

GENERAL PANEL DISCUSSION

SYMPOSIUM ON POPULATION AND FISHERIES

Panel: ISAACS, SCHMITT, PRESTON, CHAPMAN, BULLIS

Isaacs: I have been impressed throughout this symposium, more impressed than I have been previously, by the great separation between classes of nations. I am brought back to a statement by Abdul Salam, Scientific Advisor to the Government of Pakistan, an extremely intelligent man, who holds a chair in theoretical physics at the University of London. Dr. Salam once introduced such a discussion as this by saying that over a thousand years ago two medical books were written by a great Indian physician. The first was entitled "The Diseases of the Rich," and the second, "The Diseases of the Poor." He pointed out that these are even more applicable today than they were a millennium ago, and not only to individuals but to nations.

Look at this curious set of diseases that we have, in which our stocks of food are clogged, as Dr. Chapman points out, in our money market; in which we cannot reasonably reap our own fish except by those fisheries that have escaped from our immediate control, such as the tuna fishery; in which we lack money to buy such things as image intensifiers or on-off switches for important practical research; and in which we develop technologies that neither we nor a more primitive people can use.

I was impressed when Mr. Bullis was relating the tale of Jesus Christ appearing before two fishermen, as you remember, telling them to drop their nets on the other side of the boat. As several people have pointed out, Peter and Paul obviously were horrified by the results. They had caught far too many fish, and they didn't want so many fish. Their net was being torn up, it was giving them a lot of work, and they said, if you remember, being quite awed by this nevertheless, "Lord, we are but simple folk. Depart from us."

In some of his analyses of the Bible, Shaw paints a gloomy picture of these people with fish all gilled in their nets, nets ready to carry away, the boat ready to swamp, and so forth; no wonder they quit their business. Some of our technology that we attempt to impose on simple people must have some of this same effect.

With that remark and with the impression I get that there seems to be little development that seems likely to break through these barriers and make food of the marine realm available to the people who need it, I will leave all these gentlemen open to your slings and arrows and questions.

Farris: After hearing all the papers today, it seems to me that the most important thing is: how do we get

these impoverished people off the dime so they can buy the fish that we can obviously find?

Chapman: We want to get them *on* the dime so they can buy the fish.

Preston: Obviously, a lot of thought is being given to the problem, and it is not as though nothing is being done. It is not true that in most cases underdeveloped countries now have a negative growth rate in their per capita GNP. In fact the growth rate is positive and in some cases quite high, but typically less than it is in the West. It is the discrepancy between the two blocks that has increased; it is not that they are going backward in absolute terms. I think the general consensus of opinion is that a revolution in agricultural techniques is required to get enough products that could be sold on a market, and thereby acquire some of the advantages of modern living. Getting a taste of what is possible in a modern economy provides some incentives for the continuation of the growth, but it requires starting out in most cases with an intensive governmental effort to increase the rate of agricultural productivity by agricultural extension, fertilizer, plants, and the like.

Isaacs: Within the developing countries? Yes. However, Ayub says that agricultural subsidy by a government of an agrarian country is an incongruity. The national economy depends on the agriculture to start with. Introduction of technical aid is, of course, something else.

Preston: What happens is that one country begins to export its agricultural produce and in turn can import some of the capital equipment necessary for industrialization. The produce is not just being consumed within the country, but some is left over for export.

Chapman: Another thing is that it all needs a little bit of patience. These things are moving ahead really quite rapidly compared with history—with previous time periods. I run around the world a good deal and I am always surprised when I go back through a place. Everything's still going to hell in a hand basket, but on a higher economic level than it was the last time. It is much the same thing in San Diego with the tuna fishermen—the most prosperous of the fishermen in the world that I know of, and they have enormous economic problems. They just ring their hands when they see you coming down the street. No tuna fisherman, in the 30 years that I have been acquainted with the business, has ever been happy economically. He's been going broke on a higher scale all the time.

West Africa, your country, Alan, in the 10 years I have been acquainted with it, has moved ahead economically enormously, but now everybody knows they have trouble. Ten years ago, they didn't know they had trouble.

Powell: As far as agriculture is concerned, how are you going to develop all the arable land and make it really economically productive at a maximum production factor without becoming socialistic in the world. Take the farmers down in Mexico where each man owns his little plot of land. How are you going to bring maximum production about without having some real big problems?

