Journal

of the

American Scientific Affiliation

The fear of the Lord is the beginning of wisdom.
Psalm 111:10

March, 1962

Vol. 14

No. 1

The American Scientific Affiliation

(Incorporated)

The American Scientific Affiliation was organized in 1941 by a group of Christian men of science. The purpose of the organization is to study those topics germane to the conviction that the frameworks of scientific knowledge and a conservative Christian faith are compatible. Since open discussion is encouraged, opinions and conclusions are to be considered those of the authors and not necessarily held by others in the organization.

PUBLICATIONS

The Journal of the American Scientific Affiliation is issued quarterly. Its contents include primarily subjects both directly and indirectly related to the purpose of the organization, news of current trends in science (including sociology and anthropology), and book reviews.

Modern Science and Christian Faith is a 316-page book containing ten chapters on nine fields of science, each written by a person or persons versed in that field.

Evolution and Christian Thought Today is a 221-page symposium by thirteen authors, expressing the attitudes of Christians on this subject a century after Darwin's writings.

EXECUTIVE COUNCIL

The Journal of the

American Scientific Affiliation

Table of Contents

Vol. 14 March, 1962 No. 1

The Journal of the American Scientific Affiliation is published quarterly, March, June, September, and December by the American Scientific Affiliation. The publication office is located at 414 South Broad Street, Mankato, Minnesota. The subscription price is $3.00 per year. Single copies may be obtained at a price of 75c each. Copies of back issues may be obtained at the price of $2.00 per volume. Send all communications regarding editorial matters to the editor.

Printed in U.S.A.

Introduction of Symposium On the Christian's Responsibility Toward the Increasing Population

Henry D. Weaver, Jr., Ph.D.*

The Christian Church has been accused of not being relevant to the problems of the age in which she lives. The 1961 convention of the American Scientific Affiliation was an indication that Christian men and women feel that the Gospel of Jesus Christ does have something to say to the problems of our age.

At the convention and in the following pages the Christian's responsibility to the increasing population receives consideration. The examination of the problem reveals several factors. First, there is no question but that the population is increasing. It is not clear, however, how large a population the earth can or should support. It is evident that in addition to an increase in the population there is also an increase possible in the amount of food that can be produced, the amount of land available to produce food, as well as the minerals and other supporting materials for civilization. Much of the key to the balance between the needs of a large population and the materials to support it is in the energy available. It is clear that the future holds almost limitless quantities of energy.

The crux of the problem comes from at least three considerations. First, the relative rate of population increase and the rate of increasing the materials needed to sustain the large population is critical. This problem is accented by the fact that not only is the population increasing, but the needs of each person are increasing.

Secondly, there is a Christian concern about the quality of life of the people on earth. This includes the kind of diet men have, the time available for them to pursue creative pursuits, the resources available to them and the esthetic concern of space itself.

Thirdly, and perhaps of most concern from the Christian point of view, is the problem of distribution of resources to the population. At the moment some of the areas increasing most rapidly in population are lagging behind in the increases in technology that make possible even an adequate supply of food. As is pointed out in this issue, means of transportation are advanced enough that the day of an acute famine is over, barring political or sociological pressures. However, these pressures are real and add to the problem of distribution that exists.

These factors inevitably raise the ethical question of population control. As we will see, this problem is best framed in the context of responsible parenthood.

These considerations add up to a situation that is worthy of the concern of every Christian and the Church. In addition to the obvious responsibility of bringing a witness of the Gospel to the increased population, the Christian must face the question of the Church's responsibility to control the population and to help increase the essentials necessary to sustain an increasing population. The purpose of the articles assembled here is to pinpoint the factors involved to enable responsible thinking about the issue.

*Dr. Weaver is Professor of Chemistry at Goshen College, Goshen, Indiana, and the newly elected President of the American Scientific Affiliation. He was chairman of the Program Committee for the Sixteenth Annual Convention of the Affiliation held at Houghton, New York, in August, 1961.

*The Balance of Food and Population**

K. K. BRUBAKER**

There is a good possibility that Thomas Malthus would not express his views on the balance of food and population in nearly as pessimistic terms today as he did in his first essay in 1798. This is said in spite of the phenomenal increase in population which has occurred and is occurring. A serious student of the world food situation must acknowledge that agricultural productivity has in a very remarkable way been accelerated during the past 150 years. Malthus certainly was inaccurate in postulating that means of sustenance increases only in an arithmetical manner.

However, it is true that every population, be it plant or animal, ultimately faces the limits of its environment. Certainly man is no exception to basic ecological principles. But history has shown that man has been successful in modifying his environment through science and technology to such an extent that one can never really predict what are the immediate limitations of his environment. Thus to speak of the balance of food and population is not an easy task.

Science does not give us complete cause for optimism, however. Paul Sears (6) reminds us that we are not really concerned with science when considering the problem of food and population, but with the moral limitation of man. Can mankind preserve the commonly accepted values of civilization during his adjust-

*Presented at the 16th Annual Convention of the American Scientific Affiliation, Houghton, New York, August 22-25, 1961.

**Associate Professor of Biology, Eastern Mennonite College, Harrisonburg, Va.

ment to environmental limitations? It is this problem which concerns us as we contemplate the achievements and prospects of science as it relates to food and population.

Man, being more than an animal, is not doomed to savage competition for food and food production facilities. He does have the ability to cooperate in this gigantic task. The large number of government, intergovernment and private organizations concerned with food production and distribution in underfed countries gives evidence that man has dedicated himself to some extent to cooperation (9). These efforts have been effective in some measure. The world has not experienced a major famine during the past decade for the first time in recent human history. This has been due primarily to the magnificent work of the relief agencies. But such programs, however worthy and commendable, have not attacked basic problems in the conquest of hunger.

In the world today there are well over a billion people living under conditions where 80 per cent or more of their toil is spent on obtaining food. Infant mortality due to malnutrition among these peoples is 50 per cent or greater (10). It is not surprising to read and hear continually that hunger is the greatest cause of social unrest and revolution. Ill-fed people, outnumbering the well-fed two to one, and aware that food and land is plentiful in other parts of the world, will not continue to be content with their lot. Nor should they be. These people are not demanding Western standards of diet and wealth overnight, but they do desire progress. They wish to see improvement in their standard of living and promise of further advancement, even if it must be gradual. Instead, too often, they experience the vicious circle of poverty producing deeper poverty and hunger.

The food dilemma is of course most serious in view of the increasing rate of population growth. Even if conventional means of birth control are strenuously taught, we are still faced with the question of whether it is physically possible for our planet to yield sufficient food for the number of people who will almost certainly populate the earth in the next several decades. According to the data accumulated by the Foreign Agriculture Service of the United States Department of Agriculture, the observation is made that "agricultural production in the world as a whole and in the foreign Free World has increased somewhat faster than population in the past decade. It is expected to continue to outpace population during the 1960's"(11). But this report on the world agricultural situation for 1960 notes that the per capita production for Latin America and the Far East has been dropping. In Ceylon one-half of its rice and all of its wheat flour requirements will have to be imported in the immediate future. Ceylon has been experiencing a 3 per cent population growth, a formidable barrier to gains in per capita farm output. The Foreign Agricultural Service predicts the agricultural output in the Far East will increase faster than population in the next ten years, but because of the present deficit of food, these countries will still need to import large quantities of grain.

