flatten asphalt, I want to use a steamroller. If I want to go 200 miles an hour, I want an indie race car. And if I want to carry tons of cargo I want an 18 wheeler. And if I were to stand up here and tell you that I had out there in the parking lot a single vehicle that could go down mountain paths like a mountain bike, go as fast as an indie car, flatten asphalt like a steamroller, and carry tons of cargo, you'd say I was nuts because the world just doesn't work that way. There is no universal wheeled vehicle. There is no universal wood-working tool. There is no universal cooking tool. In almost

every other area of human endeavor you need different tools for different purposes. But in the world of digital data the digital computer is a universal device.

Now, once we take this universal computing device, and we merge it with digital media, what we get is the universal media machine. Something which at this point in the future, at this point in our story, becomes a plausible future: a machine which can be programmed to do absolutely anything you would like to do with digital media. Except things that are just impossible to ever do.

And so this means that the digital transition takes the issues that arose in the Betamax case and increases them to their ultimate limit. Betamax gave consumers a little bit more control. This technology in the hands of consumers is the ultimate shift in control, because it lets the consumer do absolutely anything that their computer can be programmed to do. The Betamax had a few legal uses and a few illegal uses. This technology is capable of absolutely every legal use and simultaneously of absolutely every illegal use that you can imagine. And so the other issue that arose in the Betamax case is taken to its ultimate limit by this change. And so indeed it became evident at this point that a great earthquake was coming. The first stages of the earthquake though had not yet happened. That only happens in the next chapter of the story.

Chapter 3, the celestial jukebox. Starting in 1982 when it became evident that music technology was going to be digital, it became evident even to the most clueless that this was going to happen, and up through the 80s and 90s there was a lot of discussion about what the future of digital music, the ultimate future what going to look like. And a sort of common vision emerged which came to be known as the celestial jukebox. And the idea was essentially this: that you could have access to absolutely any piece of music that had ever been recorded by humanity whenever and wherever you wanted it. Hot and cold running music was available to you under the celestial jukebox. Everyone saw that the technology to provide this music was going to become available. And people thought of the celestial jukebox as something that was going to happen far off in the indefinite future.

But in 1999 along came this guy [image of Shawn Fanning], an 18-year old college dropout named Shawn Fanning, known to his friends and family by his nickname: Napster. And he did, he built a fairly simple piece of technology, something that a couple of our computer science juniors can do in an independent work. He built a simple client program to run on ordinary users' computers and he built a simple Internet server that would help coordinate these, and this was the Napster service that you've heard so much about. A service that made it very easy to get almost any music you wanted to get, but also made it impossible to pay for it. And this is actually important. It's important to realize that Napster didn't just make it possible to avoid paying, it in fact gave you no way to pay even if you wanted. This was the celestial jukebox but without the slot where you put in quarters. And what Shawn Fanning either realized or discovered by accident is that delivering the music was the easy part of the celestial jukebox. Collecting the money was the hard part. And he just did the easy part.

The music industry, obviously, was none too happy about this and they did what you do when you object to something. They filed a lawsuit. [laughter] They said "Napter's a tool of infringement. Everybody knows that that's what it's for." Napster said, used what came to be known as the Betamax defense. "Look. This is a tool which has legal and illegal uses. There are some audio Mr. Rogerses out there who don't object and in fact encourage the downloading of their music, and our product can be used for both legal and illegal purposes and so just like the Betamax should be found legal."

But the courts said no way. The courts said essentially that Napster, unlike Sony, actually was involved in the individual acts of infringement that occurred. Sony had just made the VCRs and shipped them to consumers and what the consumers did with them, Sony had no way of knowing or controlling. But Napter on the other hand actually participated in a small way in every single act of infringement that occurred. And so the courts ruled that Napster was illegal and they issued an injunction that effectively put Napster out of business. And the Napster website which had once been so active was replaced by this. [An image with the Napster logo and words "Napster was here."]

