On April 16, 2010, in this CS 547 human-computer interaction seminar, Dr. Harold G. Nelson, Professor of Design at Carnegie Mellon University, discusses the importance of understanding the nature of designing (service), designers (lame gods), and designees (prosthetic gods, humans). This transcript has been interspersed with the powerpoint slides shown in the video of this great talk.

0m04s Anonymous introducer: Next week we have an exciting guest, we have Ed Catmull, he is the president of Pixar and Disney Animation Studios. So today I'm happy to welcome Harold Nelson and Harold is the Nuremburg distinguished professor of design in the School of Design at Carnegie Mellon and an affiliated faculty in the department of mechanical engineering at the University of Washington and a senior instructor in the Graduate School of Business and Public Policy at the Naval Postgraduate School and he is also a co-founder and director and president of the Advanced Design Institute. We're very excited to have him.

1m14s HGN: Thank you. Can everyone hear me all right? Good. Thank you for giving me your time. I really appreciate that. I'm glad to be back in the Bay Area. This is a place of fond memories. I did some serious thinking across the water [ed. Berkeley] at the other school a few years ago and I'm always glad to be back. I want to invite any of you that have not been to Carnegie Mellon to visit the University. it's a great institution and believe it or not Pittsburgh is a really nice city. really nice. It's not what you might imagine if you've never been there.

