7-12-1978

"Rates of Change (Lecture 1)"

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Portland State University
July 12, 1978

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Transcribed by Tenzin Kunden, April 2020
Audited by Carolee Harrison, June 2020

HOST: …approaching a new society that is indeed what the people want; from what I've heard and said already this morning, I think that is what we’ll hear anyway. We’ll be interrupted as we progress a little bit to put the easel, the paper, out. Now the easel was delivered, and then I found out—and it’s not their fault, it’s not critical of A/V at all, it was sort of my error in not knowing we had to find paper—so a runner literally is running to grab a pad to put on here, so I’ll be interrupting you shortly.

Our speaker today, John Platt, has enormously broad experience. He came from the University of Chicago in the olden days, when many many things […] were happening. With some of the great nuclear physicists being trained there and being on the faculty, many of our molecular biologists were there simultaneously. He was with a group of people that are now leaders in a lot of fields, and perhaps it is this interdisciplinary exposure in the past that causes Dr. Platt to be in that situation of thinking in the future [along] all lines, but on a basis that’s particularly, for what we’ve been talking about, and what you’ve been working toward. So, to keep our introductions informal as we’ve been doing, I present Dr. John Platt.

[applause]

JOHN PLATT: [aside] Somebody’s going to get screwed. [laughter] But I think it’s this chart pad. [background noise; setting up the easel] Now, have we got some things to write with. Terrific! Terrific.

I always write “yes” just to prove I’m a naysayer… not all the time. And just to test the pen.

I have had a curious background. I started off in physics, and then I got into biophysics and studies of vision and perception, first from a physicist's point of view. Then this got me into psychology. Then I got off into the absorption of light by large molecules like those in the retina, and this got me into biochemistry. The result was after a while, I had gone through several different fields of science, touching them very lightly, or they had gone through me. I began to be interested in the differences between the fields, in how physicists are different from chemists and how biologists have a certain point of view that no physicist ever had.

So I began to write essays on science and society, how different social pressures lead people to go into one field rather than another. So I got interested in science and social change, and lo and behold, this turned from a hobby into a profession. Now I am down at the University of California at Santa Barbara in the Anthropology department, of all places. I never had a course in anthropology. I am teaching a course there in "Global Problems and the Future of Humanity," but it is really just a continuation of this interest in science in society and how science is affecting society today.

In a sense, I come at our problems from what's called a general systems point of view. People who work in general systems have come from everywhere, some have come from physics like me, some have come from engineering, some from psychology or psychiatry, some from mathematics. What I have is a systems point of view of society, and a systems point of view of world change today. What I thought I'd talk to you about was a specific type of systems problem: rates of change. Many people who have written and worked on systems problems have worked on steady state systems, on how systems maintain themselves. I am working on how systems change, and this is particularly appropriate to the world system today and the human system, the human race, and its changes as we move into the future.

I thought I'd start out by discussing the rates of change in the last 40 years or so. If we start in 1945, we have enormous changes which I can symbolize by a S curve; some were slower that others, some very much faster. But around 1945, we had big jumps in communications. As we began to get television, communication now by sight and sound around the world at the speed of light, it is 10 million times—10 to the 7th power time—faster than the communication of 150 years ago say, by a ship or by horse. It took a year to get to Australia and back more or less. Now we communicate to Australia and back in a fraction of a second.

In travel, I flew here yesterday on a plane at nearly the speed of sound. If you compare—and millions of people do, of course, every year—you compare this to even the turn of the century. The locomotive got up to 100 miles an hour. This is six times faster. This is a hundred times

faster than a horse, the cruising speed for the horse. On the other hand, there are some guys in orbit now, if I remember my news correctly from this last week, some Russians, and maybe a Pole or a Czech. And they are going around at 17000 miles an hour, 25000 kilometers an hour or thereabouts, and that, you see, is 100 times the speed of planes, even. And so we have made these enormous jumps just in the last few years. Let me write down 10 to the 2nd power, meaning 100 times roughly the speeds we had a generation ago.

In weapons, in 1944, there was the blockbuster which had about 20 tons of explosive capacity. in 1945 there was the Hiroshima atom bomb, which had about 20,000 tons. In 1953, there was a hydrogen bomb that had about 20 million tons. And it is a change by a factor of a million times, ten to the sixth power, in just 10 years. We haven't changed much since then. That is typical of many of the jumps that occur in evolutionary history. We're going to talk about that some more this afternoon. It very often happens that there will be a sudden jump to a new mode of life, the creation of wings, invention of mammals. It'll take place in a very short time and it'll be constant for a long time after. The domestication of the horse, for example, about 6 or 8 thousand years ago.

As soon as you domesticated the horse you had a new speed of military operations. The Mongols sweeping across Europe, or a new speed of communications; the Roman messenger system to the ends of the empire, or a new speed of nomad travel by horse, like the Indians when they got horses. But once you had that speed, it stayed constant for thousands of years. That was the speed you could travel over land. So similarly, we get up to the 20 megaton hydrogen bombs or 100 megaton hydrogen bombs. It's already too big even for the military. So we have not had much change now for 25 years compared to that enormous change in a mere 10 year period back in the early fifties.