Now many people in thinking and talking about the issue of digital copyright think of Napster and file sharing as being the main event. But in fact this is not the main event. This is not the earthquake that I was talking about. Because Napster let you do really only one thing with the content. It let you distribute it to other people, it let you copy it. So this is not the main earthquake. This is not the universal media machine. This is just the first tremor. And if this is the first termor this gives you some idea of how big the earthquake is going to be.

Another tremor popped up around the same time. And this I'll describe in Chapter 4: Rip Mix Burn.

This is the growth of the so-called remix culture. The idea that you can create new media, you can create new works, not out of whole cloth but by taking existing work, existing music, existing images, and making sort of audio or video collages out of it. And a great deal of interesting art has been created in recent years, using digital computers, by remixing existing culture. And I want to just give you a few examples to give you a flavor. One of the most interesting groups, musical groups, working in this area is a group- I'm sorry, and I want to emphasize what's happening here is not just copying but is in fact creativity. Something new is being made out of these pieces.

Now on to Negativland. This is one of the more interesting groups working in this area ao audio collages. And interestingly enough they make these audio collages by appropriating little bits of sound from all over the place, and lately they've taken to creating songs which comment on copyright policy and the policy about appropriation of music. And I want to play for you a brief snippet from a piece, a new piece by Negativland called "Downloading." [Music Clip] You can hear in that little bits and pieces of this and that, but it's obviously a new creation, something that didn't exist before.

Here's another interesting one. And I don't know how he got this idea, but a guy named DJ Danger Mouse decided to mix together the White Album by the Beatles and the Black Album by the rapper Jay Z to make something which inevitably was called the Grey Album. [image on screen, laughter] And you've got to love the cover art. I want to play you a little snippet of this to give you an idea, now- if you first hear this idea you think this can't possibly work and the music has to be awful. The fact is it's not everyone's cup of tea but the critics loved it. Here's a piece. [music clip] All right. Again, not everyone's cup of tea but clearly new music, something that didn't exist before, and interesting.

This happens in video, too. When the first Star Wars movie came out, [image from Episode One] Episode One, the Phantom Menace, fans complained that it was too long, it was loaded up with extra stuff and it had this really annoying character, Jar Jar Binks, who's in the middle here. But of course in the age of remix culture you don't just take that, you can make your own movie. And so an anonymous fan in fact cut his own version of the movie, taking out as much pointless plot exposition as he could, and also cutting out as much as he could of Jar Jar. And he created something called Episode 1.1: The Phantom Edit, which was circulating all over the place. Not easily available anymore due to the obvious lawsuit problems.

This activity of improving something or trying to improve it by removing stuff can be done not only by hand but also automatically. [Image of a DVD player.] This product is a DVD player which contains a technology called Clearplay. And the idea of Clearplay is that you can open up a menu in the VCR looking something like this. [Image] And you can check off what kinds of content you want to see and what kind of content that are a little bit too racy for you. You make your choices off the menu and then you play the DVD, and it will automatically skip the scenes that have, that are too racy for you and automatically mute the language that's a little too spicy for you. Now, this led- what's interesting about this technology is that it creates something new and different, which some people like, but it also only works if you buy the DVD. So Hollywood gets paid for the DVD, you have to put the DVD into your player for this to work, and yet people can experience the movie in the way that they want to. Now that didn't stop a lawsuit from being filed, but that's a story for another day. Now clearly this technology can be taken futher, for example, if there are a lot of Star Wars fans among the customer base they can create a Jar Jar switch here at the bottom [Image of Clearplay menu with a Jar Jar checkbox added below Graphic Vulgarity. Laughter] And you could watch the Star Wars movie the way you want to.