2m03s HGN: I wanted to talk a bit today, well, this is a seminar it says on people computers and design. So people are really difficult to understand, computers are complicated, so I want to talk about design, if that's okay. That means I want to talk about myself a little bit, to begin with. One of the things that I've sort of started to call myself now refer to myself is as an accidental vagrant I don't know how many of you know what that means, but if you're ever out sailing in the ocean every once in while you'll find a land bird out there that doesn't belong there. And the scientists call them accidental vagrants and they're the ones that create new niches and new territories. They are the ones that populate new ecosystems so that's kind of been my career. I started off as an architect. I've had a very interesting background working with a variety of people in art, science, and design, all of them a lot smarter, more talented than I am, but they've all left an impression with me. What's happened, because of my exposure with these folks over time, is that I've come to appreciate design in a totally different way than I had learned as an architect. So what I've been doing is sort of traveling around and intruding in other people's territories, domains, who say that they're interested in or they're doing design. And I've tried to figure out sort of what that means. What are they up to? And what is design all about?
There's a lot of interest nowadays in design thinking. You can hardly pick up a newspaper or a magazine nowadays without some kind of article about design thinking. And I think that's a good thing because design hasn't received a lot of attention in the past. It's also kind of a danger in that it can become just another fad. In business they call it management by bestseller. So something comes out, new idea, new model, people think it's hot, they use it for a while, but don't really invest in it and then it passes. So a lot of good work has suffered under that kind of fad treatment and I don't want design to be treated that way. I think design is a big deal. And I come from traditions and I've worked with people who've called themselves out as designers that mostly come from a craft tradition. The tradition of making things. Nowadays there's more and more people who are applying design to things like policies, institution design, organizational design, software design. There's a lot of new fields that are emerging that say they're in design. And they're wondering and they're asking people what does that mean. So for instance software designers went to architects and other established design fields and asked: what is designing all about? What is it that you do because we think we're doing that. And I was kind of interested for instance in one of the designers at Berkeley that I originally went there to study with was an architect Christopher Alexander. And he's now quite famous in software design. And people have taken his work and used it in a totally different field from what I could have imagined. So others have found new territories as well. But one of the things that I would hope that you would take away from this short little talk today is that design is a big deal. And my colleagues and I that work with design are trying to make this case all the time. The first is that genesis is ongoing. Whatever tradition you're from, whatever religious tradition you're from, there are stories about Genesis where the world was created and then it went on. And what we're saying is that the world is continually being created over and over and it's being created by design. So genesis is ongoing. Design creates the real world so that if you for instance look around this room, there's nothing in this room that's natural. This whole environment has been designed. I would bet most of your memories who you think you are, the things that you've done in life, are all in relationship to things that have been designed. There may be some things that you had experiences with natural settings, but mostly we reside in a real world that's artificial, that's been designed. Everyone designs at some point in their lives we have groups of people who've called themselves out as designers and they've created design professions. For instance I'm a licensed architect in California and they say that I can call myself a designer because I'm licensed as such. There are other professions where you don't have to be licensed or you're not regulated but you're still for instance degreed, and you have the right to call yourself a designer in a certain field. But aside from that, everybody designs at some point in their lives. They design their lives, they design choices for their children. They're engaged in design at some point in their lives and that would be true, I would say, for everybody. And we want to make the case or we try to make the case that designing is the thing that sort of distinguishes us as being human. It's the one thing, when you go through the fossil records, that they begin to look for artifacts, that say that this was the work of humans and not of another species or near human. So our designed artifacts are...
indications that we are human and that design was probably one of the first competencies that we had as humans. And of course design creates value. That’s one of the entrees now into the business world and why business is starting to take a lot of interest in design, is because it creates value. It makes a difference, it makes businesses more competitive, and makes products more attractive, and make services more alluring, and design makes meaning. And that sort of ties back originally to the idea of what distinguishes us as humans in that this competency to design was the thing that allowed people to create their cosmologies that allowed them to create their social systems, it allowed them to make sense out of a very chaotic and dangerous world. They were able to do that because they had a design competence. So if it’s a big deal then how does it relate to our other forms of inquiry that we’re all trained in. So one of the first things we would say is that description and explanation do not prescribe action. And what’s really good at describing and explaining things? Science. Science is very good at describing and explaining things, but nothing about description and explanation tells us what we ought to do. I use an example of a report that I read a large report that I read recently a lot of data information in it in that report it says that we’ve lost so many people in what’s called the high plains of the United States that it’s now considered to be a frontier territory according to an 1860s definition. The only populations that have increased in this area are buffalo and Native Americans. Huge big report. What does that tell us that we should do do we need to do something about the Native Americans, do we need to do something about the buffalo? What? It doesn’t come from the data, it never does. When I go into organizations what happens a lot is that they’ll point to all these reports and they say: these cost us hundreds of thousands of dollars but nothing changes. And they were very frustrated. And I say of course nothing changes, because description and explanation did not prescribe action. Design does. Design is a tradition that’s action-oriented. Again, prediction and control don’t justify action so we hear a lot of times, like this is the replacement or the concern for ethics when we’re trying to justify action. What I hear a lot is that people will say: we can do it therefore we’re going to do it. So if we’re going to create a new life form, don’t worry, because we can control for the kinds of outcomes we want. So the ability to predict and control something justifies them taking action. And there really isn’t any justification for action because we can predict and control outcomes. Design does however. Because of its nature, and I’ll talk a bit more about that. So we make the case, I alluded to it a little earlier, that design is a first tradition. It means it’s one of the first competencies that humans had and it’s a third culture. And I don’t know if you all have read or heard about CP Snow’s work where he compared The Two Cultures, science and humanities, and that they would never get along. And they would always see that and talk about the world differently. We’re making the case that actually design is a third culture, different from science and the humanities. It’s its own tradition. So in a sense of the first tradition when I was growing up and being educated what I was told often were things like: humans discovered fire I read it in text books and the fact is that humans didn’t discover fire, they designed it. And they would say that humans invented the wheel humans didn’t invent the wheel they designed that too. So in the Western tradition anyway all the major achievements in civilizations were attributed to discoveries, inventions, accidents. Never to the act of design. When Bill Gates recently shared one of Da Vinci’s notebooks with Seattle put it into a museum there was ongoing argumentation in the press and the public was Da Vinci an artist or an engineer or was he just a bipolar artisan. What was he. there was pages written on this. It’s simple he’s a designer. For some reason in the West we don’t have that kind of appreciation for design, we don’t have the long tradition of reflecting and thinking about design that we have for art, science, the humanities, other
areas. Some of the professional groups are just starting. 16m15s (Somebody in the audience asks about the situation in other cultures)

16m30s HGN: I don't know what the other traditions do so much. I'm really I'm trying to be safe.

16m30s HGN: Design is a third culture, we say, it's not a midpoint between applied science and applied art. As an architect I was told all the time as a student the reason I had to take calculus and fine arts painting was because we were the midpoint between art and science. That's what design was. We'd say no that's not the case. That it's actually a third culture that has its own postulates, its own axioms. It doesn't mean that it's irrational, it doesn't mean that it doesn't have aesthetics. It just means that it's not an applied science and it's not an applied art or it's not the midpoint between them. And I apologize: I know there's a program here where folks are required to take a science degree and an arts degree to get a design degree, but we're just making the case for: what would it look like if it was a third culture.

17m38s HGN: So, what I want to do is just, sort of, because of these postulates and these axioms, is begin to add to the design discourse and start bringing in new language and new things to think about as a consequence of these postulates. So if it is its own culture and its own tradition, if it has these qualities that I talked about, what then. So I want to talk a bit just shortly about systemics, change, purpose, reconstitution of Sofia, and serving. And those are just examples of what ifs. What if these postulates were true and there was some value and treating design as if it was its own culture, what would that mean?