Malnutrition

According to E. J. Bigwood (2) of Brussels University, the present world food situation could be summarized as follows:

1. Eighty per cent of the world population is getting less than 2500-3000 calories per day (FAO recommends around 2500 calories per day as minimum).
2. There is uneven distribution of food in sparsely populated areas as well as in densely populated areas.
3. Animal protein consumption is below minimum standards for good health.

We shall discuss first the problem of malnutrition, then production, and finally preservation and distribution.

The problem of inadequate diet results in what could be considered two types of hunger: quantitative malnutrition in which the individual experiences real, overt undernourishment, and qualitative malnutrition, a type of malnourishment in which the individual is not getting the proper diet but may not actually feel hungry.

In most cases hunger is seasonal, being particularly severe in the form of sporadic "preharvest hunger." Some preharvest hunger is due not only to lack of facilities for food preservation and storage, but to peasant logic which rules out preparation for an event which may not occur (1). Why prepare for calamity if its occurrence is uncertain?

In the case of quantitative malnutrition, the consumption of food in terms of calories is usually most significant. In the United States the average calories obtained per person per day has been estimated at 3200, while in Bolivia and Ecuador it is around 1900 and in Peru, Pakistan and India around 2050 (5). The complete nutritional story is not correctly expressed in terms of calories alone, however. We must include in our concept the problem of inadequate protein and vitamin consumption.

Dr. Oomen has observed in New Guinea that even slight increases in calories and protein in the diet were effective in promoting better health even though levels were still sub-optimal (2). He noted that if a person who had been consuming only 1400 calories and 25 grams of protein per day were to increase his intake to 1600 calories and 35 grams of protein there was a marked improvement in health. Inclusion of animal protein, such as fish, was most valuable.

Protein deficiency is aggravated by a high level of carbohydrate intake. The prevalence of such starchy foods as maize, sorghum, cassava, yams, and plantain, even though supplying an adequate caloric level, may actually aggravate protein deficiency which commonly accompanies a high starch diet. This problem is most

serious in the case of children, especially newly-weaned infants, resulting in the often fatal disease kwashiorkor.

Lansbury (7) in a most readable article suggests several approaches toward alleviation of protein deficiency in West Africa.

1. Import protein — an economically unhealthy approach.
2. Development and modernization of sea fisheries.
3. New sources of protein such as fresh-water fish farming, algae production, and leaf protein extraction.
4. Fortification of local products with cheap, imported protein such as American surplus skim milk.
5. Expansion and intensification of local livestock production.

He goes on to present reasons why the production of poultry and eggs seems to be the most feasible approach in that region. It is possible to supplement and balance locally-available vegetable protein by adding animal protein such as dried milk or fish meal, but in most cases it is cheaper to balance the diet using animal products directly. Usually the problems in increasing production of animal products are quite severe. Not only are there such difficulties as disease, parasites, lack of animal feed, and poor management which severely limit the establishment of livestock enterprises, but also the extremely limited purchasing power of the people who need the animal products the most.

Finally a look at the problem of deficiency diseases should clarify the point that the problem of balance between food and population is not merely a quantitative concern. Williams (12) has estimated that there may be hundreds of millions in Asia who are suffering from mild beriberi to such an extent that it is a tremendous handicap to their struggle for self-improvement. Vitamin deficiency diseases which are common in widespread areas of the world are ariboflavinosis (lack of riboflavin associated with lack of foods containing animal protein), beriberi (thiamine deficiency associated with use of white flour or white rice), pellagra (niacin deficiency due to diet high in white flour, maize, or cassava), and xerophthalmia (vitamin A deficiency associated with lack of green, leafy vegetables, and fats). Williams strongly advocates a mass vitamin enrichment program as the most effective means of combating many of these diseases. He points out that at present prices (1960) it would cost six cents per person per year to purchase the necessary thiamine and niacin needed to enrich rice flour to an adequate level. An FAO team to the Philippines studied this possibility but favored other means rather than rice enrichment because of the technical difficulties involved.

There are still many problems of malnutrition which need to be investigated before all world problems are understood. The problems of nutritional anemias and the high incidence of bladder and kidney stones among large masses of ill-fed populations are not clearly understood.

Food Production

Looking at the world in general, there have been optimistic estimates as to food production potential. John Boyd-Orr (3) estimates that the earth could support 6 billion people if modern agricultural methods were applied to all present cultivated land and known measures were utilized to increase the area of earth under cultivation. Dennis A. Fitzgerald (6) made the following statement: "As far as global agricultural production is concerned, I have a deep-seated conviction that output can be increased more or less indefinitely at a rate much larger than any probable rate of population increase."

In the same conference, J. J. Christensen (6) expressed the opinion that even though the present rate of increase in food production is high, this does not mean that it cannot continue to increase in the future. Not all food experts may agree on the magnitude of future increases in food production, but there is general agreement that these increases will probably not occur in those local regions where food is needed the most. Even though production is increased, the distribution problem will remain.

From the historical standpoint, some remarkable increases in food production have been noted. During the occupation of Taiwan by the Japanese (1895-1945), rice production was trebled, sugar production was increased 30 times, and the general standard of living and literacy improved while the population doubled (6). In the United States, not only has agricultural production mushroomed, but in two decades the food producer has nearly tripled his output per hour of work. Orville Freeman (5), Secretary of Agriculture, acclaims this as "one of the significant and important breakthroughs in human history."

The nature of food production changes as population increases. Animals, which build into their bodies and products only about 10 per cent of the calories they consume, must be replaced by the much more efficient plant as a food source. As population increases further, cereals may be replaced by vegetables. Potatoes, for instance, produce more food energy per acre than any other staple crop except corn (6). Unfortunately, potatoes are well adapted only to the cooler climates.

As the efficient crops are utilized in place of the less efficient, production per unit of land is increased but variety of diet is decreased. This is particularly serious as it affects animal products in the diet. It is thus apparent that, although production quantity may be increased as population pressure increases, the quality of the new products has a tendency to be less desirable from the standpoint of diet.

The production problem is sometimes explored in terms of land available on the earth. Even though there are many pitfalls in this approach, it is an important aspect of the food production problem since

land will remain for some time the most important media for food production. Countries having around 1.5-2 acres of fertile land per capita can theoretically produce all the food they need. The quality of food produced depends on the efficiency of their agriculture. In the world as a whole in 1955 there were about 1.25 acres of land available per person (9). Since some countries, such as the United States, Canada, Australia, and Argentina have well over 1.25 acres of land per person, this means that most of the people of the world have less. The situation is most severe in such crowded countries as China and Japan where the amount of cultivated land per person is less than 0.5 acre. Whitaker (6) points out that even if all arable land were distributed over the earth in the same way as population, there would scarcely be enough land to meet man's needs under present usage. Even though much presently untilled land could be gradually brought into production, the total amount of land under cultivation may not actually increase because of concurrent losses due to erosion, salting, and human structures.

