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NORMAN E. BORLAUG

*The world food problem -
present and future*

NORTH-HOLLAND

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DR. NORMAN E. BORLAUG *has recently returned from Oslo, Norway, where he received the Nobel Prize for Peace during special ceremonies on December 10. He was awarded the Nobel Prize for literally saving millions from malnutrition and starvation through the development of a high-yielding dwarf variety of wheat.*

Dr. Borlaug was born in Cresco, Iowa, in 1914. His college career — from bachelor to Ph. D. — began and ended (1942) on the campus of the University of Minnesota.

From 1942 to 1944 he was a microbiologist with E. I. DuPont and Company in charge of research on industrial and agricultural bactericide, fungicide, and preservatives. In 1944, as a Geneticist and Plant Pathologist, he organized and directed the Cooperative Wheat Research and Production Program in Mexico. This program was sponsored jointly by the Mexican Government and the Rockefeller Foundation.

Since 1962 he has been Director of the Wheat Program of the International Center for Maize and Wheat Improvement. During this period, Dr. Borlaug has devoted most of his efforts to wheat research and production problems, and to the training of young wheat scientists on a global basis. He also has devoted a large part of his effort to assisting programs in six Latin American countries and in eight Near and Middle East countries, including Pakistan and India. More than 140 young scientists from these countries have been trained in Mexico under his direction.

Dr. Borlaug has been the recipient of over 20 citations and awards from universities, countries, cities, and organizations throughout the world.

The scope and magnitude of the problems that confront the human race during these next few decades are very complex, I feel this to the very bottom of my feet. I have worked largely on only one aspect of this complex problem and I would like to give you a little background so you will understand some of my remarks:

I was born on a very small farm very close to this part of Minnesota, just across into northeast Iowa and this gave me a good background of experience from which to begin a lifetime profession on food production. I can understand the socio-economic problems of the small farmer and I can communicate rather well sometimes even without being able to do so through language. This has been most helpful to me. I came up through simple beginnings, a one room country school. My original work at the University of Minnesota was not in agriculture or plant breeding in the narrow context, but in forestry in its broadest aspects: the ecology and silvics of our forest, our watersheds, and our wildlife and water, so I am sensitive to many of these other human needs beyond the one of immediate food.

Now I would like to tell you a little about what the situation is on food to lead off, and then how I react to this very complex problem that confronts the young people of your generation, and that will confront the generation of your children.

It's a sad tragedy that, despite the very privileged people of the United States and a few other countries where food exists in abundance, there still exists the problem of distributing this

food to some of our underprivileged people. I am sure that we are making some progress at correcting this, but more is needed to provide that unfortunate segment of society with this very basic commodity. The United Nations Food and Agricultural Organization estimates that more than half of the people of this planet are hungry at least several times during the course of a week and more than that half, even worse, are malnourished, short especially of proteins which affect their whole development, both physical and mental. It's becoming more and more clear as more evidence is accumulated by our medical scientists and nutritionists that the tragedy is not restricted to those who die from starvation, but even worse, those who are malnourished in early infancy, but who survive often have been damaged in mental capacity for the rest of their life. Much of this malnutrition damage takes place from the time the baby is weaned through the first 2 to 5 years of growth. This is a very critical period and it is one that we are only now beginning to become concerned about. The whole emphasis in the past has been one of producing enough food and we could only give secondary attention to producing the right kind of food.

Now, if we have this kind of a situation in the world it's not a very pleasant world, despite the fact that from your vantage point it looks prosperous. What can we do about it? I have spent most of my professional career working in the hungry nations of the world trying in my own modest way to do something about improving the situation. Very modest has been the progress indeed, but in recent years there has been some hope. Changes have started to occur, the tide has changed, it has been labeled by the popular press as the Green Revolution but we can't become complacent. Shortage of food is a tremendous problem and a continuing problem. From what we have learned so far we have been able to buy for your generation

maybe two or three decades of time in which to solve these problems, if we continue to push ahead aggressively.

Just what is involved in provoking change in a traditional agriculture? I should point out to you that agriculture here in the USA is a very efficient industry. Yet it has recently become the Ugly Duckling in our affluent urban society.