18m35s HGN: So we would say that for instance the logic of design is systemics. And you've probably all heard some language around cybernetics, system science, systems thinking, systems approach, General Systems Theory. All those sorts of vague ideas about systems. So systemics sort of catches all of those traditions. The main point about systemics, I think, that you need to take away, is that it focuses on connections. It's about how things are related and how things act when they're connected. So when somebody declared for instance: science was dead — somebody is always declaring something's dead all the time, art is dead, science is dead, design is dead - somebody declared science was dead and the physicist came through and said no actually we're just beginning in physics to understand the notion of connections. And there are these things called emergent qualities that come from connections that are very interesting and we know very little about. Most of you are very familiar with some of these emergent qualities. For instance, if you take two gases hydrogen and oxygen and you put them into certain relationships with each other you get qualities of wetness, you get something called water. And there isn't anything wet or watery about hydrogen or oxygen by themselves. You can study them as closely as you want to, you won't find those qualities. When you combine them you...
get these emergent qualities. So physicists for instance would say maybe you can get life, the emergence of life, from compounds that are different from the carbon-based ones we have now. It's possible. There are other sorts of emergences that they're working with that they say they're just on the frontier with. That's what this relationship piece is about. In art we create compositions, we pull things together, put them into relationships, so if you have colors, dabs of painting, and you see a painting what you see first is the emergent composition. You may then want to stop and study and see the brushstrokes. You may want to see what percentage is blue, what percentage is green. In the beginning what you see is the emergent quality. In social systems we have emergent qualities called community, culture, family. Those are all things that emerge from relationships between things. That's why systemics is so important in design, because it is the logic of design and actually the advancement of system science in recent decades has allowed us to take design in a much more serious way, because we can then talk with scientists, people who are interested in formal logic, in a way that makes sense. We can talk about emergent qualities and the notion of compositions as similarities and both of those are important to design.

22m12s HGN: Also just as a side note. One of the issues that's of real concern nowadays to the general public is this notion of sustainability. A lot of talk about sustainability. Sustainability is not possible without our paying attention to connections. I've had people say: yeah the systems thing, I don't think that's really, that's you know, that's gone nowhere, that died in the 60s or it died in the 70s, whatever. The reality is that you all, we all are in systems. We are all in relationships, we are in relationships that you can't ignore. Whether you think it's a real idea or not we're all living within networks of causal relationships. If we break some essential connections or relationships we pay a dear price. That's one of the things that's happening in sustainability issues, is that we have not been able to identify essential relationships and we've not been able to put essential relationships into place from a design tradition when they're needed. So sustainability isn't just about waste or lack of resources. It's about our inability to recognize essential relationships and put them in place when they're needed. Design does that, by the way.

23m51s HGN: Now there's this idea of change. So I was taught the change occurred because of chance or necessity. All my schooling from the time I was in grade school all the way through graduate school. I had statistics, I had probability I memorised laws, principles. So the change only came about because of chance or necessity. What they didn't tell me was that change comes about because of human intention. And we're doing it all the time. We're intervening in systems all the time, we're creating change. We're never really in a conversation or a dialogue with people about what that means. But we're constantly talking about things that are probably going to happen, might happen, will absolutely happen, because of laws and principles in place. So intention, this notion of desire aim direction, is one of those things that design brings into the conversation. And this idea of intention is very interesting, because intention, intentional change comes from this sense of aim or direction. It doesn't come from outcome. And again my experience with working with people in the West is that they're very focused on outcomes, on targets, on objectives: what are the outcomes? And not on the direction that you're going in. And people are saying often: we're going in the wrong direction, the country is on the wrong track, my life is going in the wrong direction. What does that mean? They're not referring to targets or objectives. They're referring to something else. It's interesting to me when I started looking at intention was that there was a medieval notion a definition of intention was drawing the bow. That was the definition of intention
and I came across a book, a small book, at one point in my student life, called Zen and the art of archery. It was about a westerner trying to learn archery in the Japanese tradition and it was taking the master forever to get the westerner to understand that the point was to draw the bow and not aim at the target. That you couldn't hit the target, if you weren't aiming, I mean, if you weren't in intention to get your mind in intention to go in the right direction. So it was kind of for me a way of exploring this notion of intention, because it becomes very important, you'll see later, to be going in the right direction. Otherwise it doesn't matter what your objective or your outcomes are that you want to reach.

