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Responsibilities of Scientists for the 80's And Beyond: A Global Perspective

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To address this august body is a somewhat overwhelming experience. One wonders what can be said that is really worth saying, what will provide food for thought, and even possibly stimulate action.

After much deliberation I have decided to share with you a moving experience which I had this past January and some reflections on that experience. I had the opportunity to participate in the teaching of a course called "Sharing Global Resources." I was the biologist on the team and had three excellent colleagues: a physicist, a sociologist, and a theologian. We looked at world resources (renewable and non-renewable) and how they are shared or *not* shared by the peoples of the world. We looked at underlying social structures and the moral-ethical questions involved in the use of world resources.

Our task, along with out students, was to look at the world as it is, to look at the major problems we face today, and (with hope and creativity) to look at what might be done to develop a peaceful, just, and sustainable society for the world as a whole.

As biologist on the team, my task was to help us delve deeply into the problems of world population, food production, hunger, the supply of potable water, and other such matters.

I would like to share with you some of the startling facts I learned while doing this course and my personal reflections on what we, as scientists and educators, might do to work toward a just and sustainable society for the whole earth.

First: world population. As you may know, the population of the earth was 4.5 billion in 1980. By mid 1983 it was estimated at 4.7 billion, with a doubling time of 39 years. At the present rate, by the year 2000, we will have 6.1 billion people on the earth. By

the year 2020, there will be 7.8 billion of us (Population Reference Bureau, 1983).

That means that every day the earth's resources are strained by the *net* addition of 200,000 more human beings. Each year the world's resources must be shared by an *additional* 70 million people. Birth rates have not really *increased* (the average number of children born per woman in Kenya is 8.0; for Nigeria it is 6.7), but death rates have decreased dramatically. In Pakistan, the birth rate has not increased at all, but the death rate has decreased by 66% in the last 70 years. This does not mean, however, that all children are surviving in third world families and that the parents feel that they can, therefore, have fewer children. The infant mortality rate for the lesser developed nations, excluding China, is still 105 deaths/thousand live births or 10.5% as opposed to 19/thousand or 1.9% for the more developed nations (Population Reference Bureau, 1981).

This makes us pose the question: have we passed (with a global population of 4.7 billion) the point at which we could adequately feed everyone *if* distribution of food was equitable (which it obviously is not)? The United Nations Food and Agricultural Organization estimates that 500 million people, primarily in the lesser developed nations, are *severely* malnourished (United Nations, 1974). Other authorities estimate that as many as *1 billion* people are *inadequately* nourished, without the 30 grams of protein per day that it takes to maintain minimal levels of health and well-being. Of course, the severe drought in Africa right now makes the situation even worse. (As an aside, I noted in the Congressional Record of February 1, that it was a South Dakota Congressman, educated at a South Dakota University who made the most eloquent plea on the floor of the House for an emergency food aid bill for African nations suffering from the drought.)

But since emergency food aid, welcome as it is to people facing starvation, is still only a stop-gap measure; what about *food production?*

I would like to share with you data from a United States Department of Agriculture report for the years 1969-82 (Table 1). The study shows that, particularly for developing nations, although *great strides* have been made in agricultural production, because their population growth rates remain high, *per capita* increases in food are very modest. Also there is a great variability among developing nations. Over the same time span, Southeast Asia increased its per capita agricultural production by 1.4%, but the African continent suffered a 1.4% *decrease* in per capita agricultural production (USDA, 1983).

TABLE 1

World Food Production
USDA Report for 1969-1982, Inclusive

	total growth in agric. prod.	population growth	per capita growth in agric. prod.
World	2.2%	1.8%	0.4%
Developed Countries	1.8%	0.9%	1.0%
Less Developed Countries	2.9%	2.5%	0.3%

A study by R. Ewell (1974) showed that world use of fertilizer doubled in the 1950's and tripled from 1960 to 1973 (Table 2). Global grain production is not keeping pace at all with fertilizer consumption, and the dichotomy is probably greater by now. The Food and Agricultural Organization of the United Nations predicts the need for 28.6 million tons of fertilizer in the lesser developed nations in 1985. Of course, it will not be available to them, at least not at reasonable prices. The noted anthropologist Richard Leakey made an impassioned plea this past year for the superpowers to *stop* sending guns and tanks that rust in the desert to his native Kenya and her neighbors. Instead he begged for fertilizer. It is obvious why.