Large areas of land are being lost at the present time in India and North Africa as deserts enlarge at the rate of a mile per year. There are today only 8 billion acres under cultivation, while there are 12 billion acres of desert. It is quite probable, in view of recent discoveries, that most of the present desert was produced as result of man's activities. It may well be that at one time 16 billion acres were suited for cultivation, half having been lost to desert during the past eras of civilization (3).

In view of the impressive desert expanse, it is not surprising that William E. Warne (6) considers water resources for agriculture to represent one of the chief hopes of the world for increasing food production. Less than 2.5 per cent of the cultivated land of the world is irrigated. Yet this land provides food for approximately 25 per cent of the world's people. It is feasible that irrigation of deserts and near-deserts might double the amount of irrigated land available with relatively few major engineering problems. Irrigation in humid regions may raise food production significantly by decreasing losses due to drought and extending the growing season. With irrigation many agricultural regions could produce two crops annually instead of only one.

Although the amount of land available for crop and animal production is definitely limited, the amount of food which can be produced per acre of land seems almost unlimited. At least we do not know just what factor will prove to be the ultimate limit to yield. How many bushels of corn, potatoes, or rice can be produced per acre under optimum conditions? Agricultural research is constantly striving to find what these optimum conditions are.

Agricultural extension workers are at the same time training producers to make use of what is already known. For instance, it has been demonstrated that rice yields in Thailand can be increased 20 per cent merely by using improved varieties (6). The use of better varieties is only one of a multitude of measures which will increase yield. Use of a combination of improvements may increase yield more than the sum of each improvement without the other. In Thailand a combination of improved rice varieties and optimum applications of fertilizer increased yields more than the sum of the increases from either used alone.

In recent years, yields of corn, wheat, oats, and barley have increased from 10-25 per cent per acre even in countries with advanced agricultural methods. Hybrid corn has increased production in the United States by 20 per cent. Hybridization has increased mushroom production 15-20 per cent in Japan (6).

The following list gives some indication of the various measures which have been used in improving yield in various parts of the world:

1. irrigation
2. fertilization
3. use of higher yielding strains
4. disease, insect, and rodent control
5. more intensive agriculture
6. better cropping systems
7. disease resistant varieties
8. new and improved tree crops
9. improved livestock management and feeding
10. improvement of pastures
11. artificial insemination
12. use of machinery
13. more efficient harvesting
14. land reform
15. capital loans
16. cooperative marketing
17. education of farmers
18. improved health of farmers
19. social elevation of farming
20. general improvement of economy and thus purchasing power of consumer.

In view of the limitations of conventional agriculture in meeting the food problems of the world, certain non-agricultural sources have been receiving more emphasis. Such conventional sources as fishing are being explored more thoroughly. In Central Africa, development of fresh-water fishpond projects at the family unit level of production has proven successful (2). Flooded rice fields in the Far East can easily yield 250 pounds of fish per acre per year. Western military authorities estimated that Japan could produce 500,000 tons of carp annually in her rice paddies (8).

Most of the world's fish production is obtained from the oceans of the Northern Hemisphere. The main reason for the extremely low catch in the Southern Hemisphere does not seem to be biological. Apparently the catch could be greatly improved with more efficient methods and equipment.

It has been demonstrated that another product of the ocean, plankton, made up of microscopic plants and animals, could serve as a useful source of food for ani-

mals or humans. It could also be extracted for its vitamin and amino acid content. Thailand is gathering over 5000 tons of plankton a year for human consumption (8).

Large scale culture of algae has been tested in various countries as a food supplement or livestock feed. The algae *Chlorella* is rich in vitamins and protein and an efficient converter of sunlight into food energy. *Chlorella* could be mass-produced at 25 to 30 cents a pound, a relatively cheap source of protein.

Production of crops in nutrient solutions has been carried out commercially on a limited scale. With adequate equipment and skilled technicians, yields up to 6 times that of conventional methods have been obtained. The United States had over 100 such nutriculture farms in commercial operation in 1953 according to Oser (8). The Robins Hydroponic Farm in Puerto Rico produces 30 tons of tomatoes per acre, with 2.5 crops each year.

The larger scale use of certain tree fruits and nuts has been advocated for feeding of livestock. The Hawaiian algaroba tree, a legume, produces 4 tons of pods per year on which cattle and chickens thrive. St. John's bread, produced by the Mediterranean carob tree, is consumed by humans, cattle, and chickens. The Alabama Agricultural Experiment Station has demonstrated that the pods of the honey locust prove to be a valuable stock feed.

The cellulose of trees can be utilized by cattle after partial hydrolysis with acid. Sweden, Norway, and Finland manufactured several million tons of hydrolyzed cellulose cattle feed during World War II. This hydrolyzed cellulose, or wood sugar from the wood pulp industry, can be used to grow torula yeast. The yeast in turn is dried and used as a valuable protein supplement in cattle feed.

Only a few of the more tenable and proven methods of food production by non-conventional methods have been mentioned here. There have been other measures suggested which, in this fast-changing space age, cannot be relegated quickly to the realm of the improbable. Perhaps it is true that the rate of increase in food production may continue for some time in the future.

Preservation And Distribution Of Food

There is probably enough food presently produced in the world to sustain 2 billion people provided all the food were divided equally. Warne (6) estimates 3 billion people could presently be sustained on an Asiatic level of living. However, food waste in harvest, processing, storage, distribution, and consumption is high. It is estimated to amount in bulk to some 20 per cent of the total world production (2). In many underdeveloped areas it is much higher due to inefficiency aggravated by environmental conditions. Some of the inefficiency resulting in waste is due to production on a family unit basis. The small production unit is particularly unsuited to handling highly perishable products such as meat, milk, eggs, and perishable fruits and vegetables. In many cases because of the low purchasing power of the local community and the lack of processing and transportation facilities, large quantities of such products are lost. Perhaps one of the greatest needs in such areas is that of efficient means of food preservation. If this produce could be processed or preserved in some way, the first big step toward more adequate distribution both in time and space could be made.

Recent methods of preservation by use of antibiotics and by use of ionizing radiation may hold great promise for underdeveloped areas, especially where equipment costs can be kept reasonable.

There is general agreement that food distribution on a world-wide basis is not politically and economically advisable at the present time. Not only are world markets adversely affected, but in some cases the local economy suffers when food, particularly donated food, enters the market. Davis (4) presents the problems encountered in the United States surplus food donation program. The establishment and maintenance of a distribution system is complicated, especially in the underdeveloped areas. The cost and problems of local distribution are quite severe in some poorly equipped and staffed centers. This problem is aggravated by the fluctuation in volume and kind of food handled. In many cases the recipients are not acquainted with the value and use of foods they receive. Other times they may become suspicious of the donor, especially when social acceptance of hunger is widespread. Despite such problems, the United States donated over 2 billion pounds of food overseas in 1958, in many cases also paying the complete cost of transportation as well.

Some individuals, such as Dr. Bigwood, are not troubled by the farm surplus problem in such countries as the United States. "Surplus production, wherever possible, will have to be accelerated at a maximum possible speed, for purposes of distribution to the underprivileged areas" (2).

Perhaps this attitude should be taken more seriously in view of the limitations of much of the world. Distribution of food does help meet the immediate problem and buy time toward meeting the more basic problems of local production, preservation, and distribution.