17m21s HGN: ... Another part of intentions that colleagues and I've been working with is, versus this notion of trends and futuring: when you start projects often what happens is people will start collecting data and they'll try to identify trends and patterns, they'll try to look for something that's going to happen, we create scenarios, futuring. We're talking about where are things taking us, how do we know, lots of data, the more data the better. The only thing certain about trends as they always change and they usually change suddenly. So for designers it's very dicey to begin to look at trends as the way you start your direction or your work. So in this case this is an example of the idea of intentions, just some, it's for every project your intentional about what you're going to do not for outcome before your intention is and we're imagining for instance that there's this machine and you're dialing in what your intention is. And this example is what I would imagine more to be relevant to digital technologies and that sort of thing, but you begin from the start saying: well, in this project are we trying to humanize or dehumanize the world. And these aren't value judgments. by the way. This is just what happens. People will decide: do you want to get people out of the system, because they're unreliable, they can't go fast enough, they get in the way. Do we want to get a system that will replace them? We do this a lot. Where do we want a system that helps them, that augments what they can do or what they're trying to do. So we dial that in. We dial in systemization, desystemization, materialization, dematerialization. All those are choices of intention. They're not based on trends, they're not based on any kind of fact, they're based on what you decide you're going to do in the project. What are you up to? What's the intention?

29m25s HGN: The other is this notion of, in design, is the reconstitution of Sophia. And for pre-socratic Greece Sofia used to mean the wise hand. Philosophy means the love of wisdom. Sophia was the wise hand. The pre-socratic Greeks would just be amazed that they could make things appear in the world like ships that never existed before. They would wonder: how could we do that. There weren't ships out there in the wild that we would capture and collect. We created that, how did we do that? So again in the Western tradition at some
point. Aristotle had four causes. Any of you that was forced to read Aristotle and ...? Some smiles ... So, in the Middle Ages this was reduced to two causes. And the two causes for anything in the world would be now equivalent to science and technology. The other two causes fell out: form and final. Two kinds of causes. Sophia was split at the time of the Socratic era. If you've read the Republic Plato's Republic you see that those who think went to top of the hierarchy and those who did things went to the bottom of the hierarchy. And that sort of stayed with us up till today, we have blue, collar white collar, we have abstract we have concrete, we have all these polarities that came out of that split of Sophia at that time that we still live with. And in design it doesn't make any sense to split thinking and making apart. It just doesn't make any sense. there's no good reason for it, tradition aside. Reflection and action. A lot of the design traditions are very focused on material stuff, on doing and getting action. Doing stuff and not so good on reflection. Others are very good about reflection maybe, never getting around to actually doing stuff. There's a lot of criticism that flows back and forth, between those who just sit around and think and those who just do stuff and then we suffer the consequences of whatever happens, but you get something done. There's this kind of tradition in America of pragmatism. Doing stuff, getting something done. Anyway we're interested in design on reconstituting Sophia again, bringing those things back together and integrating them. Because it doesn't make any sense, especially in the world that we have today: to keep thinking and making separate or reflection and action separate.

32m20s HGN: Also there's a sort of change for or concern for purpose. Which are the outcomes. It's different from intention. Purpose is about outcomes, what kind of outcomes are we interested in. And there's this notion of the difference between designing stuff and designing things. Now those are sort of bad translations of Heidegger, but what happens is that the stuff is things that we create, that are not connected to anything around them. And we do this a lot. We experiment, create products, create services, throw them in the world, see what happens, see if something works. It's not really connected. People have to adapt to what you did. The world has to adapt. Sometimes there's tragic mistakes. Have you ever been to Australia to see that rabbit population, where the rabbits were introduced for a very good reason. Just try it. Now you just see rabbits for miles. And it's different from designing things, which are the things that we create that have connections built into them. We're concerned about how the things connect to the world, how they connect in the environment, how they connect in their context, how they connect to other things. And we use both. And both of them are OK if we know that that's what we're doing, if we're creating stuff or we create over designing things. I don't know if any of you have seen the video that's going around on the web, about the story of stuff. If you haven't I would suggest to look at it because I think it's been quite popular with people. There's a concern about we're generating too much stuff. We can't manage the stuff we have. It's unsustainable stuff. Do we need the stuff? And the conflict with it is that we need people to buy more stuff. We need more stuff going through the system so that we have a healthier economic system. We need more kinds of stuff going on. So there's a real conflict right now in the public around whether or not stuff is good for us or not. Do we need more stuff or less stuff. And not so much maybe about designing things, but I think that's an important piece as well.