It's typical that we have the kind of curves I've show here: S curves which make a rapid jump and level off, in most aspects of invention or development or evolutionary change. It is not true we have steadily increasing growth. If you look at the details, it is a bunch of little jumps, little saltatory steps, as they call them. And this is coming to be the new view of evolution in general and I think the view of the kind of changes we are seeing today in society. They jump, and then you organize and begin to manage the new powers, and then it lasts a long time before the next jump.

Another jump in the last few years is data processing, data storage, and retrieval. When I was a junior at Northwestern University back in the 1930s, there was a thing called a Depression. People were out of work. None of you have ever experienced anything like that, of course… [pause, murmurs in the audience] and a generous government invented the National Youth

Administration, the NYA. They paid us poor undergraduates 50 cents an hour to do scut work for the library or physics department. I was working for the physics department doing some calculations, and I had a "desk computer," and it was the most modern thing they had around. So when I wanted to multiply by 47 I would multiply 1234 then I would flip the column and 1234567. I remember in 1935, we got an *electric* desk computer. It was a Freeden from Sweden. It had a little motor to do that. It wasn't any faster than I was, but I wasn't as tired at the end of the day. Since that time there have been something like four generations, as they call them, of computing technology. Electronic computers, transistorized, microminaturized, integrated circuits, and now there's something else. And the result is that today, data processing in banks and computer systems for military calculations and science is at least a million times faster and a million times more storage, and maybe in some aspects it's more like a billion times more.

Well, one can go on and on this way. Since about the time of World War II, even in things that are not quantitative. Things like exploration. It was 25 years ago, at the time of Queen Elizabeth's coronation, you remember, that Hillary and Tenzing went to the top of Mt. Everest. Since that time people have gone to the bottom of the deepest ocean, they've lived at the north and south poles with hot and cold running water and helicopters to take them out when they got sick, and nuclear power, I guess. And they've gone to the moon. How do you put numbers on that, but it's a tremendous age of exploration just in the last 25 years. A jump far beyond any jumps in exploration we've ever had on the earth's surface before. In the interaction between human beings with plants and animals all over the world. It's now our biological world that inhabits the globe. Once upon a time, we were just a small perturbation of nature, but now in the last 40 years or so, now we have become the most important thing in the numbers and densities in the plants and animals all over the earth's surface. It's our DDT that is in the Antarctic penguins, it's our ships—I am talking about human beings in general—that are hunting the last of the great whales, it is our […] that are killing the tigers of India for the sake of those tiger whiskers that are suppose to be a great aphrodisiac—I am glad I am not a tiger—it's our Santa Gertrudis cattle in the fields of Argentina. It's our green revolution in India, it's our penicillin bacteria multiplying in the flasks in Toronto and a thousand other places, and the result is that we now the determiners of biological evolution whether we mean to or not; very often it is accidental and just some of our debris that we have thrown over. Nevertheless, our perturbation of the whole biological system has just become enormous.

Well, you can go on and on in this way. Oral contraceptives, things like penicillin and DDT, whether one likes them or not. The changes are so great around 1945, that I like to call it "world year zero." It was within a year or so of the first electronic computers, the first long range rockets, the first atom bomb, the first radar, the first operational jet plane, within about

three years of the first television, and the first oral contraceptives. Much of this came out of the research and development of World War II. The competing research and development teams of the Germans, the Russians, the Americans, the British, and so on. So today, we are in 1978, and it is world year O33. Notice that I put an O. That means that some day this odometer may crank past 100. That means I am an optimist.

What has happened, of course, is not so much that we have had new technical changes in the last few years, but that now we have to begun to have the social changes which result from these enormous technical developments. My opinion is that in the last 10 years, since about 1968, just to pick a date, our social changes have flipped around more in this country, for example, and increasingly in the other developed industrial countries, more than in any previous peacetime decade. It has been interesting that in 1968, '76 marks a Republican administration which was dedicated to conservatism. It is just overwhelming the number of changes that have occured in that period which have been very unconservative. The reason is of course not because of any particular label on the administration. The reason is because of these worldwide technical changes which were so overwhelming and which no previous society, none of our previous institutions were prepared to manage. None of our previous institutions were prepared to manage worldwide nuclear weapons carried by ICBMs, or were prepared to manage oral contraceptives, or were prepared to manage a television society, a high information society. So we have come into this new world needing new institutions, and we see the old institutions dissolving before our eyes because they cannot cope with these new powers. The family, the school, the university, the church, the army, the nation state, the multinational corporation, everything is in flux, and the reason why it is in flux is because of these enormous new powers of communication, of terror, of biology, and so on, of data processing, which we simply never had before.

It is worth making a list of some of the revolutionary changes. I call them watershed reversals: reversals of our laws and attitudes of decades, generations, or centuries past, in the years 1968 to 78. Now don't misunderstand, when I said things started in 1945, I didn't mean they started in 1945; everything's got precursors. Television: before that was radio, before that was telephone and telegraph, and before that, of course, there was semaphore signaling. There is no place where an exponential begins, and so one can trace the roots of these changes back to the last century, the physicists Maxwell and Helmholtz, or to the Renaissance, to Francis Bacon or to the Greeks, or to the invention of fire or speech, or to the invention of mammals. We are growing in a steady stream, and there is no point where it can be said to begin absolutely. And that is why I emphasized the enormous scale of changes about 1945. If you plot these things on a logarithmic scale, so that normally you'll get a doubling every ten years or every 100 years, well, you would have a straight line on a logarithmic scale of change or an exponential scale,