Preston: I am not sure you haven't answered your own question. It is true in many cases that some form of governmental interference, particularly in the area of land reform, is productive. Latin America is a very good example and Mexico a particularly good one. Mexico is probably in the best shape of any Latin American country now, at least excluding those with good mineral resources. And the consensus is, I think, that they underwent a very successful land reform. They took a lot of land away from the large land owners who were using the land less productively for grazing or something like that, and turned it into food production and thereby generated the beginnings of the process of development.

So it may indeed be true. It is true, socialism has obvious connotations, but I think more governmental interference is going to be necessary in some cases.

Isaacs: I always wonder about this sort of thing, because in that case the big land holders were not using the best land, and there are other cases where land holdings are so small that the best methods cannot be applied to it.

Chapman: I am going to raise another question. If you do better being socialistic why not be socialistic?

Powell: This doesn't matter, but you are going to have to farm on a large-scale basis with mechanized equipment to get your maximum productivity, aren't you?

Schmitt: I would dispute this because Japan has the highest yields with the smallest plots.

Isaacs: And Russia, of course, gets the biggest production off the small garden plots given to its individuals, rather than in the big communal operations.

Schmitt: It is horticulture, almost, in Japan, with highly intensive manpower application and mechanical power, as I showed you on the illustration. I think it is not necessarily true that you have to go to large holdings. Land reform, I think, is a desirable feature of national development because the farmer needs to participate in that yield increase and that economic reaping. If it goes to the landlord, he will remain unmotivated.

Isaacs: An old Arabian saying is that the best fertilizer is the owner's footprint on the ground.

Longhurst: If you have big land owners that are not utilizing land, probably you will have some form

of socialism taking it away and redistributing, and yet—

Preston: You need a strong central government, whether it's socialistic or capitalistic.

Chapman: The revolutionary doesn't want any government at all. Another factor in this too, John, is that when Walter puts up charts and so forth, this is fine, you can see what is going on, but when it comes down to managing the use of a piece of land or an area of land or a country, there come such highly diverse problems that you can't treat them generally.

I think really the cocoa farms of the Ashanti tribe in Ghana are not quite the same as the rice paddies of southeast Asia. Every different society, and every different type of agriculture is of very high diversity. One can't generalize.

Isaacs: But you can establish some general constraints on the possibilities.

Smith: I've been going practically depressive just listening first of all to Ehrlich, then I read someone else who is very hopeful, and then I hear Dr. Preston here and then I read Borgstrom,—quite frightening. I wonder, something that both Borgstrom and Schmitt left out of their considerations, I think, is the availability of water. I have heard a lot about these problems, but I think water pollution must be considered as most crucial and that we must press, in developed and underdeveloped countries, for high quality waters.

Schmitt: I agree. I discussed irrigation without stressing its full potential importance. The Pakistan example illustrates the eminence of water. We are not yet moving toward a proper economic utilization of water. In the southwest, for instance, here in our own country, a study at the University of New Mexico by N. Wollman, showed that we could gain far greater economic returns from water use than we do presently, either by domestic residential use or even by recreation. They pay much better for water than does irrigation. So perhaps large shifts are necessary. Most of the \$80 billion expense that I quoted for the development of the underdeveloped countries' agriculture is in water supply, provision of dams—

Smith: Where is the water coming from?

Schmitt: The Indian peninsula is certainly a well-watered region.

Smith: We are providing water at a higher rate than it is being replaced.

Isaacs: Only in a few places and we are also wasting it. We are stuck with some curious anachronisms as you may know. The cheapest water in the world, that is priced the lowest, is in the Sacramento Valley where the State has to supply water to farmers at \$1 an acre foot, by far the cheapest material on the face of this earth. This allows them to raise very low-level crops, fodder crops—much of our water is tied up in this sort of a way. Also the solutions to problems of cultivating the well-watered regions of the world, the places that have more than adequate natural rainfall, have never been effectively attacked, never been re-

searched. Then, of course, there is the whole interesting matter of saltwater agriculture and some of the new information on hydroponics of using ordinary crop plants grown in sea water. This seems to be successful if you just keep the water sufficiently stirred. And then my favorite, of course, my favorite little piece of marine resource, the little DNA molecule, that tells salt-tolerant plants how to desalinate sea water using the atomic energy of the sun. We have never taken this gene out of the sea and tried to breed it into crop plants, so that there can be useful salt-tolerant plants for the ubiquitous problem of salinity of irrigated arid regions and also for the direct irrigation by sea water.