My final example of remix culture is something you may have seen, [image of JibJab's "This Land is Your Land"], the famous JibJab "This Land is Your Land" video, which takes some interesting video collage work of characters from current politics and along with the melody from Woodie Guthrie's "This Land is Your Land" and some creative lyrics. And let me play you a little bit of this. [video/music from clip] That's Howard Dean by the way. I won't show you the rest of it, maybe afterward. Now, I'll get back on track. Now this is a very interesting work but it faced also the inevitable lawsuit problem. A lawsuit, or a lawsuit threat brought by the people who own the copyright to "This Land if Your Land." Now, the irony here gets pretty thick, because the author of "This Land if

Your Land" Woodie Guthrie was, said repeatedly that he loved it when people copied his music, that's why he wrote it. And Woodie Guthrie of course was not known for his love of the institution of private property, and not known for claims of, or not known for his love of exclusion of people from property. And yet the owners of this copyright wanted to exclude the JibJab people from making this video. In fact, the seldome quoted third verse of "This Land is Your Land" makes Woodie Guthries view pretty clear. "As I was walkin' I saw a sign there/ And that sign said - no trespassin'/ But on the other side, it didn't say nothin!/ Now that side was made for you and me!" But, Woodie Guthrie was dead, and his family had sold the copyright and the people who own the copyright were as far as anyone could tell completely within their rights to assert it and try to get this video shut down. As it turned out, Woodie Guthrie had the last laugh. Because "This Land is Your Land" was itself a piece of remix work by Woodie Guthrie. The melody in particular came from a song by the Carter family recorded in the 1920s called "When the World's on Fire." Here's a snippet of that. [Music Clip]

So what this tells us is that remix culture is in fact not an invention of the digital age. It's something that's gone on forever, for as long as there's been culture. Indeed, it really is or at least was the essense of folk music and folk culture down through the ages. What's new here is not the idea of remixing. What's new is that digital technology creates new tools for doing it and doing it easily. And so it makes it easier to create interesting remix culture in the rich video and audio formats that we've seen. And this is an important development, because the return of remix culture or the growth of remix culture allows ordinary consumers to become in fact participants in culture, and not just consumers of it.

So we've seen variuos rumblings of the coming earthquake. We've seen Napster and file sharing. We've seen the growth of remix culture. And the ball was now in the court of the copyright owners, of the media companies. They had to decide whether to accept the digital future or fight it. Well they had fought every new technology when it came along it's no surprise that they chose this time as well to fight. And that brings us to Chapter 5: the best laid plans.

Now in the early 1980s music went digital. Considerably later, the time came for movies to go digital, in the form of the DVD, the DVD which looks much like the compact disc. But the movie studios decided that they didn't want to suffer the fate of the record companies. They wanted, if they could, to distribute their content in digital form but to prevent the digital convergence that they were worried about, to maintain control over their content. And their plan for doing this had two parts. The first part was to make ripping, that is, transfer of a movie from a DVD disc into a computer impossible by technological means. The second part of the plan was to make ripping illegal through changes in the law. By doing so they could control the design of DVD players. Indeed they could get a level of control that they never had with the VCR. They could, for example, decide to turn off the fast forward button at certain times. And you may have observed on your own DVD player that at certain points when you push the fast forward button nothing happens. And that's because movie studios have demanded that the fast forward button be disabled in that part of the video.

But this relied on this complicated plan. The first part of the plan, to make ripping impossible, relied on encryption technology. The idea was they would take the movie in digital form and they would encrypt it into a secret code and write that encrypted data onto the DVD. In effect to lock the movie inside a digital safe. They would then keep the combination of that safe, the combination you need to open it secret, so that programmers who wanted to write programs to run on universal computers to unlock DVDs would be unable to do so. They wouldn't know the combination.

But, in order to allow DVD players to actually play the movie, the plan was to build the combination into every DVD player. Now, some of you are chuckling, and you realize the contradiction in this plan. Keep this combination secret and yet build it into hundreds of millions of devices that get shipped into homes all over the world. And you know what's going to happen next. Somebody's going to take apart their DVD player and figure out what the combination is and post it on the Internet and this plan will fail.