35m49s HGN: So in design a lot of times people will tell me that or they will talk about design as if it's creativity. Or they talk about design as if it's innovation. So they use that energy changeably. Sometimes they use innovation as interchangeable with creativity. So when businesses say we need to be more innovative, they're saying when you talk to them that they want to be more creative. And actually those two terms mean something quite different from one another. They mean something important and they're different parts of the design process
but they're not equivalent to design. So there's a lot of interest in creativity, about novelty, imagination, diversity. You've probably all been exposed to creativity workshops classes that sort of thing there's a lot of interest a lot have been said about that. I want to talk a little bit about innovation. Innovation in its definition, the one that I like, is how something becomes a part of people's lives. That's what the original definition of innovation was. This notion of diffusion, this notion of going into people's lives. That's what innovation was about. And it's an important thing for business to be concerned with. How do their products get out into the world? But it's not the same thing. But one of the interesting things for me was that in the 20th century innovation, what it was, was captured in this motto for the Chicago World's Fair. And it's sort of the steps that people still cleave to today. I find it in place all the time. Science finds, industry applies, man conforms. What I'm finding is that as the younger generations get better educated and they start thinking about things more they're much less willing just to conform to whatever comes at them. They want to have more investment in what their lives are like. What becomes part of their lives, what the world is like. So this is not necessarily a process that they're so interested in continuing with and I think that's a probably a good idea.

37m17s HGN: So I would say for example from a design centric position, we could say that: we start with what people desire, it's called desiderata, designers then imagine, what's ideal, sustainable, systemic, significant, any of those steps, science confirms that what we desire and what we've imagined can actually occur, and technology enables. This is just an example of a different notion of the process for innovation from a design centric point of view.

37m53s HGN: Now, lame gods in the service of prosthetic' gods. Designers don't work in isolation. Design by definition is working on behalf of the other. Artists and scientists in the best ways can be
self-serving. Artists like to work mostly with expressing their emotions, their feelings. Scientists like to follow what their interests are, to serve their own interests. Designers by definition have a relationship with others that they are going to serve those people's needs. So we're always in some kind of a systemic relationship with others. And I picked up on this idea of lame gods and prosthetic gods in that in the Greek pantheon there's a blacksmith, Hephaestos, and he is prototypical of a lot of mythic systems in Africa and the Middle East it's usually a blacksmith, has some kind of handicap. But Hephaestos, anyway, makes things to overcome his lameness. He has the qualities of a God, he was born as a full God, but he didn't have the full capacities. So he created things like winged chariots, he created things like robots, crazy talk, he created robots to serve his needs, he created things that the other gods would start to watch what he was doing: well, could you do some jewelry or could you do some armour. So he was working for the other gods, but he originally started working because he had to overcome his handicap. But he had this incredible power, this incredible ability of all gods, to do things. He became an archetype to my mind for what a designer does. And then Freud talks or brought up this notion of prosthetic God, in that what we're interested in as humans are extending ourselves. None of us want to be stuck with what we're born with. And I think that's fine. And I've worked a lot in developing regions of the world: nobody wants to live naturally. I mean they might be able to say that in Berkeley or someplace, that you want to live naturally. No place else in the world do people want to live naturally. They don't want to be subject to diseases, they don't want to be subject to animals, they don't want to be subject to weather, they don't want to be subject to any of those things. That's fine. I think that's a great thing and prosthetic Gods, the idea of prosthetic God is not about what's missing, but it's about what we desire. What is it that we desire to extend our humanness in the world our humanity, what is it. So the prosthetic God's idea is not about needs assessment. Needs assessments are always, usually, about what's missing, what should be there what's not there now. That's not what this is talking about. This is talking about, what is it that we desire as humans, to extend ourselves in.

41m18s HGN: So, lame gods have unlimited power, but they have natural limits. We're not prescient, we're not omnipotent and we never will be. We can get bigger databases, we can get faster computers, we can do all of that stuff, and we will always have these natural limits. We will never know what we're doing is the right thing to do for sure. We'll never know the direction we're going is the right direction for sure. There are no guarantees. So, for designers to be mature designers I believe they have to appreciate the unlimited power that we have and we've proven that to ourselves many times sometimes disastrously, we can create incredible change - we also have to admit we have natural limits and that's okay. The problem is when we're indifferent to that when we're indifferent to the power that we have and we're indifferent to the limits that are in place.