you see a sudden turn up of the slope even at the exponential about 1945. So it was a dramatic change, even though it was not the beginning of things. Now similarly, in 1968 was not the beginning of social change. We had enormous social change in the 1920's, in the flapper era. When the liberated young people got new dress lengths, new hair lengths, new dances—the Charleston, and jazz—new music, new drugs, the hip flask… forbidden drugs. One can go on and on with the changes in the 20s which were precursors of the changes in the late 60s. I don't mean that everything started in 1968, but it did become very dramatic and very visible about 1968. '68 is roughly the time when we suddenly realized as a nation that some sort of shift had taken place. One of the ways I like to say is this was the year when the musical *Hair* came out on Broadway—and who ever celebrated long hair on Broadway? It shocked us all—and then they stood nude on the stage there at the end of the first act. Everybody, *nude on Broadway*? Our musicals today are in a sense much more like *Hair* then they are like the 1940s. So this was the time of the McCarthy campaign against Johnson. Whoever had a Democrat try to upset a sitting president? It was the time of the assassinations of Martin Luther King and Robert Kennedy; it was the time of the Democratic convention in Chicago—which just was really a revolt in the streets—such as what we haven't had in this country in years. It was the time in Europe events of Mai-Juin, the events of May and June in Paris when the de Gaulle government almost was toppled by students' protests. It was a time of sudden awareness that we were in a new world.

The reversals I would like to list which are reversals are ways of previous centuries, are done in the spirit of a chart that Jonas Salk… Jonas Salk drew in his book *The Survival of the Wisest*. One time when I started in this book, I thought he meant himself, but later I realized that he hopefully means all of us. But in that book, there is a chart which is an S curve, and it shows a curve of growth in a bacteria in a colony. The bacteria double every—here is time, going along here—the bacteria double every twenty minutes, so after twenty minutes there are twice as many, after forty minutes there are four times as many, and after sixty minutes there are eight times as many and so on. Up to the point where they begin to reach the limits of the flasks. And when that happens, then the number of bacteria levels off and it may even crash, they may poison themselves. So they wipe themselves out, or they may come to some sort of steady state depending on how much of sunlight or nutrients is dripping into the flask all the time. But Salk emphasizes that this first part of the curve is what he calls the "A" section of the curve. It's the section with positive feedback; that is to say, the more it grows, the more rapidly it grows on growing. The second section of the curve is the "B" section. It is the section with negative feedback; the more it grows the more it is inhibited, the slower it grows on growing. And of course the curvature turns around. And every engineer or physicist or chemist will recognize that we are talking about a point of inflection between the A section of the curve and the B section.

Salk's reason for drawing this curve for bacteria is to say that many of our human problems today have a very similar time course. And so he draws a parallel, for example, with population growth, when you begin to reach overcrowding or with the growth of economic goods. And what he says is, that in human affairs, when we turn from the A section of the curve to the B section of the curve, it's a watershed. It is like taking your foot off the gas and putting it on the brakes. And the result is you have a reversal in your laws and attitudes. Your ethics. Simply because the situation has changed.

So in the case of the human population, he says the first period of human population is a period of growth. God says to Adam in the first chapter of Genesis: "Go forth, be fruitful and multiply"; you gotta multiply when there's only two of you. Incidentally, he says essentially the same thing in the same words in chapter 6 of Genesis to Noah—you are down to two of every species again—so you had to multiply, that's the only way to survive against the vicissitudes of nature. Multiply, pro-growth is a moral imperative in an evolutionary situation of this type. On the other hand, when you begin to reach the limits of the flask, now the word is zero population growth: two children or one child or none at least a while. And the reason is not that your large objective is any different. Your large objective maybe is to maximize the human potential, but the point is that your tactics have to be different, because the external reality has changed. Here you maximize the human potential by maximizing the number of humans, but after the watershed—after you begin to reach limits—you maximize the human potential not by maximizing more humans, but by maximizing each one and developing the individual potential within each person.

Somewhat the same thing happens with us in our own limits to growth. If I had gone on growing at the rate I was at age 16, I would be through the roof. I would be monstrous; I would walk about like one of those great giants, and if I fell over, I couldn't raise myself up. It is good that we have limits on physical growth, so that we can develop the intellectual management of our powers, so that we can develop in terms of awareness or sensitivity or scientific insights or human insights. Salk goes on to make the same point about economics or about the growth of energy consumption. It is good in the early stages to have steady growth of power consumption in every generation, because this frees you from slavery. This gives you lesiure, this gives you consumer goods which are good for the human spirit, it gives you more potential. But if you go on and consuming more and more power in every generation indefinitely, by and by you overheat the cities. At the present time, Los Angeles is some 7 or 8 degrees hotter than Orange County; it's a semi-desert. If it had gone on the rate that it was going 10 years ago, by the year 2000 it would have been 25 degrees hotter than Orange County. Nobody would live there. They would move away. Of course they might have air conditioners, but you know there is a limit

even there. An air conditioner is very inefficient. It takes one unit of heat out of the room and throws three units into the outside air, and the result is your neighbor is now three times as hot and he has to get a bigger air conditioner and take three units out of his room and throw nine units into the outside air. Obviously, that way lies madness. In short, even Los Angeles is going to limit the size of air conditioners, as it is going to limit the size of factories, the number of automobiles in town and the number of asphalt highways, simply on the grounds of thermal leveling off, because continued growth of that sort cannot be sustained.