Five per cent of the people produce enough food for this country, plus very large quantities of food for export. Yet in the hungry nations anywhere from 70 to 80 per cent, or more, of the total population are engaged in a livelihood of subsistence agriculture, tied to a small piece of land, living under impoverished conditions, with even inadequate food despite all of their efforts. Not at all a pleasant picture. And what is worse, to provoke change in such a society is one of the most frustrating and difficult situations that you can encounter in this world, because these poverty stricken societies are in such a poor position to help themselves. Almost invariably there is a lack of trained people, beginning with school teachers at all levels and ending with scientists who can provoke the kind of technological and scientific change that may raise the standard of living. In India and Pakistan, two of the nations with extreme food shortages, we have recently drawn on our experience in Mexico which was in just such a situation twenty-six years ago when we began working there. We found through experience one must begin attacking these problems of increased food production by establishing a research program, not working on narrow disciplines but on all of those inter-related factors that must be integrated to produce a final effect to increase production. In the developing countries it is not the number of profound scientific treatises or publications that appear in scientific journals that will help to make changes. Change must be measured by the increase in tons of grain be it wheat, rice, corn, sorghum or millet; this must be your

criterion of change, not the over-sophisticated approach, which we, the developed nations, have unfortunately sponsored in our university staff advancement philosophy of 'publish or perish'. Now, it takes a long time to train a generation of scientists. The schools and universities in the developing countries aren't functioning right; they aren't providing the right opportunities for the right kinds of people. Of those that do graduate, it takes time to find out which are really well motivated. I wouldn't give a nickel for the most talented scientist in the world or have him join my scientific team that works internationally, if he doesn't have social motivation and isn't interested in trying to help the people of the country to which he is assigned. I am not interested in those people who are only interested in their own personal ego and their advancement in their own special field. This won't help solve the big human problems that we face around the world. In a country where there are few or no trained people, it takes fifteen to eighteen years to develop a whole corps of scientists and teachers in adequate numbers to cope with this problem. The world food production problems are of such magnitude that we have to find shortcuts, we can't wait. We have to draw on certain international institutions such as the one that I have been affiliated with. The International Center for Maize and Wheat Improvement evolved from a country program, financed in part by the Mexican government and the Rockefeller Foundation, which within the last eight years has grown into an international research institute that has now much broader responsibilities, working not only in one country, but working in many hungry countries trying to provoke change. It took us ten years to solve Mexico's wheat production problem, working diligently and I hope creatively, but the magnitude of the problems that we began to face ten years later, when we began working in India and Pakistan, were of a very much

greater scope. We analyzed the situation and decided we could not wait fifteen or eighteen years for results, we couldn't gradually train people as we did before in Mexico, there was no chance for a long period of gestation before we could get a result. The crisis was too urgent. We decided to bring many young scientists to our Mexico base and give them the best type of practical training that we were equipped to do. The same was done at the International Rice Institute in the Philippines where they were carrying out similar work on that important crop. Our approach is to make science function to serve human needs. It's quite a different approach from that of many very sophisticated academic institutions in the U.S.A. and Western Europe. We have an urgency, we live and work close to poverty, we know the tremendous need for rapid change. We try to inculcate this spirit of urgency into these young scientists and at the same time we try to train them in all of the disciplines that bear on food production. By this I mean genetics and its application in plant breeding to produce the new kinds of seeds which have an entirely different production potential when they are properly cultivated. We have to find out how to grow these new kinds of plants right: what kind of fertilizer, what kind of insect control, when to plant, how much to plant, how to conserve the moisture or how to apply it if it is irrigated. All of these are factors that are involved in changing production. And if you can bring them all to bear, sometimes you can make very spectacular changes in a very short time.