42m36s HGN: As prosthetic gods the desire to live unnaturally is fine. It's expressed in desiderata that people have. One of the things that's unfortunate is that people usually express the reason for taking action as problem. I have students watch TV for a week, read the newspapers, read news journals, and keep track of how many times action is justified by problem. And how many times action is justified by something that people desire. And it's 99.99% problem versus people saying what they desire. In architecture we would get handed a problem, we wouldn't get handed an opportunity we wouldn't get handed a desire, we would get handed a problem. I would suggest highly that you read some material by Horst Rittel on the difference between wicked problems and
tame problems. I know he's in the old guy and he was at Berkeley, but really he sets a great case for why we should be very nervous about always justifying the work that we're doing starting with a problem. Especially as designers. When thinking about prosthetic gods there's this notion of extensions of self and there's been some very interesting work in this. It's people's identities actually extend out into their networks of other people, of places, of things that are really important in their lives, of valuable things, belief systems. So who they are who they believe they are when you're working with people doesn't stop at the skin level. It doesn't even stop at the handshake level. They have incredible networks of extended self, so when you're dealing with people you're dealing with other people, you're dealing with family, friends, you're dealing with all these other things including technologies, and other stuff that's extensions of them. And that's good. People lead much richer lives, because they have this extended self. The problem is, with the possessions of stuff, of course, is what we talked about earlier, is that there is now concerns of unsustainability of the complexity of the stuff that we have. We can't manage all the stuff that we have. And its unsustainable support. We can't have all the resources that we need, we can't get rid of the waste that we have. So we have a real challenge with this notion of possessions of stuff. Not necessarily the extensions of self, although people can get confused where they start to see themselves as identified with their BMW. I wouldn't. Or I'd like to try, see if it works. People can get confused over things for those things that are real things and not stuff, or what's the difference between stuff and things. And of course the danger with a prosthetic gods is that if they're heedless, if we're not thinking about what we're using to extend, who we are, what becomes a part of us and what just becomes aggregations of stuff, that has consequences environmentally socially all other realms.

46m24s HGN: So how do we deal with these kind of dangerous powerful dynamics that's going in place between these two figures. One of the things that we think is important is the creation of a design culture. Creation and support of what emerges as value experts. People who can say what they want, what they desire, what's good for them, what they would like to have. A society that can sort of contain and hold some of this activity that designers are engaged in that they know when to call for design and why they're calling for design. If you ask people out in the street what science is they can give you, even if it's a poor definition, they can give you a definition of what they think science is all about. If you ask them what design is and it's probably the colour of the iPad, maybe, or I don't know, something usually about form or color or shape. Nothing necessarily about value or creating reality or the impact they have on the real world. So this is an important thing that I think we should be up to is letting the rest of the world know what design is, why it's important, why they should be engaged in design, what the consequences are, what the values are. Then there's this notion this other notion of creating a culture of design, like creating good designers and focus on this notion of expertise for instance, design expertise. So I've been working with three forms of expertise that we get from training, education: routine experts adaptive experts design experts. Routine experts are primarily what comes out of our educational systems. People who can give you the answer to problems on a quiz. That's how we know that they're good routine experts, because we can give them quizzes. They'll give us the right answers and we're assuming that nothing's changing so those routine experts can go into the world. If somebody asks them what's the answer, what do you do here? They can tell you, because they know the answer, they're an expert. Nothing has changed, the problem is as we all know. Now things have changed, the world has changed, the environment has changed, expectations have changed, not just 9/11, it's a whole bunch of things. Things change. How do you make sense out of the world that's
changing in the way that it is now. The public asks all the time: can anybody connect the damn dots? Can anybody put this together in a way that makes sense, so we can do something that improves our lives. What they’re looking for are adaptive experts people, who can engage in a rapidly changing environment in context and make sense out of it. That’s hard to test for by the way when you’re teaching that. Because you only know if somebody is an adaptive expert if they are put in to a situation where there’s dramatic change and what they do was a good idea. And that’s very hard to replicate in a studio or a classroom. But we necessarily need adaptive experts. Now both the routine expert and the adaptive expert sort of responds to change. So the routine expert responses things that aren’t changing, adaptive expert responds to things that are changing. And the design expert creates change. That’s a huge difference. And I tell people it’s sort of like laying track for a moving train while you’re still on board. You’re trying to change the direction that systems are going, while the system is underway. It’s never still.

50m45s HGN: So begin to wrap up here: I think that to create or help create a better understanding of design, for instance, what I’ve been working with, is in addition to what I would call apparent design, which I find most of the focus and the design fields are on. So those things that we see. That’s the tip of the iceberg. So when we’re talking about a laptop for every child and everybody’s critiquing it and wondering about it: how much does it weigh, how long does the battery last, what does it look like, does the screen glare, does it fit into ..., all these things are at this level of apparent design, what we can see, and what we can experience. That’s where the focus is. In addition to that we need to know and because of these issues of sustainability and these other concerns that we have we have to know about systemic design, how does it interact with the environment, what are the unintended and the intended consequences, how does it interact with other designs, how does it interact with people, with cultures. So we need to pay attention to systemic design.