And indeed that's what happened. It turned out to be this guy. [Image of Jon Johansen] A fifteen year old Norwegion teenager who came to be known as DVD Jon. [laughter] DVD Jon and his anonymous cohorts reverse engineered a DVD player and figured out what the combination was and they wrote a software program that can decrypt DVDs. [Image of DeCSS program] And there it is, the core of it. This is how you decrypt DVDs. Now this may not mean much to you if you are not a computer scientist, but you could take this and put it on your computer and it would allow you to decript, unlock DVDs. And so this technology made the ripping of DVDs possible, and the first arm of Hollywood's plan failed.

The second arm of the plan was to make ripping illegal. And the way they did that was to get Congress to pass a law. And I'll note that it says something about the political power of this industry that they devised a plan that involved significant changes in the law. But in fact they did get the law changed as one part of the Digital Millennium Copyright Act back in 1998, which Larry referred to in his intro. And their were two relevant parts of the it, the DMCA here.

The first one says essentially that it's illegal to open a digital lock without permission of the copyright holder. The second one says that you can't make or sell technologies for opening digital locks, at least not without permission. And you might think that that law would prevent the distribution of DeCSS, the program for, the computer program for unlocking DVDs but in fact it hasn't. If you do a Google search for DeCSS code you get 42,000 hits. Not all of them are the code but many of them are including the first one. So this code is available to anyone who wants it regardless of what the law said. That's just a fact on the ground. This law, this arm of the plan, designed to prevent the knowledge of how to unlock the digital safe, prevent it from spreading, proved to be unenforceable.

Despite that, despite the fact that this plan didn't in fact prevent DVD piracy, didn't in fact prevent the unlocking of DVDs, it had all kinds of nasty side-effects, including side effects on researchers, which led a number of researchers including myself and my colleague at Rice Dan Wallach who's here in the second row to become close personal

friends with our universitys' general counsels, a couple of years ago. [Laughter] Now the failure of the plan to control or limit the unauthorized copying of DVDs led to a reexamination of what Hollywood would need to do in order to maintain their control. They discovered that it's not enough to control DVD players, because the thing they're worried about, the ripping of this content onto digital computers wasn't happening on a DVD player. It happens on a computer.And if you want to prevent that by some kind of regulation or some kind of technology you're going to need to control computers too. And that brings us to Chapter 6: the Fritz Chip.

After the failure of the first plan to secure the DVD the second plan involved changes in the law to regulate the design of devices, to regulate the design of digital media devices, to require that controls be built in, to a sort of digital traffic cop to detect when something illegal was about to happen and stop it. [image of Hollings] This man, Senator Fritz Hollings, introduced a bill into the Senate in 2001 called the Consumer Broadband and Digital Television Promotion Act, which would have mandated the inclusion of this kind of security or anti-copying technology into every digital media device. It said this: essentially that it would become illegal to sell or transport a digital media device unless the device included a government mandated security technology. This technology became to be known as the Fritz chip.

This was the digital traffic cop that would sit inside digital media devices and prevent them from doing bad stuff. But it's worth noting that the law would have, the bill would have included the Fritz chip in every digital media device that was built in the United States. And there are a great many diverse digital media devices. Here are some examples. Big Mouth Billy Bass is a digital media device, because he plays music that's recorded in digital form. Also the electronic whoopie cushion, as advertised on the Howard Stern show, plays recorded digital content which happens to be copyrighted. Think about that. [Laughter] Any my personal favorite the Kung Fu Fighting Hamster. I actually have him here to give you a performance. [Sound of the Kung Fu Fighting Hamster, laughter] That's copyrighted audio. Not to mention other devices like digital hearing aids, which would have to vet the sounds that came into a listener's ear to make sure they weren't copyrighted [Laughter], and digital sewing machines which would have to vet the patterns of stitchery that were to be put onto cloth to make sure they weren't copyrighted. Because in fact, embroidery patterns are copyrightable, and Senator Hollings brought to Capitol Hill to testify a person who makes their living by creating embroidery patterns.