Summary

Food experts generally express a guarded optimism concerning the future balance of food and population. This is partly the result of study of the way in which food production has been keeping pace with population and anticipation of many significant new possibilities of increasing food production. The problem of feeding the world involves quality aspects as well as quantity considerations. The improvement of quality of diet, especially in relation to animal protein and vitamins, has proven to be especially difficult. The food dilemma will be solved only through coordinated efforts in the areas of production, nutrition, processing, and distribution coupled with necessary changes in the economic and cultural framework of underfed regions.

Acknowledgment

The author wishes to thank Dr. F. S. Deatherage, Department of Agricultural Biochemistry, and Dr. K. R. Richardson, Department of Physiological Chemistry, for permission to prepare and present this paper while engaged as a NSF research fellow under their departments at the Ohio State University.

Literature Cited

1. Bennett, Merrill K. *The World's Food; A Study of the Interrelationships of World Population, National Diets, and Food Potentials.* New York: Harper, 1954.
2. Bigwood, E. J. "Problems of animal nutrition in underdeveloped areas," in Panel VI: Animal nutrition and food production; *Fifth International Congress on Nutrition,* Washington, D. C., September, 1960.
3. Boyd-Orr, John. *The White Man's Dilemma; Food and the Future.* London: Allen and Unwin, 1953.
4. Davis, Howard P. "Sharing our bounty," in Food: *The Yearbook of Agriculture,* 1959, Washington, D. C.: USDA.
5. Freeman, Orville L. Address before National Council of Jewish Women, Pittsburgh, Pa., March 23, 1961.
6. Hatt, Paul K., Editor. "World population and future resources": *Proceedings of the Second Centennial Academic Conference of Northwestern University,* 1951, New York: American Book Co., 1952.
   Chapter 6. J. Russell Whitaker, "World land resources for agriculture."
   Chapter 7. William E. Warne, "Water resources for agriculture."
   Chapter 8. J. J. Christensen, "Technologies of increasing food production."
   Chapter 9. Paul S. Galtsoff, "Food resources of the ocean."
   Chapter 10. Paul B. Sears, "Cultural factors in food production."
   Chapter 11. Dennis A. Fitzgerald, "World food needs and resources."
7. Lansbury, T. J. "Animal protein production in West Africa with special reference to the use of oil seed by-products in poultry production." *West African Journal of Biological Chemistry* 4:71-78 (1961).
8. Oser, Jacob. *Must Men Starve? The Malthusian Controversy.* London: Cape, 1956.
9. Philips, Ralph W. "Feeding 6,280 million," in *Foods The Yearbook of Agriculture,* 1959. Washington, D. C.: USDA.
10. Schaefer, Arnold E. "We need an integrated effort to improve world nutriton." *Monthly News Bulletin, Ohio State University Institute of Nutrition and Food Technology;* June, 1961, pages 73-74.
11. United States Department of Agriculture. *The World Agricultural Situations* 1961. Washington, D.C.: Foreign Agriculture Service ofthe USDA, 1960.
12. Williams, Robert R. "The classical deficiency diseases," in Panel VII: Three hours around the world—new possibilities in nutrition research; *Fifth International Congress on Nutrition,* Washington, D. C., September, 1960.

Ethics and Birth Control *

ROBERT D. KNUDSEN**

The area of discussion of our conference naturally leads to the question concerning the ethicality of the limitation of birth. We have taken under review the population explosion and the Christian responsibility towards an increasing population. This is a specific social problem which bears on the question of birth control. The discussion of the limitation of birth, however, is important for other reasons also. There is, first of all, the actual widespread practice of birth control. Furthermore there are economic, health, and other reasons which arise within the family itself.

When we speak broadly of the limitation of birth or birth control, we can have several things in mind. First, there is abortion, the killing and the removing of the fetus from the body of the mother. Secondly, there is self-denial, the voluntary withholding, within the marriage bond, from sexual union. Third, there is *coitus interruptus,* the interruption of the sexual act at the moment of ejaculation of the male sperm, so that it does not enter the female body. Fourth, there is the rhythm method. This is the choice of the periods of least fertility in the female as the time for cohabitation. Fifth, there is the use of contraceptives, the use of mechanical or chemical means by either or both spouses to prevent the male sperm from reaching the female ovary.

Even though abortion falls within the scope of birth control, our discussion will not include it in any prominent fashion. Abortion is the willful limitation of birth after conception has taken place. It involves the killing of a young life and is to be rejected except under the most unusual circumstances. Ethical questions may indeed arise, as in the case of the exposure of the woman in the early stages of pregnancy to a disease that would certainly result in the malformation of the fetus if it is not destroyed. Ethical uncertainty may also arise in extreme cases as to the prior right of the mother or her unborn infant to life, when it appears according to the best judgment of the physician that the unhindered development and birth of the infant will most likely result in the death of the mother and possibly in the death of the infant itself. It is the position of the Roman Catholic moralists that the infant always has the prior right and that nature must be allowed to run its course even in the face of extreme danger to the mother. In support of this position they say, that not only are the destruction of a young life and the interference with the course of nature unethical, but the unborn infant, not being baptized, will die without any hope of eternal life, while the mother, though she may die, is yet able to receive the sacraments and enjoy their benefits.

Even though circumstances sometimes place a physician in a position where he believes a therapeutic abortion is necessary and he and any others involved are placed before most trying ethical problems, this kind of problem is not that in which we are primarily interested. Our problem is more specifically whether, given the normal functioning of the physiological pro-

*Presented before the 16th Annual Convention of the American Scientific Affiliation in Houghton, New York, August 22-25, 1961.

**Dr. Knudsen is Assistant Professor of Apologetics at Westminster Theological Seminary.

cesses, there is ever any warrant for the willful attempt by whatever means to hinder the conception of a child.

When we consider such questions, our minds as Christians naturally turn to the Scriptures, as our only infallible rule of faith and practice. Upon referring to the Scriptures for guidance concerning birth control, however, one comes away without any explicit command. In the area we have delimited, there is no explicit teaching of the Scriptures to guide us. Instead, we must rely upon what can be drawn by good and necessary inference from the more general Scriptural principles.

Certain inferences can be drawn from the meaning of marriage itself, as it is set forth in the Scriptures.

The family was established from the very first, at the creation of man. It is a creation ordinance. God created man, male and female, "And God blessed them, and God said unto them, Be fruitful, and multiply, and replenish the earth, and subdue it" (Gen. 1:28). Concerning the relation of himself to Eve, Adam says, "This is now bone of my bones, and flesh of my flesh: she shall be called Woman, because she was taken out of man. Therefore shall a man leave his father and mother, and shall cleave unto his wife; and they shall be one flesh" (Gen. 2:23, 24; cf. Matt. 19:5).

From the very beginning God intended that the union of man and wife should result in the birth of children. Adam and Eve were to be fruitful and to reproduce, filling the earth. The complete family is found in the triadic relationship between the husband, the wife, and their offspring. If the marriage relationship between man and wife establishes a bond that is unique and satisfying, the coming of the child brings the family into another unique position, that is even more complete and satisfying. Even apart from the subjective desires of the individual persons involved (the father, the mother, and the child) there is in the family an ineradicable union or bond. This inner connection comes to expression clearly when this bond is violated. When the union is broken, inerasable scars are left both on the parents and on the child. The child feels the shock deeply when his parents are separated or when he discerns that there is disunity between them.