The same thing is true of economic goods. It is good in the beginning to have more and more goods in every generation for the same reasons as I said about power. But by and by, you want to leave something in the ground for your children and grandchildren. By and by you begin to think about the long run future and the steady state or the sustainable society instead of the growing consumptive society. Well, so what we can do if we are interested in these questions of where we are on such a diagram, we don't have to look as Salk would say at numbers of people, amounts of food. We can look at the changes of laws and ethics as we cross this kind of divide, this kind of reversal. We can see how aware we are that we are that we are in a new world.

Since 1968, I think there is at least a dozen reversals in this country of patterns of earlier decades or generations. One of the is détente. 1969, Mr. Nixon, whatever you may think of him, opened the doors to China, one-fifth of the human race, and to Russia. Which had been the Cold War for over 20 years earlier. International money, the so-called special drawing rights. In 1963 this was proposed as a wild idea, 1968 it was adopted. The special drawing rights are a recognition that we are in one world economically. It is the first time—it is a watershed, because it is the first time in human history that we have had a currency which is between a group of countries by agreement, which is not based on national currency like the dollar and not based on a primitive currency like gold. It is an agreement currency that represents that we are in one world internationally, just as détente is an agreement that we are in one world of terror. Ecology. The blocking of the supersonic transport in 1970, I think it was, whether you agree with it or not, was the first time in western technical history that a billion-dollar juggernaut rushing forward into the future was stopped in advance on grounds of human or environmental concern. Now, sure, it was also on grounds of financial concern. But that can happen with projects at any time. But in addition the human and environmental concerns blocked the supersonic transport in this country.

Since that time there have been dozens, hundreds of communities, states which have introduced ecological and environmental laws, and of course we now have an Environmental Protection Agency. We have environmental impact statements which have totally changed the

atmosphere of Washington. Every agency in Washington is now faced with environmental impact statements on every new proposal. Something that shocks them, that they never had to do before. In sex laws, you can't have oral contraceptives, easy ways of preventing births, without changing your atitude towards births, towards human love, physical love. And the result that is in the last 10 years, approximately, we have changed our laws on pornography, on homosexuality, on prostitution, on abortion in this country. It is the greatest change in our sex attitudes in a Western Christian country in the last 2000 years. Now, sex acts between consenting adults are legal. You have to go back to the Romans or the Greeks to find any similar tolerance. And this, just like these others, is spreading all over the world. Italy just changed their divorce law, the Catholic Church wasn't dominant after all. They said, Where did that come from? France allows the open sale of contraceptives, Thailand gives out contraceptives at public banquets. The change in the awareness of birth problems, of sex problems, of changing our attitude of family structures, the effect of this of course on women's rights, on women's work, has just been enormous. The women's rights movement is certainly in part powered by these changes in our attitudes towards sex and the family and so on.

I could go on indefinitely listing other changes, but I'll limit myself to a few others. There is a change in our attitudes in the universities. The students in 1968 to '70, they won. It is very often said that students today are apathetic, not interested in social change. What happens is that they won something like 80% of the changes they demanded in 1968 to '70. And the result is students today are not hassled every hour on the hour by some administrative stupidity or some rule which deprives them of the sense of being fully adult human beings, so they can go back to studying which is what they went to the university for in the first place. Just think of what the changes have been. At a big state university like Michigan where I was for many years, one can list these changes: the change to 18-year-old voting so the students are adults, the end of the war which they protested against, the end of military recruiting on campus, the end of wartime research on campus, the hiring of Blacks and women by the faculty, the introduction of environment courses, students on boards of trustees, the end of the landlord contracts that the university enforced, so a student had to pay 12 months rent for 8 month occupancy, open dormitories. The university is no longer, quote, "in loco parentis," that is in place of the parents, which was its legal and actual position up until 1970. Suddenly students are adults to be treated as equals in the educational process, to some degree able to determine their own education instead of taking it handed down from on high. The changes in the legal system, rights of prisoners, election reform, campaign financing, public information acts, the accountability of federal officials; these are some the greatest changes in the legal system in this century. The changes in religion in the churches, the move towards Oriental religions on the one hand and at the same time the rapid departure from some of the older traditional religions of the West on the other hand. The departure has been most spectacular in the case of the Roman Catholic

church. This has been studied by the National Opinion Research Center at Chicago. The reasons for the changes in the Catholic Church have been studied by Father Andrew Greeley in particular, who was curious—as you probably know, although it's not conspicuous in the papers—the number of practicing Catholics in this country is down about 50 percent since 1970. This is measured by sales of diocesan journals, by attendance at confessions, by children in Catholic schools, parochial schools. I was near the mother house of the Dominican high school system in Adrian, Michigan for some time and I talked there a number of times. The mother house, Sienna Heights it's called, had 2400 nuns in 1970. Today it has 1800. The reason is the drop off in recruiting. In 1970 one still had hundreds of high school graduates, girls coming into the order every year. Last year they had three. The result is that what they are dealing with is an older population of nuns who have to be sustained on social security. And a cut off almost completely in the supply of young people in their teens and twenties. This results in priests being brought into the U.S. from Italy and from Ireland because there aren't enough American priests. Something like fifteen thousands nuns and priests are said to have left the church. One Jesuit friend estimates there are four million former Catholics now meeting in sessions with each other. They still are attached to the rituals, to the songs, to the tradition, to the rites of baptism and marriage, and the rites for the dead. But they have broken away from the structured church, as they say. Why? Andrew Greeley's study for NORC shows 80% of them have left because of their opposition to the Pope's attitude, the encyclical, on birth control. Catholics are in fact practicing birth control in about the same percentages, also abortion, also divorce, about the same precentages as Protestants or Jews in this country. And the result is, this is incompatible with the central hierarchy dictating what many of them feel are moral decisions on their part as individuals, and feel the central hierarchy cannot speak for the ethical attitudes involved.