So that was problem number one, the Fritz chip would have be built into nearly everything, including devices where it clearly wasn't needed. The bigger problem was problem number two, how was this thing going to work? What technology could you design which would actually prevent bad things from happening? Well here's what the Hollings bill said about this: It said that the, whatever the Fritz chip, whatever the design of the Fritz chip was, it should be reliable, renewable, resistant to attack, readily implemented, modular, applicable in multiple technology platforms, extensible, upgradable, and not cost prohibitive. [Laughter] Which is all well and good as a goal, but again the question, how is this thing going to work? And the truth is that nobody who

knew much of anything about technology had any idea of how you could possibly do such a thing. And it was, in testimony I submitted to the Senate I likened the standardization of the Fritz chip to the creation of a standard system for teleportation. [Laughter] And it just wouldn't do for the Senate to pass a bill that said we will make a standard for teleportation and we'll do it within eighteen months. After that we'll teleport all over the place. [Laughter]

And the fundamental reason why nobody knew how to build a Fritz chip is because of this dilemma: Any Fritz chip you built, had to either to allow universal computers or ban them. If you allow universal computers then you allow consumers to do absolutely everything you're afraid they'll do. And then what's the point? Or if you ban them then you're throwing out the baby with the bathwater. And we no longer have universal computers, we no longer have a universal Internet and the entire computer revolution goes out the window. Much too high a price to pay to protect ourselves against copyright infringement.

And so the Hollings bill was withdrawn, frankly withdrawn in shame almost. It's now given as an example of what not to do, in the sense that when new copyright regulation bills are introduced the first thing that the sponsor says is "this is not like the Hollings bill." But the dream of technological enforcement of copyright still lives on. And people are still trying to build this, still trying to figure out how to build a Fritz chip. This goes under a term, a rather Orwellian term these days: Digital Rights Management. As if what's happening is not a restriction on what you can do but mere management of your rights. But at this stage it's still a dream. This technology doesn't exist and frankly I think we're no closer to finding it now than we were in 2001. I doubt whether we'll ever find it.

While all of this rumbling in the ground was going on, the remix culture, Napster, and the legal attempts, failed legal attempts to regulate technology, the universal media device, the cause of this earthquake, was slowly getting closer to occurring. And that's the subject of Chapter Seven, the hidden computer.

[Image of a Tivo] This is a Tivo digital video recorder. Many of you have probably heard of this. It's rather like a VCR only cooler. [laughter] It has a number of features which are better. It does things like try to figure out what you like. If it has empty space on its recording media it records things it thinks you like. You can tell it always record Seinfeld and it will do it and so on. [Image of Replay device] This is a Replay TV which is very much like the Tivo. Think of them as modern souped-up versions of the VCR. [Image of iPod] This of course is the Apple iPod which is the modern souped-up version of the old Walkman, the portable audio tape or CD players that we once carried around. And the reason that these things are souped-up, the reason that they're more functional than what came before is that they have universal computers inside. If you open up an iPod, I'm sorry if you open up your Tivo [image of open Tivo] what you see is this. You see the green circuit board, you see the silver things down in the lower right hand corner, which are hard disks. This is a computer, running the Linux operating system and programmed by the Tivo company to act like a VCR. If you open up an iPod, well I don't have a picture of the inside of an iPod but I do have an X-Ray [image of X-Ray, laughter], and

as your cyber-radiologist let me tell you what's in here. You see in the middle toward the bottom center there's a round wheel-like thing. That is the spindle at the center of a hard disk. Elsewhere, you see a raise of closely spaced black dots in rectangular ring. Those are the holes in a circuit board where a chip is attached. This is, in fact, a digital computer running an operating system, running software that was written by Apple.

So, everyday devices are having their guts hollowed out and replaced by universal computers, and this means that in designing these products the ReplayTV company, the Tivo company and Apple are not limited by the constraints of the previous technology. Every feature they would like to implement is possible, because that's a universal computer and anything you can, any program that you, anything that you can write a program to do this device can do. So ReplayTV for example decided that they wanted their, they wanted to give their customers the option of never seeing a commercial. They created a box you can check saying "Never show me commercials." And once you had done that the device would automatically detect the commercials and invisibly skip them whenever you replayed a TV program. They could do that because every feature is possible. They got sued, and they had to stop doing that. But nevertheless it was technically possible to do that.