There are reasons to believe, however, that the meaning of marriage is not found in the procreation of children. That is to say, marriage has other functions. The union which under normal circumstances will result in the begetting of offspring has meaning even apart from this function. This is evident from the Biblical description of the marriage relationship itself.

In the marriage ordinance as given in the Scriptures there is a reference to the marriage partners' being one flesh. "Therefore shall a man leave his father and his mother, and shall cleave unto his wife; and they shall be one flesh."

There is indeed a meaningful relationship between the sexes in the consummation of the sex act, the mysterious union that is expressed in the words of Scripture in the establishment of the marriage bond, "and they shall be one flesh." This oneness is brought out strongly by Otto Piper in his most recent book on marriage, *The Biblical View of Sex and Marriage* (New York: Scribners, 1960). Possibly overstating his case, he seeks to establish on this foundation his entire argument for chastity before marriage and for monogamy in the marriage relationship itself. To be sure, there is possible here a great deal of romanticizing, which has little or no b a s i s in the Scriptures. The Scriptures themselves, however, seem to indicate that there is such a mysterious oneness in the sexual relationship. The anomaly of the Christian's having intercourse with a harlot is that they become one flesh. "Know ye not that your bodies are the members of Christ? shall I then take the members of Christ, and make them the members of an harlot? God forbid. What? know ye not that he which is joined to an harlot is one body? for two, saith he, shall be one flesh" (I Cor. 6:15, 16).

The psychological aspects of this oneness have been discussed extensively. In the sexual union there is a deep sense of bodily unity and a deep uniting of psyche, especially in the climax of the sex act. Precisely what importance the orgasm has I am not prepared to say; but it is clear that it has a profound psychical effect, especially if the partners reach their climax simultaneously. The significance of the bodily union of man and woman is perhaps shown in the fact that promiscuity cannot help but harden one and make him also less able to enter into a healthy relationship with a single sex partner.

Sexual union is not only physical, in the narrow sense of the word. In the marriage relationship there should be the entwining of life with life in a communion of love, so that there is a broadening and deepening of mutual interests, a growing helpfulness, etc. That this goal is not always realized in the marriage relationship is patent; but the mutual interdependence of the marriage partners is shown in the violence of the dislocations when this fellowship is not present.

The physical union and the spiritual fellowship of husband and wife complement each other. The spiritual fellowship naturally finds its expression in physical union, and physical union reinforces and stimulates the spiritual fellowship of the spouses.

It is also relevant that the apostle Paul sets forth a function of the marriage relationship apart from any immediate reference to the begetting of children. He advises that in the interests of avoiding fornication each should have his own wife and that each should have her own husband. Both husband and wife should render to each other his due. The possibility that the husband and wife might not cohabit for a while is allowed, but only in order that they might give themselves to religious exercises, specifically, fasting and prayer. The willful abstention from sexual intercourse within the marriage bond is therefore the exception. The rule is that the marriage partners not defraud one

another. Paul speaks in a strong fashion, that neither the husband nor the wife belongs to himself but that each belongs to the other and disposes over the other's body. "The wife hath not power of her own body but the husband: and likewise also the husband hath not power of his own body but the wife" (I Cor. 7:14). The terms in which Paul speaks, that the marriage partners not defraud one another, and that each of them has the disposition over the other's body for the gratification of his sexual needs, implies that there is a use or a meaning in the sexual union of husband and wife other than the begetting of offspring.

What is in the foreground here, to be sure, is the satisfaction of sexual desire as a protection against fornication; but for our purposes it is enough that we establish a function of the marriage relationship other than the begetting of children.

We might also mention that it is the relationship of the husband to the wife, apart from their relationship to their children, that is said to be analogous to the relationship of Christ to his Church. The wife is to reverence her husband. The husband is the head of the wife and is to protect and cherish her as his own flesh. This union is an earthly analogy of the union of Christ and his own.

If there is a function of sexual union other than that of the begetting of offspring, the way is opened for the employment under certain conditions of contraceptive means so that this function may obtain while the actual conception of children is hindered. We have in mind the use of contraceptive means for such reasons as the following: the presence of some disease or weakness that could be passed on to the sibling; the poor health of the mother, demanding that there be no further pregnancies; the need for spacing successive pregnancies both in the interest of the mother's health and in the interest of the needs of the children she has already brought into the world.

The position generally taken by the Roman Catholic Church is that the sexual act has the purpose only of propagating the race. Certain Catholic apologists have claimed that birth control is an evil influence on morality and religion. It is supposed to work against the personal welfare of the married couple. It is supposed to obliterate the distinction between prostitutes and respectable women, eliminating the ideal of motherhood and substituting for it the ideal of personal pleasure. It is supposed to break down self-restraint and self-discipline, relieving one of the fear of consequences.

The Catholic position is in e r r o r in so far as the meaning of the sexual bond is limited to the function of childbearing and in so far as pleasure is set aside as an improper motive for sexual relations. We have already dealt with the first of these points at some length; it remains to speak somewhat further of the second point.

It is very customary to contrast lust and a so-called spiritual attitude in which the element of desire for the sex partner has no essential part. Sometimes this so-called spiritual attitude would give desire little or no place at all. Such a position is possible only if the senses have no proper place, or if all desire must be strictly subordinated to an extrinsic end. The result of such a position is that the urgings toward the sexual partner are repressed as a whole, without any qualification, and thus abstractly. While remaining within the same framework of reference, the only possibility of combating this position is to argue, again in an unqualified fashion, for the legitimacy of passion and human urges. The latter way is taken by the so-called naturalistic theories of sex which are so current today.

It is questionable whether such blanket negations or affirmations of the sexual urge are really allowable on the basis of the Scriptures. If I am not mistaken, modern sexology emphasizes the deep-seated nature of the sexual life of man, pointing out how it colors his energies and drives in a most basic fashion. It would be embarrassing and even dangerous psychically to ignore or to repress entirely such a basic drive, or even to give it a peripheral meaning. It would be equally embarrassing, and even more dangerous in its results, however, to let this urge set its own course.

The Scriptures do not dictate either of these attitudes. Indeed, it inveighs against sexual abuses and it limits the sexual relationship and marriage to this earth; but sexual desire is never spoken of as an evil in itself. It is not even linked directly with the fall of man. In fact, as we have pointed out, the Scriptures give a large part to sexual desire in marriage, so that neither the husband nor the wife is regarded as having power over his own body.

The Biblical teaching is that marriage is honorable and the marriage bed undefiled. "Marriage is honorable in all, and the bed undefiled . . . " (Heb. 13:4). Desire for the opposite sex is spoken of as evil when it is outside of the marriage bond. To continue on with the quotation from Heb. 13:4, "but whoremongers and adulterers God will judge." When there is some anomaly in sexual desire, or when the sexual urge is out of balance with other demands of the Christian life, it is also proscribed. Thus the Christian is not to give himself to chambering and wantonness. Nevertheless, even though there are illegitimate and perverted desires and even though sexual desire must be kept in harmony with other demands of the Christian life, it is impossible Biblically to set desire or passion to one side as being evil or inferior, contrasting it with some more "intellectual" or "spiritual" motive as the legitimate one for the sexual act.