And yet, the growing demand for fertilizer is not the most major problem for food production. A more subtle and even greater problem is world wide *soil erosion*. Lester Brown of the World Watch Institute in Washington, D. C. says that soil erosion caused by three things: *deforestation, overgrazing,* and *overplowing* (particularly of arid grasslands) is the number one world problem (Brown, 1981). Two years ago, Dr. Van Bruggen in his presidential address to this society pointed out the severity of the soil erosion problem

TABLE 2

World Fertilizer Use
(R. Ewell, 1974)

	1956	1973	% Increase
Global Grain Production (million tons)	866	1371	58%
Fertilizer Consumption (million tons)	21.9	72.4	230%

for South Dakota and the nation (Van Bruggen, 1982). Here in the United States, in the "breadbasket of the world," we are plowing some 500 million acres. We have lost another *200 million acres* of formerly arable land to urban sprawl, superhighways, and soil erosion so severe as to make the land unusable. That is an alarming rate of soil loss and loss of food production capability (Brown, 1981).

There are many other things we could think about. The fact that safe and plentiful drinking water is still unavailable to ½ to ¾ of the people of the third world, despite efforts by the Agency for International Development and other organizations, is a scandal. The fact that water borne diseases (cholera, typhoid fever, dysentery, shistosomiasis) are still rampant in the third world is inexcusable. The World Health Organization of the United Nations (1981) estimates that 80% of the diseases in the lesser developed countries may be attributed to poor water and inadequate sewage treatment and that 25,000 people die each day because of the lack of safe drinking water (that is, they die from the diseases associated with impure water).

Then there is the whole matter of energy and mineral resources—the fact that resources are unevenly distributed: much of the world's supply of cobalt in Zaire, most of the world's chromium and much of its uranium in South Africa, oil in the Middle East. There is the fact that we are living in the twilight of the age of oil. Many of us grew up at the beginning of the era of oil, after World War II. Gasoline and home heating oil were cheap and abundant. But this petroleum based society is a short-lived phenomenon. Before the end of the century, if we continue our present rate of consumption, world petroleum reserves will be exhausted. A natural resource which took millions of years to make will have been exhausted in less than one human life span.

But this gloom and doom and seemingly insurmountable list of problems is not the end of things. It is a challenge. It is a challenge to the human spirit, to our creativity and our compassion. There are answers. And we in South Dakota have got to be part of the answer.

What has to happen? The grave dichotomy between those who have and those who have not has got to be at least *diminished*, if not eliminated. The alternative is international conflict; and with the nuclear materials now available to more and more nations, that is a horrifying prospect. But what can we do here in South Dakota? I would like to make three points.

First of all, South Dakota universities and colleges are already making a significant impact; although we should, no doubt, attempt

even more. We are, and have been for some time, educating talented individuals from third world nations. South Dakota State University, for the last ten years, has graduated twelve to fifteen students from third world nations each year in various fields of agriculture and food production. The University of South Dakota has trained many students from the third world in health care and education, as have a number of private colleges in the state. The South Dakota School of Mines and Technology has educated geologists for the third world and, along with SDSU, trained numerous engineers. This *is not a small matter*. It is a contribution of which we should be proud. Furthermore, SDSU's project for agricultural development in Botswana funded by the Agency for International Development is to be commended. Also to be commended is the work of the Remote Sensing Institute on that campus for its involvement in the training of third world scientists in improving agricultural production and, in particular, for its land use and resource management projects in Senegal, Mauritania, the Sudan, and other lesser developed nations.

Secondly, we have many people in this state who work to advance crop production while conserving natural resources, persons who work in plant and animal genetics, persons involved in the improvement of animal husbandry, range management, aquaculture, alcohol fuels production, and the like. Those of us who are not specialists in those areas can at least lend our interest and strong support and urge continued government funding for their work.

Finally, those of us who are educators must endeavor to help our students gain a global perspective. This is a serious responsibility. We *must* challenge them to understand and care about the future of our world and its people. We must help our students understand that their education is *not* a passport to privilege but a sacred obligation to serve others. Our students face an uncertain future in a world with nuclear capabilities that can destroy the earth many times over. They must understand that unless we remove the root causes of war—human injustice and greed—there will be no peace in the global village. We must all learn with the French philosopher, poet, and anthropologist Teilhard de Chardin that "the age of nations is past. The task before us now if we would not perish is to build the earth."

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