Preston: Could I address myself to something other than the water question which you raised? An inconsistency exists in the predictions about whether disaster is imminent in 10 years and whether we can go up to 50 billion people. They are really based on a different set of assumptions. People like Ehrlich, I think, assume that institutions and techniques are *not* going to change. In that case we are going to have a problem. But obviously, if it is possible to increase the world food production by a factor of 10, whether we are going to have a problem in 15 years or so really depends on the rate of change. Institutions in these countries themselves have made estimates like that, maybe perfectly correct, and maybe a pessimistic approach is what is necessary. The only argument that is currently being made is that a rapid rate in population growth itself may make institutional changes inevitable, which can't be easily discounted, but I think world opinion is for trying to achieve these changes in another way.

Schmitt: I am very certain that these changes will come about before 10 times the food is necessary and the institutional changes that Dr. Preston hints at, they are already taking place.

The Vietnam war may well be the last military confrontation for both East and West. We are actually moving into a humanistic age with more adequate allocation of resources to the real problems of the world, and particularly gratifying to me was the appearance this summer in Russia of Andrei D. Sakharov's *Progress, Coexistence, and Intellectual Freedom*. Sakharov, an eminent Soviet nuclear physicist, says in this privately distributed manifesto among other things: "International affairs must be completely permeated with scientific methodology and a democratic spirit, with a fearless weighing of all facts, views, and theories, with maximum publicity of ultimate and intermediate goals, and with a consistency of principles.

"Specialists are paying attention to a growing threat of hunger in the poorer half of the world. . . . What is involved is a prognosticated deterioration of the average food balance in which localized food crises merge into a sea of hunger, intolerable suffering and desperation, the grief and fury of millions of people. This is a tragic threat to all mankind.

"It is apparently futile only to insist that the more backward countries restrict their birthrates. What is needed most of all is economic and technical assist-

ance to these countries. This assistance must be of such scale and generosity that it is absolutely impossible before the estrangement in the world and the egotistical, narrow-minded approach to relations between nations and races is eliminated. It is impossible as long as the United States and the Soviet Union, the world's two great superpowers, look upon each other as rivals and opponents.

"A fifteen-year tax equal to 20 percent of national incomes must be imposed on developed nations. The imposition of such a tax would automatically lead to a significant reduction in expenditures for weapons. Such common assistance would have an important effect—that of stabilizing and improving the situation in the most underdeveloped countries, restricting the influence of extremists of all types.

"Mankind can develop smoothly only if it looks upon itself in a demographic sense as a unit, a single family without divisions into nations other than in matters of history and traditions.

"The problem of geohygiene (earth hygiene) is highly complex and closely tied to economic and social problems. This problem can therefore not be solved on a national and especially not on a local basis. . . . Otherwise, the Soviet Union will poison the United States with its wastes and vice versa. At present, this is a hyperbole. But with a 10 percent annual increase of wastes, the increase over 100 years will be multiplied 20,000 times."

Parrish: What about our petroleum reserves?

Isaacs: We have two hundred years of recognized reserves for present consumption rates at the moment, and the recognized reserves seem to be growing rather rapidly. If we had time, I would show you an interesting extract from the old book some of you were raised with, the *Book of Knowledge*, 1912 edition. It relates the then common opinion of how soon we were going to run out of petroleum fuel because of the rapid increase in use in trains and boats and all the new fangled automobiles around, and that by the year 1946, all petroleum would be exhausted. The man that writes this, however, possesses a lot of inner confidence, for when he finishes relating the current opinion, he says—and he has turned out to be correct—that he thinks as we learn more about petroleum and how it was formed we will learn more about how to look for it; we will find greater reserves; and even after that when we finally run out of petroleum—as he says we inevitably will—by then he says that we will have unlocked the marvelous power in radium. Of course, that was the only radioactive material they knew at the time.

And now the new discovery is apparently of petroleum and petroleum-bearing formations in the deep sea. The writer of this old article turns out to be correct—we may be able to increase petroleum production for any length of time that any of us here have reason to worry about.