The spread of these changes in religion is of course reaching all the other churches, the Episcopals taking in women priests. I even saw a squib in the paper the other day where the Reformed Judaism was asking if there couldn't be women rabbis. Whew! [laughing] When that happens, the revolution, the E.R.A. won't be important anymore, the revolution would have already taken place. I said the legal system; let me mention two more. One is our attitude on limits to growth and one is our attitude towards the future. The book on *Limits to Growth*, the study at MIT done for the Club of Rome, came out in 1972… January, it's been now 6 years. In that time, the idea of *Limits to Growth,* which was derided of course by the U.S. establishment—you know, it's anti-American—it was equally derided, very interestingly, by the Communist establishment. It is anti-Marxist. Marx thought of continued human progress indefinitely into the future, meaning technological progress, more electricity, more consumer goods, and more heavy industry. Nevertheless, thousands of groups in this country have begun to realize that there are limits to growth for very many of the reasons I was just discussing. I

mentioned Petaluma, California; they carried their case up to the Supreme Court: the right to limit the growth of their city as part of city planning. Communities now limit the heights of buildings, the number of cars in the center of town, the increase of sewer and water extensions, new developments, and so on. Many of these for selfish reasons or right-wing reasons, you know, “We got it good here, let's keep out those poor or Blacks.” But nevertheless, there is an awareness that one cannot go on on growing indefinitely and continue healthy, any more than the individual can go on growing indefinitely and maintain coordination. So all over the world we are aware of limits to growth in a mere six-year period, in a way that we never were before. Our planning all over the world is for a long-run, sustainable future, rather than for a future in which there is expected to be indefinite economic growth.

Our awareness of the future itself has turned around in the last 10 years or so. It was in 1967, I think, that the *Daedalus* study came out on the year 2000, at the same time Herman Kahn and Wiener published their book called *The Year 2000*. It blew our minds. It is hard to go back to that time in our mental set and realize how startling it was. We were in the middle of the Cold War, where one did not know what was going to happen from month to month or year to year. Somebody forecasting 33 years into the future and doing it by extrapolation, trying to show what population would be, what food would be, what economic growth might be. Now, those studies are badly out of date; you look at them now and they are quaint. They didn’t even cover the next ten years, they missed on the oil crisis, on the energy crisis, on the women's movement, on pollution and the environment. All the things which are at the top of our headlines today: expansion of government, Proposition 13, all these things which are on top of our world concerns, and national and state concerns today, are not in those optimistic and cheerful books of 1968. Now, that doesn’t mean any of us could have done any better at that time. We had to have those forecasts in order to see what the contradictions were, in order to make the new forecasts and the new awareness as we began to reach limits on oil and energy.

Nevertheless, we are all now aware of the future and planning for 25 years, 50 years into the future in a way we never did before. You couldn’t have done this in the 1930s. You had Hitler. It was all too likely that within 20 years there would be the 1000-Year Reich. You had to get rid of that before you could even think about a future for the human race. You couldn’t have done it in the 1900s; there wasn’t the data. We didn’t even know what the population of the world was, or what food consumption was. So suddenly, within the last 10 years or so, we have begun to have the worldwide data which is necessary to think about the future in a serious way. At the same time, we have begun to have… we have changed from the old social lag of the 1920s and 1930s. When I first went to college, social lag was the hottest thing in sociology. Ogburn had told us that after you have a technological invention, it takes 30 years for people to catch up with it in their attitudes, families, and institutions, and the reason is it takes that long for the

old people to die off. After you have had the telephone, the motion picture, the radio, the automobile, all those inventions of the 1900s, it takes 25, 30 years before you can begin to understand and accept them. That is so out of date. Suddenly today, society says, Hey, we don't want X, and the things that we don't want are things like extended highway systems, nuclear power plants, supersonic transports, polluting industries, continually bigger and bigger automobiles, and molecular biology which might endanger us. We are stopping those things in advance, and we are saying to technology: Why don't you produce mass transit for us? Why don't you give us more food? Why don't you give us less polluting cars; why don't you give us solar energy? And the result is, technology says, Hey, don't rush us, it'll take 25 years. [laughter] Suddenly, instead of social lag, we have technical lag, because society is not any longer willing to be pushed around at random by these technological changes for the profit of some inventor or the profit of some company. And suddenly, society finds out it's got an automobile on its hand, or society finds out it has a radio or television on its hands. Now it suddenly says, Hey, we want a choice in the future and we want to shape it in the direction in our values. We want to seize the wheel of the bus. It is a slow bus and it's hard to turn; it may take 25 years. But we are trying to turn it in the direction we see as a good direction. I am not saying that I agree with all these directions. But I am saying that there is now a democratic process of debate, of lookout, of anticipation 30 years into the future such as we never had before.