I say 'if' because you must simultaneously treat with two other very important groups of factors that I call the 'economic and physiologic factors'. You must insist that government economic policy is such that this small farmer, who has always been accused of being ultra-conservative to the point that he is unknown to change, will adopt the new. He has

farmed the same way all his life, as had his father before him and his grandfather, back for generations and generations. He has been accused of being immutable from the standpoint of provoking social change. This unjust accusation has frequently been made, unfortunately by very sophisticated scholars, not only from one country but from around the world. So you must remove the economic roadblocks before the peasant farmer can adopt the new technology that has been developed by research. Economic policy must make the production of more grain profitable to this small farmer so it's worth his while to adopt the new technology. If you can only demonstrate a change of 10 per cent, he will not take the chance; if you can demonstrate a yield difference of 100 or 200 per cent, he's ready, assuming that the government policy is right so that it will be profitable, that the prices for his product are stabilized at a reasonable level; and that fertilizers are available on time and at the right price and with credit to help him to purchase them. The new technology must be demonstrated as widely as possible on small farmers' plots throughout the country so that they see it with their own eyes. The farmer will not be receptive if he sees these demonstrations done at government experiment stations or in university experimental plots. He is not sure how much of the change in grain yield is attributable to science and new technology and how much is 'witchcraft', but if he sees it done on his land or his neighbour's land, there is quite a different point of view on the psychology of change.

I have had the good fortune of seeing this change take place in several different countries: first, after a long hard struggle, in Mexico; more recently in Pakistan and India. In the latter two countries the food deficits have been of tremendous magnitude in the last six or seven years and without a doubt millions of people would have starved to death in the 1966 and

1967 crises had it not been for the importation of vast quantities of grain from United States, Canada and Australia. The magnitude of the change in India and Pakistan in the last three harvests surprised even me. The rapidity of change surpassed my fondest hopes. In India I have seen wheat production jump from the so-called highest pre-Green Revolution base – the very favorable year of 1965 in which India produced a harvest of 12 million metric tons – to more than 20 million metric tons last year. In Pakistan the total production has essentially doubled in that same period of time. These are dramatic changes that the world thought were impossible to achieve in this short period of time. The most significant thing of all, as far as I'm concerned, has been to disprove that the small farmer, this small, peasant farmer, would not change. He'll change if you help him change. You have to help him at all levels; not only at the scientific but at the top government levels with proper government economic policy. This is not an easy task. When you train a group of new scientists and they move back in their old environment it's impossible for them to break through very often. You young people are so right; the top scientist is there because of seniority and he's all too often a fossil that 'hasn't been dug down yet'.

In the last seminar I always give these young scientists before they leave Mexico, I say, 'Don't be too impatient, too fast, or you will destroy yourself. You bring a new philosophy, a new approach to scientific problems. We want to provoke constructive change; let's not be destructive or in the process you will destroy yourself and whatever hope we have for provoking constructive change. Remember it is easy to destroy but very difficult to build constructively.' At the same time somebody from the outside must try to put an umbrella over these young people after they have returned home to protect them and to keep them working together as a team in so far as

is possible while simultaneously trying to convince government that they have to change policy on the price structure and the availability of inputs as well as at the same time give these young people a chance to use their talents. You don't accomplish this in 24 hours or in 24 months, but you can do a surprising lot once you learn how to operate like a skilled torero (bull-fighter) while avoiding getting your leg torn off; because you yourself are also as vulnerable coming in from the outside when dealing with the stratified, social government situation as the young student is who is returning to his country. You must be deft, you must know how far you can go and how fast or you will destroy any opportunity you have for provoking constructive change.

In the process, in the heat of battle trying to accomplish these changes I have often wondered and thought: Wouldn't it be wonderful if a person were deaf and if he were blind and if he had a skin and a hide as thick as that of a rhinoceros through all of the accusations that are leveled at you? But you must control yourself, you must go on, you must struggle, and suddenly things will start improving if your science and economics are right, and you will have the great satisfaction of seeing constructive change.