McGowan: None of these conversations make any sense to me. I have heard several others and read several others on population problems and no one has come up with tangible solutions. Sooner or later there

is going to be a population problem no matter how much food you produce and it is easy to calculate when that will happen. For instance, we could literally populate the earth. It doesn't require a very sophisticated calculus to do that.

Isaacs: They calculate it every 10 years, John, and there is always a group of people who say their calculations didn't turn out to be correct, but that this must make the inevitable fiasco more terrible. I agree with you that there are limits, but dire predictions have gone on for hundreds of years. The human race seems to continue to solve these problems.

Schmitt: Obviously Malthus would not have made his statement about geometric populations growth and arithmetic food growth had food supply not been at a danger level. Certainly there was no considerable surplus of food around. Therefore, 150 years ago at the time of Malthus, we should draw the food production as tangent to the population growth at that time. This would by now leave the food production adequate for perhaps 10 percent of the people. Obviously, food production has grown geometrically as well. It must have jumped repeatedly in response to technological innovations, even though many segments in its curve advance arithmetically, but certainly the sum total of it is a geometric growth in food production.

McGowan: Are you talking about the population problem?

Preston: No, the food problem. There is a difference between the food and the population problem.

McGowan: And what is that difference? I guess I didn't get it.

Preston: Well, the population problem merely relates to the restrictions placed on the ability of a country to develop into part of the modern world.

Chapman: We in the western world are getting ahead of the game.

Preston: Many countries are not getting ahead fast enough for their own wishes. I guess there is some limitation in the total food supply, but that doesn't mean we're anywhere near that at the moment. It is really a quite different matter, I think, than the population problem although they are always discussed in the same terms.

McGowan: And I think they should be.

Isaacs: All these calculations can be applied to the American Indian. Using his particular production methods he was overpopulated.

McGowan: Could very well have been. Of course his population growth rate became negative, and ours is not and it never will unless something is done.

Chapman: One other factor, John, looking back in history, we aren't doing too bad now because we are worried about our condition. It certainly isn't as bad for mankind generally as it was 100 years ago, and 300 years ago it was a heck of a lot worse. There have

been periods in history when things were going along pretty well, but they have been very few and very temporary. We have worried that the dollar was going to pot, but during my lifetime the general economic welfare of the human race has been a hell of a lot better than any period in history of which I have read, and it's measured rather well by the increase in population. For a long period of history population didn't increase very fast. The reason it didn't was because things were tough.

Hardwick: Without worrying about the physical necessities of food, we can produce these for any number of people; however, there are aesthetic problems and psychological problems and physiological problems—people begin to act differently in a crowded environment, in an urban environment, and I don't know whether you can say people act like rats or not, but if you put rats in a cage and let them reproduce until they are crowded, they become completely abnormal. This also seems to happen to human populations. I know I grew up in a rural area, and people there act a lot different.

Isaacs: I often wonder why we are so tied down to urban populations anyway. We keep saying that we have to save our cities. Are there no alternatives?

Preston: People like to live in cities, that's why there are cities. People enjoy them.

Chapman: Well, the great unpopulated areas of the United States are Pennsylvania, New Jersey, Maryland. Fly over this, and very little of it is populated. Most of it is bum timberland full of deer, more deer now than when the white man came.

Isaacs: Also when you take off from Calcutta, which is a teeming mass of people, overpopulated in a way people think is the prototype of the future, what do you fly over? You fly across four hundred solid miles of almost unpopulated jungle.

Longhurst: Yes, but how are people from Calcutta going to live in this jungle?

Chapman: Alan, what you want to do is live in a big city all by yourself.

Isaacs: I feel that we have opened up endless avenues for discussion, that we could go on like this for the whole 3-day session, but I think we should bring this symposium to a close at this time. I wish to thank the panel and the participants for a spirited and valuable session. I thank the speakers for four most unusually perceptive, penetrating, and provocative presentations.

I will not attempt to summarize, but I believe that important characteristics of the broad problems have been very powerfully developed. Dr. Preston's points on relative rates of population growth and economic development; Wib's discussions of the economic constraints; Walter's on total potential and on alternatives; and Dr. Bullis' on the open-ended possibilities of technological advances in fisheries.

I thank you all.