In the 1950s we thought we were future-oriented, but the General Motors and General Electrics wouldn't sponsor any research which took more than 15 years before there would be a product. Today there are billions of dollars of research and development money going into things like solar energy, food, and mass transit and less polluting cars which will take until the year 2000, or longer than that, before they can possibly have a major effect on society. Billions of dollars going into that. We have shifted from the 15-year horizon of the 1950s now to a 30-year horizon or a longer-run future than we ever had before. I think this is a staggering list and one reads the daily headlines—it's the police blotter. Reporters are so damn lazy, they can go down to the police station and copy off all the murders last night—they never find out all the court cases, they never find out what's growing in the universities, what's growing in the women's movement, the popular changes, the slow steady pressure of society, which is moving in new directions far beyond, far more important, than the total list of the mini-crises, and the local so-called news which is actually oriented towards police and violence, instead of being a story of human organization and human planning of the future.

Well, it's worth stopping and asking if there are some questions. Yes.

[question in background]

PLATT: I think it is better for society to try to decide what its values are and then to say to technology: You help us get these values, than it is for society to be driven hither and thither by any technological invention that happens to come along. […] There isn't one voice and there never will be; we have what is called a democratic process. One of the good things, though, with an affluent society, is that one can have many directions at the same without stepping on each other's toes. Not always, we all have to agree on controlling nuclear weapons and certain other global things. But some of us can live on communes and go back to the land and have windmills. While others of us are having less polluting cars, living in the city, and others of us are having high intensity television communication or education. We have many diverse directions that we can follow today for many styles of life. In many ways, our society today is the most diverse society there has ever been in the history of the world. Surely, the U.S. society is in fact the most diverse today on the planet today: in clothes, in modes of travel, modes of communication, styles of life, in acceptance of diversity. If you go through the number of different LP records—once upon a time, they were held by a tight monopoly of RCA. Now one has a thousand little companies making dirty nightclub comic records, giving us […], giving us poetry readings, giving us a range of diversity which extends over centuries of music, drama and poetry such as we never had before, and the same thing is going to soon be true for television with video discs and video cassettes, we are going to be able to have a little library of our own in which we can see and study whatever subject we want to on the video disc. And this diversity is going to be the rule, where we all don't have to agree on looking at the same program at the same time every night. Yes.

[question in background]

Sometime after World War II. He says: When, what was the date when the technological lag became greater than the social lag? I would say these great naysayings of society, the great denials of further development really begin around 1968. There have been in the past history of the human race some times when technology has been cut off. Around 1400, the Chinese cut off further technical development, they were way ahead of the West at that time. They had paper, they had gunpowder, they had rockets, they had block printing, they had the magnetic compass, they had silk, and they stopped it all. Essentially because the Manchu rulers were fearful of this kind of technology and so… they had shipbuilding, their ships ranged all the way to India, they had colonies in what is now called Goa. All these ships were called back because the rulers in Peking were land people and were fearful of pirates. And the result is, it is possible for a technological society to stop technology, but this the first time in Western history, which has been much more expansionist now for hundreds of years, that we have begun to stop technology that we thought was going the wrong direction, and demand other technology which will take us another direction. Yes.

[question in background]

PLATT: Who is society? Once again—all of us. […] Go ahead. […] And fifty other senators.

[question continues]

Did everybody hear that? Who is society? I would hold that society in your sense is first a historical process. The first gun, the opening gun does not end the battle. And what I've talked about here are opening guns. You speak about French policy going on in the SST case. It is worth noting the nuclear protests in Europe, perhaps concentrated in France now, more intensely than now in Britain or Germany, but it's spreading all over western Europe. In Sweden, a government fell, because they wanted to continue nuclear development. The new government now has come to more of a compromise. But governments will fall again and again, and I think governments will fall in this country over trying to continue nuclear development. I think what we are seeing is an ongoing historical process, in which you have thesis-antithesis-synthesis. You've got backlash; any organized system is going to fight back at attempts to change it. This is simply a fact, like a tiger bites, that is the nature of organized social systems, is that they are self-maintaining, if they weren't self-maintaining they would fall apart every year. They are self-maintaining; it took us 30 years or 100 years to get into the kinds of social organizations we have now. It will take us 30 years, perhaps less, but something like that to get out of them. But the process of change has begun, we have seen the opening guns in a great battle.

[question in background]

PLATT: Well, I have been talking about changes in society. They are not all at the daily level, but they are things that we are aware of, so to speak, in our cities and in actual decision making. This afternoon, I want to talk about the jump to space. And think reversal of this sort—it was instead a continuation of the technological growth ethic of the past. And I want to discuss this afternoon, how that can be reconciled with these ideas of limits that we are coming to on the surface of the earth, or whether it can be reconciled.

[question in background]

Thank you. He says something like society—he is agreeing that society is all of us and does not have to have a single opinion. When I say "we," I am thinking in terms of democratic process. The democratic process of a representative democracy, working along rules for getting the

opinion of people, the protests of people represented in governmental decisions, and also those governmental decisions being reversed when the time comes that people think they should be reversed. And we have a process of doing this which does not represent every single person every time; there are minorities whose interests are written over, and sometimes there are majorities who make classic mistakes that have to be corrected again. There are governmental officials who think they are running things and who don't in fact speak for most of us, and by and by they have to be corrected by the electoral process. But this is a democratic feedback process of collective decision making which we've worked out in this country, as well or better than any other democracy in the world. When I say "we," what I mean is the outcome of the collective decision process which we are going through, collective consciousness raising, collective political interaction and finally collective action by the nation as a whole. Yes.