Within the marriage bond there is a proper and needful function of the body with its desires. It is unfortunate when a marriage partner (most likely the woman) divorces the meaning of the marriage relationship from sexual union. Instead, there should be a recognition of the pervasiveness of sexuality and of the fact that in sexual desire there is the longing for a

union of two persons in the strongest way. It is precisely in the union of the body, in being one flesh, that the affection and love of the marriage relationship will have its legitimate and needful expression.

Considered in this fashion, the motive for sexual union is not the satisfaction of desire in any abstract sense, as if sexual desire could be thought of as being completely undifferentiated and essentially polygamous in character, having no essential relationship to the union of one man with one woman in the marriage bond. The motive for sexual union is the fulfillment and expression through the union of flesh with flesh, of the oneness for which both the man and woman long. Within the structure of the marriage bond the various forces and stimuli (mutual affection, bodily contact, etc.) complement and reinforce each other. Within this structure sexual desire and fulfillment are not degrading but upbuilding.

Because there is a legitimacy of sexual union apart from the intent to conceive children, under proper circumstances there is also a place for the use of contraceptive means. Particular objections, however, have been lodged against such use on biblical grounds. We shall briefly consider two of them.

The Biblical story of the sin of Onan has often been thought to militate against any form of birth control. Onan entered into the sexual relation with his brother's widow; but knowing that the seed would not be his, before the climax of the act he withdrew, letting the seed fall to the ground. For this act God punished him with death (Gen. 38:10). Here there is an instance of *coitus interruptus.* The sin of Onan, however, was not that he interrupted the sexual act as such, but that he refused to perform his duty, as his father requested him, to raise up a seed for his deceased brother, so that his brother's family would still have a place within the tribe. Jealousy prompted him to let the seed fall, "lest he should give seed to his brother."

The use of contraceptive means is also said to be against nature, being an interruption of its normal course. Man, however, from the first was given the task of subduing nature, not simply out of a desire for self-gratification but in response to the commandments of God. Interference or non-interference in the course of nature is not the prime consideration. What is important is whether the sexual union of male and female has any meaning in the divine economy of things apart from the intent to produce children. We have sought to indicate that it has. We have therefore advocated the use of contraceptive means under certain circumstances.

In determining whether such means should be employed, there are certain factors which must be taken into consideration. Due attention must be given to the formation of a family, in response to the divine command to be fruitful and to multiply. We should not go so far as to say that this command applies in the same fashion to everyone. There are also eunuchs for Christ's sake (*cf.* John Murray, *Principles of Conduct,* p. 78). Some couples might even marry when sexual intercourse was physically impossible, or they might for some reason, with the glory of God in mind, abstain from the sexual act and not raise a family at all. But the general command is for all to consider, even though one cannot dictate precisely how it should be applied in every case.

Even when due attention has been given to the formation of a family, there might still be room for the employment of regulative means. Such means, as we have indicated before, might be used in case a physician should consider further pregnancies dangerous. They might also be used to space children, for the sake of the physical health of the mother. Such control is especially needful when the parents are very fruitful.

From time to time it has been urged that the family should also take into consideration in spacing its children the educational and other needs of the children already possessed. I am much less in favor of the use of contraceptive means in such cases.

In advocating a responsible use of means, however, we must proceed carefully. With our theme, the population explosion, in mind we might advocate a dissemination of knowledge; but we must be careful not to enter any area that does not properly belong to us. If a program were to be instituted that would be adequate to cope with this social problem, state involvement would be almost a necessity. State enforcement and interference in the sphere of the family might have worse results than having too many children. Furthermore, in such an intimate sphere of the family, enforcement is almost impossible.

As to the mode of birth control, we have eliminated abortion from consideration on ethical grounds. We have found that abstinence is not supposed to be the rule, according to the Scriptures. To be sure, this provision is made in order to avoid sinful lusts. It also has a deeper basis, however, being rooted in the order of creation itself.

The third method we mentioned, *coitus interruptus,* is inferior both as to its effects and its effectiveness. Unless the male is exceedingly thoughtful and artful he may leave the female just at the time that her desire for union is strongest, thus destroying her sense of fulfillment. In any case, the climax of the partners cannot be simultaneous.

The use of the so-called rhythm method is possible. It is possible to choose the periods of least fertility in the woman as suitable for cohabitation. This method, however, involves both a planning and a patterning of the sexual union which rob it of its spontaneity. It also involves that the woman will have intercourse when her desire is not at its high point during her monthly cycle.

Though the rhythm method is not out of the question, I should prefer the use of mechanical means, most preferably on the part of the woman, and in extreme cases on the part of both the man and the woman. We must remember that the rhythm method, just as well as

the use of contraceptive means, is a conscious effort to limit conception. The use of mechanical means, however, has the advantage of not limiting the time of cohabitation. The partners can choose a restful and relaxed occasion when their family duties are momentarily out of the way, perhaps after they have enjoyed an outing together, when the husband has been free to give full attention to his wife. As we have pointed out, under certain circumstances such use of means is not in conflict with the Scriptural understanding of the sexual relationship.

It must be remembered, however, that the human providence involved in birth control does not in the least diminish the need for one's dependence upon God and his providence. Just as a man who saves or who invests must trust that God will so rule the conditions of his life that there will be enough stability for him to realize a return, and just as such a one must be willing to accept a loss gracefully as coming from God, so the marriage couple must also rest in God's providence.

To be sure, there are dangers in the use of contraceptive means. There is the danger that there will be a fear of their malfunctioning. This fear, however, is slight compared to the fear a woman might have of pregnancy apart from the use of means. Many women fear the burdens and dangers of pregnancy. In some women there is a desire to be free from their nature as women. Such feelings, of course, are questionable or even wrong. The woman must learn to rest in the providence of God. There is also the danger that the couple will make the use of means an occasion for unbridling sinful lust, giving way to their desires without any reference to God and to his laws. This, of course, is wrong, whether contraceptive means are employed or not. A final danger is that the couple will believe that they have everything in their own power. Instead, their additional freedom, gained by the use of contraceptive means, should be accompanied even more fully by a strong sense of trust in God, his law, and his providence.

*The Gospel, the Church, and the Population Explosion**

William A. Smalley**

The population explosion, already very serious in some underdeveloped parts of the world, threatens to be the major world problem within a generation or two. The many difficult problems which it presents to the Christian church are crucial to Christian ethics, and to Christian social responsibility. But in the light of the very nature and meaning of the Church, in the light of its responsibility to witness and to grow, it is the rooting of the gospel in men's hearts which remains at the very center of the problem of the church in the face of the fantastically expanding world population.

The evangelistic forces and missionary branches of the church are seriously concerned about the growing gap between the church and the population. In percentage terms the world-wide church is shrinking. Into the gap more and more time, money, and effort are being poured. At no time in the history of the world have there been more missionaries at work, or such large missionary budgets. The American Bible Society, to give one example, in 1960 distributed an all-time record of 23,210,000 pieces of Scripture. To do so it expended a record budget, and it seeks to do more in 1961.