52m00s HGN: And deep design: this is the way that, this is just an example that I use for my understanding of deep design, because of my interest in ceramics at one time I discovered that raku, which is a certain kind of ceramic, low fire ceramic process, it came from the need to create teacups in the Japanese tea ceremony. So when I was in ceramics doing the raku work I had no clue what lay underneath the reasons for raku and the way that it was done and its aesthetic all of it, I had no clue what all that was about. Because I was in this sort of art mode, object mode, in the apparent design
mode. What I discovered when I looked into the raku who was that it was part of the tea ceremony in that you would create the cups that you were going to use in the ceremony itself, so you needed a very quick process. It was all a part of this Zen Buddhist tradition. So there are these layers is what do you see in function, form, appearance and experience. At the next level: what's the purpose, what's the ends, the outcomes. This notion of the ceremony itself, what does it do, what's its point. The aesthetics that it is up to. And at this other level: intention, aim. What is that level? What direction is Zen Buddhism aiming at. And of course at the core there's a much deeper religious belief system. I would say that every design that we create has these connections, whether you're aware of it or not. It may be that you're just given a presumption of what the end is supposed to be, or what the means are supposed to be but there's implied in that if you look at that all these other deeper levels. Some of it may be not so pleasant, some things are rotten at the core, maybe you don't want to know what's there. Some things are quite beautiful attractive. I've done this with several things that in my life like Shaker furniture or something where I have had this deep interest in it. And it all started I guess with us one of the sisters at this Shaker settlement just before she died said I hope I'm not remembered as a piece of furniture I want to be remembered for the work and the beliefs that I had. And I realized all those things I had been collecting Balinese masks rugs all these things that I had collected actually had this incredible deep system that caused these things to appear in the world I knew nothing about. So we have a lot of products that are in this apparent level that actually, if we look at them, we can find what those belief systems are. As designers I believe we need to know we need to understand more about what those deeper levels are, because Russ Ackoff would say, the righter you do the wrong thing the wronger you get. So the better you get at doing something, being a designer of something, and the better you do it, you may be making things a lot worse by not understanding what is going on at those deeper levels. We can't assume that because we're becoming more efficient or effective in what we're doing that we're doing a better job. So just to wrap up I would say: for design inquiry what designers do that's
different from for instance what you would do in science which is science is mostly focused on what's true, and they have very good designs of inquiry to understand what's true, in addition designers need to know what's real. And that is I mean the ultimate particular of anything. You as an individual are so complex as an ultimate particular that it's impossible to really truly understand what's who you are really. So we create avatars and other things to sort of stand in for people. People hate that by the way when they're not treated in organizations as valuable individuals as persons. So this idea of what's real is important in design. What would be ideal, that's another huge challenge. And finally then what should or ought to be made real. And I think those four forms of design inquiry are what constitute design scholarship and praxis. Thank you. Questions?

57m23s HGN: [Question 1, about One Laptop Per Child] One good thing about that particular model is that I can use it as a critique as a design critique. And that's an important part of design practice, it is actually be able to critique things that are done, so you can take something like that, one laptop per child. You can look at the next level and ask what were the outcomes that they were looking for. So you can't tell whether or not that's a good object unless you know what the purpose was. And you can't tell whether or not the purpose was a good purpose unless we know what the intentions were. So when people are trying to critique something like that computer you can't do it with how much it weighs, how much it costs, how long the battery lasts, unless you know whether it makes a difference. Because of what the purpose was, what was what was the outcome and then deeper. And of course when they run into issues of cultural problems those sorts of things would show up if you were designing from scratch. For instance what were the deeper value systems that you were working from and then what were the directions that you were going in because some areas that may not even be appropriate for this kind of technology. So in design and I would say in any design work you don't start at those levels every time. What you do as a professional is you worry about those things all the time. You worry all the time about what are the deeper values I should be working from as a designer and how do I recognize the deeper values in the people that I'm designing for. So that each time you do a project you're not going to start all over again. But in the case of that laptop and other projects that model has been very valuable in sort of asking people and driving the process down, because you can't say for instance if this car is going too fast or isn't big enough or anything, unless you know what was the intended outcome, and what was the intention. But we do this all the time I read the newspapers where they review cars or they review products. And it's just at this level of appearance it's wrong color I don't like the shape, I don't like the swoop. But what was it for. Because if you work cross-culturally things will startle you that you see and you'll say oh well if you understand at those deeper levels it's fine so you can you can appreciate and work with them if you start with them at those low lower levels.