I have talked about food, but the game is bigger than food production. From wheat alone - while there is also a very dramatic change in rice production and more recently in corn in some of these countries - in the last three harvests the gross national product in India has increased by a billion eight hundred million (1.8 billion) dollars. This is largely money that has gone into the pockets of the small farmers. This vast segment of the society begins to enter into the economy of the country for the first time. When the peasant farmer has money he starts buying things that he was never able to buy before; he had lived outside the economy. This starts a whole series

of changes. Some of them are good, most of them are good; some of them are not so good. He begins to buy simple little machines that make his farming more efficient. It doesn't necessarily displace people into the slums of the large cities if it's handled wisely. He begins to buy fertilizer and things that he has to have in order to increase his output. He begins to buy transistor radios and if the governments are wise, they can reach many villages that they have never reached with public schools. The ultimate success will depend on the government and its vision. Sewing machines come into the village, better transportation, the government begins to demand a school or better schools. There is a whole psychological change. Despair, which was widespread in India and Pakistan only five years ago, is being replaced by hope and a new enthusiasm.

Now, how do we keep this alive? With what we have now achieved we have bought a few years of time. If we can convince governments to allocate their resources wisely and if we can find and train the right young talent, in sufficient numbers, the right kind of people who want to become scientists and improve the lot of the poverty stricken masses of the world, we can continue to make progress.

There are an increasing number of new opportunities becoming available in international programs, but we need dedicated well-prepared people. It is not enough to be a political idealist, we need young people with scientific skills and training and the mental and physical toughness, discipline, and motivation to implement these skills for the improvement of the lot of mankind. There is altogether too much wishful thinking that empty words will fill empty bellies and solve the problems of the world. You can't build a better world on empty idealistic words alone. Cozy words do not change the type of government nor does a change of government solve automatically the basic problems of hunger and poverty. That

solution would be wonderful and simple. But it isn't forthcoming. These same basic problems confront all governments from the extreme left to the extreme right and all of those in the middle of the road in the developing countries. Working on food, I have had the unique pleasure and opportunity of working with all types of governments in one capacity or the other. I have twice visited Algeria within the last year, looking at its agricultural problem, talking to its officials and trying to formulate some type of rational program, trying to outline for them some training program for their young scientists, who are practically non-existent. They had eleven university trained scientists in agriculture at the B.S. level when they gained their independence. Algeria is a vast country. What do you do? We can't wait; we've got to start training at all levels. I was recently in Russia and I see the same problems. They have somewhat different problems in that theirs are mainly problems of production. I think the communistic countries distribute what production they have better than we do, here in this country, but they are less efficient in production. I say that the United States with its vast food production must find a way to assure food to the underprivileged sectors of our society. I am not in a position to say how to do it. I say you have the wealth and the ability to do it if you have the will. And yet I must say that there are many confusing issues that can make this water very muddy. It's easy to level your finger at government and say that they have not taken action, but sometimes when they try to take action to improve the lot of these unfortunates through expanding, let's say, the Food Stamp Program, there are 'dropouts' that take advantage of this and this provokes a reaction again from government or certain sectors of government, and the whole issue is at stake. *You can't be a dropout in this kind of a society* – the world society of today. No matter what you do, without food you will only

live three weeks, assuming you are starting with a good, vigorous body and a good healthy condition. And if you are ill or already poorly nourished, it will be much less than three weeks. And each and every day when you eat whatever it is, you owe somebody in your society something. The food you consume daily is produced by the sweat of the brow of some person in some part of the world. You haven't dropped out. I'm not talking to individuals; I am talking to the world in general. The easy way out is to 'drop out' and become a social parasite, a 'hippie'. But the world can't survive with too many of these social parasites who 'mouth empty idealistic slogans'.

All right, we have talked about trying to increase food production. We have made modest progress recently; I think that we can stay ahead, but we haven't solved it. We can stay ahead for two or three decades if we get the right support from all kinds of governments. It is very questionable that we will continue to do so unless we continue to fight more effectively than we have in the past. It's much easier to get big budgets for national defense even in the developing countries than it is for food production. So, you see, you don't solve these problems easily. You have to keep fighting, you have to keep struggling and you have to keep trying to stimulate the young scientists to work together in a team effort. If they each go their own way, they will be devoured by their environment and they will never be effective. Staying together and each biding his own time until he grows in stature and experience and advances in his own system, they will change the system and become more effective – but you don't do this overnight.