Dissipation of Energy

But as we observe the efforts put into the preaching of the gospel in this day of exploding population we make some disturbing observations, observations which keep coming uneasily to the consciousness of many thoughtful Christians. For one thing we seem to require ever larger expenditures of energy simply to mark time or to make small advance. In many respects the same misssionary work seems to require greater and greater output. As compared with a generation or two ago, our missionaries must be older, have more education, have more specialized training. Our selection processes are more elaborate, time-consuming, and expensive. "Outfits" as missionaries often call their belongings, grow larger and larger as missionaries take with them the way of life to which they are accustomed, and this way of life is ever more complex with each new year. Ever larger sums of money are needed to support the program, and the machinery for raising the money becomes more and more elaborate, until larger and larger percentages of the money raised go to keep the machinery moving.

In the countries abroad where missionaries work, mission stations develop greater complexity in spite of the strong reaction to "compound" missionary work which has grown up in missionary theory. Mission residences with only one missionary, trying diligently to avoid the dangers of a "Little America" in a mission compound, are also complex, and in many parts of the world the missionary finds that a disproportionate part of his time is engaged simply in keeping the machinery going, the car running, the generator operating, visiting mission executives traveling, prayer letters moving, and disputes and frustrations within the church cooling. He is called on for government contacts, social contacts, committee meetings that require a day's travel. He is an amateur linguist, translator, hymn writer, and mimeograph operator. He teaches, doctors sores, and experiments with growing a variety of hybrid corn, or import-

*Presented before the 16th Annual Convention of the American Scientific Affiliation, Houghton, New York, August 22-25, 1961.

**Dr. Smalley is an anthropologist and is Editor of *Practical Anthropology*.

ing roosters to improve the chickens of the area. On Sunday he travels many miles to preach a hastily prepared sermon with a nagging feeling of guilt that he knows so little of the thinking of the people whose minds he is trying to meet, and of the basic emotions of a people whose hearts he is trying to touch.

Labor-saving and communication devices conserve a great deal of energy but part of the gain is lost through the effort required to keep them going. The radio broadcasts require personnel and committee meetings, machinery and repairs. And the more the devices multiply, the more they seem to bring the focus of attention on themselves, on techniques, on programs, and the more remote people seem to become.

It is clear, as Nida has pointed out[1] that there are tendencies in social systems analogous to entropy in physical systems. Energy becomes dissipated in heat, in overcoming friction, in unrelated, random activity. The church and its missionary arm feel the effects also. Many a missionary knows that with today's responsibilities he has to run hard just to keep up.

Weak Impact

A second disturbing observation which we must make as we observe the preaching of the gospel in the face of the population explosion is that usually its impact is weak. There are exceptions in many cases, and in periodic movements that spring up at one place or another in the world, but it is partly by these exceptions that we can so dramtically see how weak the impact usually is.

I have seen the impact of the gospel on a college student, the son of a godly professor, a leader among a group of intelligent, sophisticated, cynical rebels against the gospel. None of us who knew him at the time will forget the electrifying impact of the service in which he gave in to God, and was converted in the most dramatic sense of that term.

I have visited in the wake of a "people's movement" which spread rapidly through people of the Meo and Khmu mountain tribes of northern Laos. Several hundred people turned to Christ in a month. The initial explosion of the spread had tapered off when I was there, but the impact was still very strong in the new Christian villages. It was contagious, exciting, thrilling.

I have sensed the change in impact of a church service when the form of presentation changed. During one Sunday morning service in Africa the congregation was restless, noisy, paying little attention through the Western-type routine of the singing of Western hymns. But then the choir powerfully and movingly sang an anthem in a more indigenous style. Restlessness and boredom were instantly gone, and the only noise as the music died away was that of heartfelt "Hallelujah!" and "Amen."

Last Christmas I began to sense more fully at least part of the reason why so many nominal American Protestants are turning Roman Catholic. At a Midnight Mass on Christmas Eve, what had always seemed to be 6a medieval anachronism of Latin gobbledygook became a moving emotional experience. As the drama of the mass unfolded, and came to a climax in the priest elevating the host, a climax signalled by the tinkling of the bells, there was no doubt about the emotional impact on that large congregation, and on me. There was no intellectual content so far as I was concerned, and to me hardly any Christian meaning, for the symbolism is too far removed from mine, but there was impact. And although I assume that the mass is usually far more perfunctory than this one, and emotional participation by the communicants less complete, the contrast with the normal Protestant service was startling. Whether it is in the ritualistic or more "informal" branches, the typical Protestant service is by comparison insufferably dull, hopelessly blah.

Here, too, there are cultural forces at work. The entropy which characterizes the system of course contributes to the weak impact. But there is another, related human problem as well. It is that in a communication system the fact of repetition and familiarity lessens impact. The burglar alarm, when it goes off after months of silence arouses a flurry of excited activity, but if it develops a short circuit and goes off every few hours people soon settle down and the impact is considerably lessened. We do not hear the noon whistle, although we hear the fire alarm blown unpredictably by the same whistle. West Berliners live under the constant presence of war and of Soviet might, but it is only when a new and unpredictable move is made, a wall is built across the city, that their situation is jolted out of the routine with a new situation which for the time being has tremendous impact upon them.

The Protestant service relies more on intellectual understanding, on meaning and content than the emotional drama of the mass, but the impact of the communication has so often run out.

Distorted Communication

A third disturbing observation which we must make about the gospel in the face of the population explosion is that it is distorted in the very act of its communication. This is not a reference to problems of orthodoxy or of theological points of view as these are traditionally seen in the West, but to problems in the way in which the message is understood, the interpretation or the reception.

A missionary doctor looks upon himself as serving mankind in order to serve Christ and bear witness to His love, but he may be interpreted by the community as exploiting the community, a rich man having come all this way to make money off of poor people. The teacher may be thought of as a propagandist, and the evangelist a spy. Or, a missionary is one who comes here to ride around for three or four years in a jeep and then go home for a rest. He must be rich. How does he earn his money? Why doesn't he *do* anything?

People interpret new things on the basis of the old and the familiar. A tribal group with relatively little

knowledge of the West had become familiar with the missionary family living in one of its villages. They had heard how cans with pictures of carrots on the label had carrots inside, and ones with pictures of beans had beans. Then one time when the missionary family returned after an absence they found that their house had been broken into. Nothing had been touched except for the baby food—cans with pictures of babies—which had been opened and examined.

One of the proofs that missionaries eat Negroes is Aunt Jemima pancake flour. Then, too, missionaries have a religious custom, where they go out on a hill somewhere, face the setting sun, build a fire, and roast human fingers on a stick and eat them rolled up in bread.

In the resurrection of Jesus Christ the modern sceptic sees a myth. The Navajo, on the other hand may be terrified by the account. Fear of the dead, and of ghosts, is extremely acute to him and here are missionaries who make so much of death and a "ghost."

These are extreme examples, but all of the preaching of the gospel must pass through the screen of the hearer's language and experience. The distortions involved make it mandatory that the witness be presented in such a way that the least distortion possible will occur. This is why the emphasis on national preachers as against the foreign missionary. But if the foreign missionary has so indoctrinated the national preacher that he cannot do anything but repeat what he has heard in more or less the form he has heard it, we are not much farther ahead there.

Reactions in the Church

These are not new observations. Characteristically responsible missionaries, mission leaders, and many Christians have reacted to these observations with a variety of responses in which we can distinguish two poles.