[question in background]

PLATT: Can this process work quickly enough to respond to the changes we are now facing? This is one of my themes. And that is one of my reasons for emphasizing this reversal in a very short time. *Limits to Growth*, 1972; by 1975 this was a world discussion; they sold 4 million copies in 30 languages. For example, détente produced a reversal of the international climate within a year or so. The Constitution is very interesting in terms of its feedback. It's an interesting mixture, like any good biological system, it's an interesting mixture of fast feedback where energy and dispatch are necessary, as the Federalist Papers say, and slow feedback where deliberation and thought is necessary. So the Constitution permits a president or the Senate to go to war within 24 hours, as we saw in Korea or as we saw in the Cuban Missile Crisis. On the other hand, it also elects Supreme Court judges for life, so they will not change the basic Constitutional interpretations too rapidly. So that there will be time for processes, for the democratic process to work through decision making. The result is I think we do have a good mixture in this country, and I would argue that we are in fact becoming aware faster than ever before in history. It remains to be seen whether it's fast enough. Yes.

[question in background]

PLATT: The question is: are changes always brought about by minorities and then are left for the majority to decide on? The answer is there is always some initiating point. When a piece of metal breaks, there is some atom which was in the wrong place first. The idea of the creative minority, of the intellectual vanguard, as Marx put it, of the leaven as Jesus puts it, a little leavening or a little yeast in the flour which leavens the whole lump and makes it all rise for making the bread. That little bit which multiplies, that little bit that spreads itself, is always the initiating point of revolutionary change. […] Well, what I have emphasized here is cases where

minorities before 1968 have become majorities since 1968, and so we have passed through the inflection point, I would claim, in the last 10 years. Yes.

[question in background]

PLATT: The question is, if the creative minority may, for example, be the United States, which is ahead in some of these things… but aren't they endangered by all the other groups and nations in the world which have not come around to these new points of view? For example, in the case of population change. It is true that the U.S. is ahead in many of these changes because it has been ahead in education. The U.S. is the first system of mass education that we have ever had in the world, mass higher education. England educates less than 1/4 as many of its adults through college. France, Germany, Sweden all still have elite higher education. The U.S. with its mass education is frequently criticized because it is said that this education isn't as good as you get in England, but it's broad, and the result is that one has a group of people that have left home, who are open to change, who know something about history and society at a higher education level. Also the U.S. technology has put us in the forefront of problems. We encountered pollution first, so to speak. So a combination of awareness because of communication technology and education with the technological advances in the U.S. has put us at the forefront of encountering these watersheds and of taking the leadership on watersheds. The Russians denied that there was any such thing as an ecological problem; that was due to the capitalist and imperialist countries, until they found that they were polluting Lake Baikal and Lake Sevan, and suddenly they had to turn around and start cleaning up their rivers. Leningrad is filthier than now—I was there a couple of years ago—the smoke level is worse than Chicago was in the 1950s, where Chicago now has become relatively clean. One has these new ideas moving across the world. That is why I emphasize things like the ecology movement have moved to all the Western countries, things like these sex changes are moving to all the Western countries very rapidly. I'd say the time lag has come down to about 10 years. In part, this is because of television. Television reaches 80% of Russians just like it reaches 95% of Americans, it reaches 70% of the industrial countries, and the result is that women's movement, ecology, any one of these movements spreads rapidly around the whole world that has television. In 1980, it is estimated there will be 2 billion people watching the Olympic Games in Moscow by satellite retransmission, and this represents approximately half the human race. And the result is that our rates of change are themselves changing rapidly, as fast as these communications modes spread.

But now to answer your particular question about population. The population awareness has spread to all governments since 1968. I think it was 1969 when Eisenhower finally said that he had been wrong when he said population was not a concern of the government. It took that

long for a rather conservative Republican president to flip his ideas on the subject. It is no surprise, then, that it takes a little longer for China and India to switch their ideas. China was still pro-birth in 1966. Today, it is said by observers that China has the strongest population control program in the world. The birth rate in Shanghai is estimated by foreign observers to be 9 per 1000 per year. Lower than any birth rate probably in human history, especially… even in an urban society of predominantly young people. This is because of cheap contraceptives; oral contraceptives cost about a penny for a month's supply. It is because of concentrated programs, the communes for example, everyone has a women's committees which more or less assigns how many births your going to have in the next year. It says, Liu Sheng, you have had two children, you wait a while, let Shi Yen have a child this year. I'm making up these names, they may not be Chinese names at all. The point is this is family planning, but it is on a scale of 20,000 in the family or 50,000 in the family, the size of the commune. Every country in the world, perhaps with the exception of Israel, has brought its birth rate down by something like 10 points within the last 10 years. The world's population growth has changed from 1.9% per year of 1970 to 1.6%, it's come down 20% in a five-year period according to the World Watch Institute. Countries like Thailand are now having massive population programs with considerable success. I think the result is that the population problem is almost solved. That is to say, it doesn't mean it doesn't take millions of people devoting their time and energy for the next 20 years to work on this terrible problem, but the problem is solved in principle. The battle of awareness is won and the battle of implementation is well on the way. So I don't feel nearly as hopeless about the population problem, but I think it's one of the problems that we collectively as a world have begun to solve fairly successfully.