Computers, in fact, are infiltrating everyday devices. And as they infiltrate everyday devices the capabilities of the universal computer become available to the makers of those devices. And so the universal media machine is not here yet but it's creeping up through these hidden computers, through this infiltration.

Chapter 8, Fast Forward. I've talked in this lecture about how the advent of digital technology and the digital convergence would cause a great earthquake that would rearrange much of our media and culture. And I've talked about how the ground is rumbling about the battles over file-sharing, about the growth of remix culture, and about hidden computers infiltrating everyday devices. The ground is rumbling, but the big one is still coming. The universal digital machine, the empowerment of an ordinary computer to do absolutely anything that you want with digital media, is not here yet. But it's coming.

If we look back twenty years to the Sony Betamax decision, we see the Supreme Court making a choice about how to handle these two important questions, about who will control the use of media and the design of media technology, and about how the law and policy will deal with multi-use devices. And we see the Supreme Court making a decision to allow the technology to advance, and to trust that things will work out. That decision, the Betamax decision, has been called by many commentators a sort of Magna Carta for media technology, creating the base level of rights and the base level of confidence among technologists that they can design the technology that would be helpful but they wouldn't get snagged on copyright law. And that policy has served us well over the last twenty years. The Betamax turned out to be the best thing that ever happened to the movie industry, and a great many valuable technologies have been developed over the last twenty years because of the freedom that the Betamax decision provided.

Looking forward twenty years from here, we see what I think will prove to be the main event. Within the next twenty years I think a great earthquake will occur. The universal media machine, that vision will start to become real in the living rooms and on the desks of ordinary people. And as always happens, when the technology changes, a great battle is likely to be fought. A battle with many different sides but fundamentally amounting to a battle over these fundamental questions asked in the Betamax case: what do do about multi-use technologies and who will be in control. Monumentally, we as a society have a choice to make. Whether to embrace that change, the change in technology or whether to resist it. I believe that in making that choice we should listen to the wisdom of the Betamax decision. I believe that if we embrace that change, there'll be some bumps in the road but in the long run everyone will be better off. Consumers will be better off, gaining more control over their use of media, more control over what they can do in consuming and using the artifacts of our culture. Creators will be better off because the digital technology would give them tools like they've never had before. And even those creators who want to make a living by creating culture will ultimately be better off. Because I believe that if we embrace the change new business models will emerge, business models that allow the creator to make a fair profit and to make a living by creating content and creating culture. Just as the rise of the video store came as a surprise to most people, and turned the VCR which was a technology that the movie industry had feared into a savior, I believe that if we embrace this change the same thing will happen. I can't tell you right now what that business model is. I wish I could. I certainly would like to do some investing if I did, but I believe that it will happen. It always has in the past.

But this depends on choices that we make. And I hope that we do choose wisely.

Thank you.

[Clapping]

First speaker : Professor Felten would be delighted to answer questions. The floor is open.

[Can't make out question.]

Felten: Sure. Well, I'm not going to give you advice about what's legal and what's not but I know that Clayton Marsh from the General Counsel's office is right here and probably would be happy to do so. But let me talk a little bit about the general concept of fair use.

Fair use is an exception to the rights of copyright owners, which at the highest level says essentially that uses of copyrighted material which are socially beneficial and don't take away from the business model of the copyright owner are okay. For example, I played little bits of copyrighted music in this lecture. Little bits in an educational academic non-profit setting. Nobody is going to come to my lecture rather than buying the Negativland CD. And so I'm not cutting into the business model of Negativland. If anything, maybe one of you will buy it. So fair use is an exception to copyright law but fair use is not laid out according to a strict set of guidelines like you can copy up to 23 pages and give it up