60m35s HGN: [Question 2, about complexity] Yes, absolutely and that brings in a lot more about systems science and systems traditions. Helping us understand complex entities. When I teach organizational systems design there are a lot of approaches that we can use for handling complexities, for understanding them, for characterizing them, for modelling them, and how do we know where to intervene in existing complex systems. Where do we get the most leverage. So there's quite a bit that we can do with complex systems. And I would say almost any system isn't simple. A problem is if we treat them as simple, because we're afraid of complexity that there are ways of dealing with complexity and not complicatedness. So in health systems for instance one of the approaches that I use in the beginning working with people is to identify who are the clients who are the surrogate clients with the stakeholders who are the decision... I have a whole list of roles that you go through get people to begin to articulate those make them transparent and even if they don't do it completely that still gives us enough information to give us some direction to work with. And you can't be comprehensive, and this that's another thing that is sort of hard for people to understand. We don't need more information we don't need more data we don't need to because we can't be comprehensive. That's not the point. The way that we work with design in those complex areas is we learn to deal with professional judgment, which is another thing that doesn't come through our educational processes. But professionals do use judgment all the time so we have
to make judgments on where we bound systems what we think are important what are the connections we do that all the time and designers get trapped in this notion that well we need to do more we need to get more data we need. And suddenly I’ve seen like in Community Planning projects or large political issue, people just get overwhelmed with data they don’t know what to do with it. We can generate data unimaginable amounts of data. Horst Rittel in one of these seminars, he used to smoke these little cigars and he carried these little boxes of matches all the time, these little stick matches. And he pulled out two matches and he said okay, brilliant Berkeley graduates, tell me everything that’s the same about these two matches. And so we said we were brilliant so we just got to work and we start generating all this stuff that was the same. He says okay stop now what’s different about the two. Okay Duke you know we’d get Mettler balances we do all these things get everything that was different about me so stop. Now what’s important is to know is what’s important about these two matches. And it may not be all that data that you’ve just generated. It may be looking at them in a totally different way. And that’s I think the difference for designers. How do we decide what’s important to know, what do we need to pay attention to? Because, trust me, we do this with students a lot: take your pen and get them to describe that pen in as much detail as possible. It’s simple, you know. The shape, the scratches, every little detail, thing’s out. Pretty soon it’s unimaginable, they have an infinite amount of information on just one simple little pen. So the point of knowing what’s important to know about the pen is essential. And that’s for designers, it’s not data it’s not about being comprehensive it’s about being able to understand what’s important, what we need to know and how we put what we know to use.

65m07s HGN: [Question 3 about teaching designers] Yes, I’m not sure how Stanford does it so I’ll get away from that but working with the people I have in on other research projects trying to figure out how to change curriculum, so people aren’t dependent on exams for instance. And on exams in situations where they’re in an artificial environment, where things are stable. So that the real issue for routine are for adaptive expertise for instance is what happens when you’re in a real situation and it’s very complex and changing. And you make decisions or judgments and what you do is you look for good outcomes. That’s very difficult. So we have to find a way to create a curriculum where we’re with some confidence we think that people are becoming better adaptive experts and then hopefully of course design experts. So I worked with a crash site investigator for Boeing on his doctoral work and they were trying to figure out how to stop pilots from getting into trouble. How can you train a pilot not to crash. And he was a pilot himself, and what I discovered early on had all these decision-making experts on his committee. Well it turned out was that when a pilot or when there’s a crash: no crash is the same, cargos different, the aircraft’s different the time of day is different the landing zone is different everything is different in every case. So you can’t train somebody to do something ahead of time, because all the conditions are different. and pilots are receiving unlimited amount of information at the same time and they’re making judgments that there’s no right or wrong answer there’s only consequences that’s a huge difference. So the adaptive expert has to work in that realm rather than in the realm where there’s right and wrong answers and nothing changes, work in this notion where everything is different there’s just consequences there’s no right or wrong. And that’s especially true for designers I would say. Most universities I know aren’t doing this well and it doesn’t matter for a lot of the professions or for a lot of the disciplines I think it matters a lot for designers and some of the other professions. I would say it matters for engineers it matters for people in medical matters for a lot of the professional areas that we have adaptive experts.

68m20s HGN: [Question 4, about curricula] I’ve actually designed I ran a program for several years. Trying to help people become design experts and the curriculum was designed so that the learning was design learning and it was a design process that students went through rather than I don’t know if you all are aware of the kind of maybe, curriculum designs that you have where there’s accumulations of information. You go from basic to a little harder to really hard stuff and you learn things in this kind of accumulation of stuff. So that process is very different from the way designers work, where there’s immersion and there’s all these different kinds of knowing and learning. And you figure if a student can go through and learn with that kind of process that they’re going to em-
body that in a way that they will then be able to replicate it when they're professionals and that's different from sort of trying to figure out how 101 and 102 equals 203, you know in the usual kind of curriculum build-up yep. [The end]

1 If you want to read more about man as a prosthetic god in Freud’s Civilization and Its Discontents (1930), go to http://faculty.georgetown.edu/irvinem/theory/Freud-CivDis.html and scroll down to the end of section III. It’s fascinating stuff.