But food isn't enough. We look at how fast we are growing in human numbers and I'm sure it's the will and hope of every person in this audience that we can see the standard of living of all of the peoples of the world improve, especially of those

unfortunates in the developing countries who are hungry and short of the other basic necessities of life. It isn't just food. What about employment opportunities? I am of the firm belief that the vast energies of youth with their strong bodies have a great deal to contribute. These energies must be burned and utilized for good, for constructive programs, not for destructive purposes. Sometimes I think our whole social structure has gone too far in the direction of protecting our youth. We have over-reacted in trying to correct the abuses on child labor prior to the enactment of the child labor legislation. Now we have a situation where it is very difficult for young people to get jobs even during the summer vacation. Up to a point we have defeated our own purpose. I think we have to re-examine this whole issue. The tremendous energy of youth will be used for good if it is given the opportunity, or will be used destructively all too often if this opportunity is not provided.

Quite apart from employment, what about medical care? Look at the miserable nations of the world. Even here, in this country, in the slums it's not pleasant. What about adequate housing? Adequate clothing? Transportation? Recreation? Most of the underprivileged people of the world don't even know what this word is. They are too busy struggling to exist. As we grow in human numbers and we pile up people in our own large cities, what about the strains and stresses and all of the unpleasanties that go with this, especially in the slums and in the ghettos? Are we doing enough to correct it? Do we even understand the problem that is involved? I doubt it very much. Looking at experimental animals there is a lot of evidence to be seen and yet there are those that say, 'Oh, you can't compare man to rat.' I say sometimes there is a great similarity between two legged rats and four legged rats. But in a serious vein, these experimental animals can tell us a

great deal; maybe you have to make extrapolations to apply this to the human needs.

What happens when populations of rats grow too dense? They can't stand the stress and go beserk and their society collapses. What happens to the snowshoe hare here in Northern Minnesota and Wisconsin and Michigan and Manitoba, when populations become too dense? For thirty years their dying was misinterpreted as being from a shortage of food. It was not. Then a virus was looked for and never found. About 7 years ago it suddenly became evident from some studies in endocrinology that when snowshoe hares get too crowded, some cannot stand this condition and they just have internal hemorrhages and die.

The only difference between that snowshoe hare and a human being is that when we get all crowded up together, we go out and club one of our neighbors on the head but the old snowshoe hare just lies down and dies, peacefully. In our animal societies there are built in devices for controlling their numbers to fit in to the carrying capacity of the habitat or environment. It makes no difference whether you are talking about lions in the free in East Africa, the snowshoe hare here in Minnesota, or the Arctic lemming. The Arctic lemming is, of course, a suicidal species. His population builds up, he gets nervous, and it's unfortunate but true that the young of the population start migrating madly to the ocean and drown themselves in vast numbers. The small remaining part of the population again builds up.

All around about us we see these devices for population control in operation but they don't appear to exist in men. I am sure they do exist, but as social beings with our evolution and our concept of societies, we have tried to protect the life of each man and the result is that our numbers keep growing. If we aren't wise enough to adjust our population growth to

the carrying capacity of our planet it will get to a point where we all starve to death or kill ourselves by beating each other on the head. Our own built-in-mechanisms would adjust, but would it be pleasant? Would it be pleasant to see these youngsters that we hold highly in value dying of starvation, of disease, of this or that? I don't think so. It's against the Christian ethic and so we have to come to grips with these problems.

Today everybody talks about environment and those that are talking about environment are talking about 15 different aspects of the environment. The total erosion or degradation of the environment is the interaction of all of the physical and biologic forces on this planet. And of those biological entities, the worst one is man, and the more and faster we grow in human numbers the more difficulties we are going to have. Now, there is no question but that we have been neglectful of coping with this. We have polluted streams and rivers and lakes. That pollution is in the ocean already. Perhaps the tuna have a lot of mercury content but the sad part is that in many cases we don't have good bench marks of what that content was before. We're dealing with levels that sometimes we know very little about when it comes to both immediate and long term effects on human and other living species that inhabit the environment around us. We need to know more, but again this takes time, and you cannot say, we will immediately change this, because we must recognize that we are dealing with many imponderables that we have very little data for. For example, Maine said three years ago, we will use no more DDT. Perhaps a wise policy because of the effect it has in building up in certain of the food chains when used on forests and watershed areas. But, you will notice that last summer in order to save the forest from gypsy moth it was necessary to go back and use reasonable levels of DDT at critical times.