to 20 students. All the statute says about fair use is that in deciding whether a use is fair a judge is supposed to take into account certain factors, like how much of the work did you use, was the setting commercial or non-commmercial or educational in nature, would the use really, honestly cut into the business model of the copyright owner and so on. And so there are specific instances where courts have made decisions about whether a specific action is fair use or not. And this is actually one of the parts of the Sony Betamax case that I left out in order to save time. The court ruled in that case that it's fair use for a consumer to tape a television show and watch it once and then delete it. Now they didn't say whether you are allowed to skip the commercials. That still is I think an open issue as far as I know. And in fact there are still lawsuits about whether commercial skipping is okay. The movie industry says you may not copy [I think skip] the commercial and there's this great quote from the CEO of Turner Broadcasting in 2001, where he said that skipping commercials is theft, not watching commercials is theft. Although he did allow that there was a- and I quote, "a certain amount of tolerance for going to the bathroom" during the commercials. [Laughter] Fair use is a sort of vexacious area frankly. And judges know it when they see it. So if you're unsure, and most people are unsure, then the General Counsels Office number is in the book.

[Can't make out question.]

Felten: Sure. Probably the biggest success story in this area is Apple's iTunes music store. This is something that you can use accross the net. You can buy any track, any single song out of a fairly large database of music for 99 cents with a single click. And this has been a big success by the standards of online music stores, meaning that they've sold if I recall correctly millions of songs. It's a drop in the bucket compared to the overall revenue of the music industry, but Apple's been quite successful in doing this. And I think what's made the iTunes music store successful is that rather than making the primary objective in designing the system the prevention of copyright infringement Apple really focused on how to make the experience of the paying customer as easy and compelling as possible. And so they're a little bit looser about what they'll let you do. They don't try to build a foolproof technological fence around the song. They provide something more in the vein of a speedbump, so that if you want to rip the song, if you want to rip the song and share it on Napster or Kazaa which you should not do they don't prevent you. But they make it easier and more comfortable and more pleasant to stay within the world where you're paying 99 cents. That's a good example. There are lots of other business models involving selling things over the net. And frankly the, I think experience of the software industry has been an interesting one. The software industry has made a ton of money over the last couple of decades despite the fact that unauthorized infringing copyright of software is rampant. Not so much anymore in this country but in some parts of the world absolutely rampant, in some countries 98% of software is pirated. Yet the software industry makes a ton of money.

[Shirley Tilghman comments- I believe "What stopped in in this country?"]

I think it's a number of things. It's partly fear of enforcement. The large copyright owners, large software companies went very aggressively after, especially businesses that were

found to have infringing software on their computers. And the damages that you have to pay for copyright infringement are quite large. Willful copyright infringement carries damages of one hundred and fifty thousand dollars per instance, and that adds up when you have a few hundred computers in your workplace. So if the copyright cops bust in your door and find you with hundreds of copies of unlicensed software in your computers you're basically at the mercy of the copyright owner. The fear of that has caused a lot of businesses to try to go legit. That's part of it. Part of it is education. Part of it is I think increasingly people coming to understand that software is a valuable thing that's hard to produce, and thereby having more respect for the copyright owners.

[Can't make out question.]

Wow. I'm getting the hard questions today. The first sale doctrine is a part of copyright law that says effectively, essentially that if you buy a copyrighted work, let's say you buy a book, then the book is yours to do with as you please. You can rip out pages, you can read it in any order you want, you can sell it to someone, you can give it to someone, you can lend it to someone, you can turn it into paper airplanes. The book is yours. And having sold you that book the copyright owner no longer has control over what you do with it. Now in the digital realm that turns out maybe not to work as well. Because many of the- at least many of the technologies by which one buys content in the digital world turn out not to be easily transferable. A DVD being an exception. If I buy a DVD I can give it to you or sell it to you and there's no problem there. But if I were to buy a song, let's say on Apple's iTunes music store which is a product that I think is quite a good one, it's not easy to give it to someone else. The system just doesn't provide a way to do that within it's own confines, a way to transfer that copy to someone else. You have to create a separate account and put that song into that account and then give that account to someone else but the account is bound to your credit card number. It's a pain in the neck. So the first sale doctrine is probably getting eroded by the transition to the digital world. And there's also some legitimate concern on the part of copyright owners about the first sale doctrine because it's one thing to say that I can lend a book to someone who I see today and they can give it back to me tomorrow. It's another thing to say that for a few microseconds the copy of the book on my computer can flit over to your computer and then flit back. The concern of copyright owners is that people will find a way to share a single copy very widely by using the ease of moving stuff in the digital world. And so this is really a policy conundrum which, as you say, is largely being ignored. Not just ignored in this lecture but ignored in the entire policy discussion. It gets pulled out as a rhetorical device every now and then but I think the sense is that it's been weakened.