You've been signaling.

[question in background]

Well, I said that in the "A" section of the curve, when you don't have any goods, consumer goods are good for the human spirit, they give you diversity, they give you new potentiality, and it is not the capitalistic countries which are so eager for consumer goods. There are lots of people in this country who are going back to simpler life; it's become a major movement. It is the Third World and the developing countries which want consumer goods for their people. It is when you are desperate that you need consumer goods most badly.

[question in background]

Who says they are happy with their ways of life? Have you ever lived with a stick hoe, have you ever lived with kuru, and filariasis? People in the developing countries are not happy with their

ways of life. They are not happy with their medical care, with their education, with their possibility of longer lives, and advancement, and development. I don't understand what you are saying. It sounds like a very elite point of view. I think you had… ?
[question in background]

What I would hope is that there will be Third World leaders who will re-emphasize the old values again, the older religious points of view, the older family points of view against this industrialization. But it is not something that an American white can say to them; they've got to discover this for themselves, it's got to be a democratic process, not a process of implementation by us. […] It is hard. One has a few leaders in India, for example, who are talking about going back to earlier values. Moraji Desai, […] and so on, with Ghandi's principles, but Desai is likely to be thrown out because people don't in fact like, en masse, his return to the old values and his turn away from industrialization. The Chinese have tried anti-industrialization in many ways for 10 years, and now with the death of Mao, one has them reversing and racing to catch up with the West, at least according to the statements from their party congress and the openness towards science and technology that they are now showing. It will be very hard for a Third World leader to preach a return to simpler values when there is a possibility of more goods, more education, less infant mortality; what they see as the good life.

[question in background]

No, we use twice as much energy for our manufactures in this country as Sweden does. We could go back 50% if we simply change our processes, which are just wasteful because energy has been cheap. We can save another 20 or 30% by conservation; we can save some more by rapid adoption of solar heating. For example, 1/4 of the buildings in Israel have solar heat and they've had it for 30 years, we just haven't had it. So there is an enormous amount we can do for the next 15 years without any loss in consumer goods and cutting back our energy consumption by almost a factor of 3. This is according to Mark Ross and Bob Williams' article in the *Bulletin of Atomic Scientists* about a year ago. Somebody else had a question? Yes.

[question in background]

The Chinese have very interesting statements about DDT and about people who protest against the use of DDT. As you probably know, the trucks go through the streets of Peking every morning—at least they 2 years ago when Harrison Salisbury was there—according to his story, spraying DDT on the trees on both sides of the street. The four enemies, the "gang of four," originally was not the four people; originally they were flies, lice, rats, and dogs. That is why the "gang of four" statements had Chinese overtones five years ago, that they didn't have for the

rest of us. They had this 30 year program since 1948, of getting rid of flies, lice, rats, and dogs because these were the sources of infant mortality, dysentery, diarrhea, and short lives. And they've just succeeded dramatically. I had a friend who spent six years there and came back with 18,000 color slides. Fortunately, I did not have to look through all of them. He announced proudly that he had only seen 17 flies in six weeks in China. Some of us said, Seventeen? Did you count them? He said Yes. We said, How come you go around counting flies? He said, Because I was there for about three weeks before I saw any, and there was one in a railroad coach. And when it buzzed in the corner, suddenly a dozen of people jumped up with papers and came swatting after that fly. That fly did not have a chance, and then I realized I hadn't seen any flies. So then I began to count. He said he saw one more in a room and 15 around a manure pile. Well, this is dramatic when you read the stories of Peking in the 1930s or any of the other Chinese cities. The garbage was piled up head-high beside the street, rats were everywhere, dogs running loose all the time. All that is gone, apparently. And the Chinese say, DDT, sure it kills insects, birds, and butterflies; but what would you rather have, a dead bird or a dead child? It is their way of reducing infant mortality down to the lowest levels in the Third World. And I think we as the people that make DDT, and as the people who started off with it, are not in a position to say to them, You cannot use DDT. They've got to make that decision for themselves.

[question in background]

Well, let them find that out for themselves, but we can't order them not to use it.

[…]

I mean, who makes the decision? Us, or them?

[…]

Well… maybe what I've just told you is all propaganda by DDT companies, though I didn't think so.

[…]

Well, I read the publications of the World Health Organization and statements of health officials in dozens of countries. And for them, as for us in the 1940s, DDT is the safest pesticide ever invented. You can eat a spoonful of it and it doesn't produce any immediate results; it may store up in your fat and you may die 30 years later. But the immediate effects are to reduce

diseases faster than any other tool and cheaper than any other tool the human race has ever found. Now we need better things, but I don't think I am in a position to say to the World Health Organization, We won't manufacture DDT and you can't have it because we don't approve of it anymore. We have come to these problems as an affluent society which encounters the problems first, and there are many other countries that are going to have to work their way through this same process, hopefully faster; but they are going to have to make the decisions, not us.

I'm running down a little bit, I could answer two or three more questions, and then have a coffee break, or… what's your pattern? Is there coffee, or does it come at a certain time? […] What do you do, you take a fifteen-minute break or so? [We usually take a half-hour break.] Half hour. [Then come back at eleven.] All right, is that all right? Well, let me answer three more questions. Let me answer four more questions and then come back. Shall we break? [voices in background] OK. Break now.

[program ends]