DDT – now widely damned – has saved the lives of millions from malaria. What this really means is that we have to weigh each case. I have had people say to me within the last few weeks, 'What about all this fertilizer? If you are advocating its use for the expansion of wheat production and rice production, in the developing countries, isn't this greatly adding to the deterioration of our environment by being leached into our streams and bodies of water?' Well, I think this is a vast over-simplification when we are talking about nitrogen and also phosphate. And, it's one thing for the USA and all its privileged to speak this way when we enjoy an abundance of food. Perhaps if one were to put back into production all of the agricultural lands that have been taken out of production and you made a complete reversal back to organic farming with clovers, alfalfa, and soybeans as a crop rotation with corn, wheat and barley, you could perhaps produce the food and convert it into the necessary animal products, meat, milk and eggs sufficient for a period of 10 to 20 years. But that's not the solution necessarily. What will happen to the price of food? To achieve this the price would probably double, triple or maybe more than triple. What's going to happen to the low income people?

What is worse, well-fed privileged people from the developed countries, especially the USA, pose these simple solutions and say, 'Why are you advocating this sort of thing in India?' The only answer that I can think of is: Do you deny these people the chance to improve their standard of living, since the amount of land available per capita to them is already only one-fifth of what it is in this country? Do you say that it is morally incorrect to use chemical fertilizers under these conditions? Do you think you can build world peace on poverty, empty bellies and empty words? The man in India cannot make the change to legumes. I spent my first three years in

India talking down this fallacious approach of organic farming as a solution to food production problems. They can never make a breakthrough in production employing organic farming techniques where they are land hungry first and then cereal grain hungry.

So, again, *unless there is the right mixture of common sense and science and technology, the world is doomed.* The whole world wants simple answers. We all get imbued with the importance of our own discipline. I am very fearful that we are doing a most miserable job of communication between the social sciences and the biological and physical sciences as well as between many other disciplines in our society. I am very concerned about the criteria being used by the people who are passing judgment on human behavior. I am going to be blunt and to the point – this includes the lawyers and judges and, I am sorry to say, I must include many who serve on juries. They are passing judgment on the behavior of Homo Sapiens – a biological species. All too often decisions or verdicts are based on the false premise that all people are the same. In this room, with the possible exception of some identical twins who may be present, there are no two people that are identical in physical make up, in mental capacity, and in behavior under different stresses and stimuli. This is all lost track of when we go to interpretation of how we behave under our own system of laws; and it gets confused when we talk about the right of the individual and the right of the society. What is really often on trial is the trial of democracy, the democratic way of life. I have lived and worked in governments from the extreme left to the extremely militaristic ones on the right and I prefer the middle of the road, the democracy. But in order to keep democracy alive we must understand that there are certain rights of society that up to a point cannot be infringed on without bringing down in ruin that society, that democratic society.

Twenty years ago I saw Uruguay held up as the model of democracy in Latin America, the Switzerland of Latin America. Look at its seething pain and agony today; inflationists destroyed its viability; dissension and chaos rule the land. I saw Chile, with the most advanced social legislation in Latin America before the last war, have its economy eroded away, again by inflation. It wouldn't come to grips with this; it slid into a different kind of democracy, into a social democracy. I do not here intend to discuss the pros and cons of one or the other; I am simply stating bluntly and boldly that I want the middle of the road where I hang my hat. I think if all of us weighed all of these values with which we have been blessed we, too, will decide that the middle of the way is the most humane way. You can throw the 'scoundrels' out with the ballot in a democracy but you have lost this prerogative with extreme governments of either the right or left.