[Can't make out question.]

The length of copyright, yes. [More inaudible question.] Well seventy years. So the copyright in this particular presentation which by the way belongs to me will expire, according to the actuarial tables maybe in the year 2140. [More question.] There is a sort of vicious cycle here regarding the copyright of academic material because in some disciplines- in every discipline there are certain journals where you want to be published, most, labeled as the most prestigous and everybody knows that you get tenured, you get

promoted, get raises by publishing in these places and not elsewhere. And in cases where those journals belong to say professional societies as is the case almost universally in computer science then we have publishers who have quite reasonable and generous terms. But in cases as you said where those journals belong to aggressive commercial parties then you find a situation where a copyright owner, having submitted to that journal and being honored to publish there then finds that they have to transfer to that journal the copyright. And then they can't distribute their own work and their colleagues can't get it without paying quite high [prices?]. There is I think the start in a number of disciplines of a sort of revolte against this system. The emergence of open access journals which allow much broader access at least for non-commercial, educational or research use to published content. And it makes sense. There's no reason fundamentally why it should cost that much to get access to stuff which the author was willing to give away for free. And yet we're sort of stuck in this rut where the open access journals need to become prestigious before people will become willing to switch to them. I think that will happen eventually.

[Can't make out question.]

That became a real issue in the mid-nineties, where- Now the background here is that the way computers work is that every time you operate or do anything on some piece of data it gets copied from one place to another. If I send you an email message it gets copied from a place where my keystrokes land into some, into the email program. It gets copied onto the disk of the computer. It gets copied across the net to a router which then copies it to another router, etc. etc. all the way to you. You can't do anything on a computer without copying. And there was an argument made in the mid-nineties by alarmingly enough some people in the White House at the time that those copies should all be covered in copyright law, and every time you did anything on a digital device that should require the permission of the copyright holder because it was copied. The counterargument was look the focus on copying in copyright law is just an artifact of the way technology used to work, when copying used to be the rare and expensive step, and so that was the one you wanted to regulate. Nowadays I think there's generally a view that the sort of incidental copying in transit is either okay, either not covered by copyright, not really a copy or maybe fair use. And here you get beyond me in my understanding of this part of the law. There are certain exceptions built into parts of copyright law that say that ephemeral copies in computer memory don't count. So I think that this issue is less contentious then it once was. There still are difficult issues where people claim that copyright controls fundamental aspects of how computers work, but that's a topic for a longer discussion.

[Can't make out question.]

Well of course you're not supposed to do that. [Laughter] And I'm not interpreting that as you saying that you have [Laughter], but there's no doubt that ths transition is going to cause some businesses to have difficulty and maybe vanish altogether and other businesses to grow. That's what's supposed to happen as technology advances. Some things that we used to do, used to have aren't really needed anymore and some new things

are needed. Also some of the businesses that we have may morph into something else. The record companies, for example, have historically done a lot of work to identify artists who people are likely to use and to promote them. And it may be in the digital world there's still an important role for people to identify talent and to promote the talent. If that's the case then the record companies will survive. And they'll survive in a sort of smaller and leaner form but still survive. I think- I can't tell you whether the names of the companies, the names of the businesses will change but I'm sure that what they do will change. But that's what happens as technololgy advances. If you're in this businesses and the technology advances you have to adapt or you won't be around anymore.

Shirley Tilghman: May I suggest that we continue this conversation in the lobby and I hope all of you will join me in thanking Ed Felten for a wonderful ... [Applause]