Now, all of these aspects of human needs become a nine-headed monster with the longest, most menacing tentacle that of population growth, that threatens to destroy us all as a world society. I am of the firm belief that we can no longer blindly go ahead, any more than many other countries have tried to do, and have an aristocracy or an elite protectively isolated from the poverty and misery of a vast segment of our society. That will not prevail for very long. It will be another Chile or another Cuba or another Russia. But neither can you have this kind of difference in standard of living in the world and have it exist very much longer. The world gets more crowded and whether or not we like to recognize or admit it, it is becoming more one world as Wendell Willkie long ago predicted. We need to understand the problems of our fellow man, not only within the country, but between different parts of the world. We need to have our democracy conditioned by the right blend of idealism and of science and technology that

can give not only us, but all of the developing nations of the world a better standard of living. We have seen the consequences of trying to build a Utopia in the past. Plato tried it; he didn't succeed. Are we any smarter? I think that all too often we fail to read history from a critical point of view and learn from it. We point out all of the bad things that were done in the past. There are many lessons in history if we will approach it with an open mind. And to you youth I say, prepare yourself for building this better world; it will be your world very soon, and with it go all of the responsibilities. Prepare yourself with skills, not just with words and ideas. It's easy to criticize and destroy; it's very difficult indeed to build constructively. And, again, don't look for easy solutions. They won't be forthcoming.

I would just like to bring home to you what the magnitude of this population problem is and how this population monster relates to all of these nine aspects. Each tick of the clock at the present time adds 2.2 additional people to the world's population that must be given some semblance of a decent life, and this means that each year we add to the total world population 70 million mouths and stomachs and bodies. By 1980 it will go up to 2.7 per tick of the clock, and by 1990 it will be 3.3 and by the year 2000, and most of you young people are going to be here to see this change, the tick will be menacing louder and louder at the rate of 4 per second, with an increase of 125 million per year in 2000, unless we come to grips with this problem. Do we have the will? Do we have the desire? Unless we think and ponder this, I seriously doubt we will build a better world, and yet we can. We need idealists to build a better world, but to students and youth, I would repeat, don't be a dropout. You can't build a better world being a dropout. I have already pointed out that you automatically become a social parasite and the world has got too many of these. You

young students know who the fakers and the demagogues are and who are the true idealists in your own student bodies. Fakers and demagogues exist in all segments of our society in all parts of the world in all age groups. We have ours in science and I am not proud to claim these as colleagues. Protect the democratic way of life. Identify these people for what they are or our democratic process will be doomed and short lived. And in order to produce a better world I don't think you need to be turned on with drugs. That's the weakling 'easy way out'. Don't get hooked. All of the energies that you have and the strong, good bodies that you have and the excellent minds, use them constructively. I don't need to be motivated by drugs. I went through the depression and I gained my education working for it. I have never regretted it. I carry no psychological or social callouses or scars of any kind despite my humble beginning. I'm proud of that simple heritage. At that time I enjoyed it. I reflect on it now with even greater joy and satisfaction. The world isn't worse now than it was in the depths of the depression in the 1930's. I have lived and looked at the standards of living in many parts of the world. It isn't as bad in the USA as we make it. There is plenty of hope and it's up to you, the youth of the USA, to make it better, not only for the USA, but for the rest of the world, and I am sure you will.

I'd like to point out that there are still some old people with good philosophy. I am sure most of you know Will Durant, the philosopher who wrote the *Story of Philosophy*. He and his wife, I suppose they are 85 years young, are now finishing writing a series of volumes on the *Story of Mankind* from the beginning of recorded history up to the present time. He is quoted in the August 13, 1965 issue of *Time* – he was then 79 years old, or young – as saying: 'In my youth I stressed freedom and in my old age I stress order. I have made the

great discovery that liberty or freedom is a product of order. Sixty years ago when I was 19, I knew everything. Now I know nothing. I have made the great discovery that education is a progressive discovery of our own ignorance.'

Shaping the Future

A DISCUSSION AT THE 1971 NOBEL CONFERENCE

organized by the Gustavus Adolphus College, St. Peter, Minnesota.

Edited by JOHN D. ROSLANSKY, Woods Hole, Mass.

1972. 112 pages. Dfl. 25.00 (ca. \$ 7.75) ISBN 0 7204 4096 3

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