One pole leans toward placing the responsibility for these disturbing facts on God, and on personal obedience to Him. It recognizes the Holy Spirit as the ultimate source of energy for the spread of the gospel and the growth of the church. It recognizes in individual obedience the possibility of an unbroken circuit along which the energy from God can flow. In the face of these disturbing observations its recourse is to self-examination, confession, prayer.

By experience, and by the authority of the Scriptures, we know the importance of this approach to the problem. Yet it is interesting also to see the cultural limitations within which God is expected to seek obedience. Few Caucasian American missionaries would respond in the affirmative to a question such as, "Is it possible that God would require a White missionary to marry into an African family?" The reaction of the French missionary would often be very different, much more open to the possibility. If there were a Brazilian missionary his response might well be, "Why not?"

The other pole leads toward the placing of responsibility on methods and techniques. This is, of course, a very characteristic American reaction. We enlist linguistics and anthropology to the missionary cause. We say a great deal about the importance of language learning precisely because we see that language has an enormous amount to do with understanding, and even impact. Our skills of writing and technology of printing are being enlisted to the cause of Christian literature. Our gadgets, radios, public address systems, cars, airplanes, are all being used.

Of course, most people stand along the line between the two poles, subscribing to both, and combining them in different amounts, as they look for a formula by which the church can witness to the world today, and even catch up with the population explosion.

The Church

But what of the church itself? This is the meeting ground of the Holy Spirit and society, the believer in a social order, the Body of Christ. It exists to bear glory to God, to witness to His redemptive grace in Jesus Christ. Its function is to grow.

Much is being said about the "indigenous church," in terms of a church which is "self-supporting, self-governing, and self-propagating," in missionary circles these days. Yet valuable as these "three selfs" are, this understanding of an indigenous church does not touch upon the problems we are here discussing.[2] The suburban church in the United States is self-supporting, self-governing, and self-propagating, but in terms of spiritual relevance it may still be hopelessly lacking in impact, dissipating enormous energy in a helter-skelter of activities, and operating within its own particular middle-class American distortion of the gospel (which, to be fair, is probably no more of a distortion, though a different distortion, from those of other peoples and classes, times and places).

There are other ways to look at churches than the "three selfs." There is the responsibility which they show to God and to the community (including the extension of the community throughout the world) and there is the relevance of their message, as well as its power. The "three selfs" have been an emphasis to counterbalance the colonialist mission policies of the past, but they are not enough. Although there is a very true sense in which the church must be indigenous (in a fuller sense of that word, not just the "three selfs"), must be rooted in the culture where it lives, there is also the equally important fact that it must *not* be indigenous. It must be *different* from the culture in which its roots grow, in it but not of it, transcending it, standing in contrast to it, struggling to grow to greater maturity under God's judgment of it. In this climate the church can turn to a consideration of how well it is witnessed to the needs of its generation, can turn in obedience to the power of the Holy Spirit. And out of this climate may come a witness which is pointed, cutting deeply to the issues which people feel, a

witness which has impact because it comes with freshness and relevance. People are stimulated to a more thoughtful understanding of the Scriptures, so that the distortions which remain are at least not casual ones resulting from half-listening. A new flood of energy, with a new focus is available in Spirit-empowered enthusiasm.

The Prophet

A church like this is not the fruit of the reports of study groups, evangelism weeks or revival meetings. It grows up in response to a prophetic voice in its generation and in its culture. It blossoms under the new impact of the reformers, or of Wesley, or on a smaller scale in the little-known leader of a small movement. Some people accept the message gladly. For the first time the Scriptures come alive, seem to have some point to them, some meaning to life. Their faith is exciting, their witness contagious. Others reject it. They see too many flaws, too many theological inconsistencies. It may be too shocking, too radical, not orthodox enough. But nobody who comes into serious contact with it can simply let it pass by with indifference. The impact is too great.

It is the orthodox who rejects the prophets with the most vigor. This has been the history of God's dealing with man. And, in turn, the prophets have protested the main stream of the church of their time. Included in the message of the Old Testament prophets was the condemnation of the religious life of the religious leaders of Israel.

Christ said he did not come to abolish the law, but to fulfill it. But to the religious leaders of the Jews it seemed as though he were flouting everything sacred, and it was not until later that the meaning of that greater "fulfillment" became evident, that Christ was really concerned with what people meant by what they did, by their motives, more than with the actual form of behavior. Christ in turn reserved his harshest words for the orthodox religious leaders: "Woe unto you, scribes and Pharisees, hypocrites!"

The Jerusalem church was the mother church, but some of the apostles began preaching to the Gentiles. This was shattering to the self-image of some of the Jerusalem Christians. Paul speaks up sharply against their Judaism.

Later on, in the reformers, we see men who wrestled with enormous theological changes related to the problems of their day, and to the rigid theology and ecclesiasticism which characterized the nearly monolithic church.

And in our own day, in certain parts of the world, we see a multitude of prophets, some of them deeply devoted to Christ, others ready to make a good thing out of the fact that the church is out of touch with the realities of the needs of people. South Africa with its hundreds of small movements and its "Black Christs"[3] is one notable example.

The church in every generation, and perhaps every culture, needs another prophet if it is to break out of the deadly routine to speak with impact to a new group of people. The prophet's gift goes beyond that of the evangelist precisely because it contains that element of iconoclasm, of radical thinking, of restating the gospel in some way which seems more relevant to the burning issues which people now feel, rather than to those of a previous generation or a different culture. The prophet is usually not a theologian in the academic sense, but in some area of the gospel in relation to life he has struggled with a new synthesis, a sharp reminder calling men back to God, and doing so with impact because it calls into question some of the easy assumptions derived from the past.

What happened in Jesus' day when new wine was poured into old wineskins? The energy involved was too great. They burst. Usually the older institutions cannot contain the new movement, although there are some important exceptions. Splinter movements are formed, and the older institutions stand uncomfortable in the face of this radicalism, which may be anything from a theology to an emotional expression. Sometimes these movements prove to have been singularly God's channel, the Holy Spirit's means of operation. Sometimes they ultimately have a profound effect on the institution from which they broke off.

I do not mean to imply that the Holy Spirit is not operating in His whole church. I firmly believe He is. But in the wake of a genuine Christian prophet He works with a spontaneity and electric effect—energy of impact which is usually not otherwise known. And this, it seems to me, comes only in the context of the shattering of some of our most cherished institutions, our assumptions, and in particular our pride and smug security, making the understanding of our faith relevant to our day once more.

Without this painful rending of our blasé sophistication the church will have little to say to the population explosion, except to offer it platitudes. The platitudes may be true, but nobody will listen. It will revert to being, in effect, a little anachronistic enclave in one part of the world or another, like the ancient Coptic church for centuries in the Middle East, ingrown, isolated, seeking little more than its own self-preservation in a hostile world.

[1]Eugene A. Nida, *Message and Mission,* New York: Harper and Bros., 1960, p. 150 ff. I am indebted to Nida for several of the ideas reflected in this paper.

[2]William A. Smalley, "Cultural Implications of the Indigenour Church," *Practical Anthropology,* 5 (March-April, 1958), p. 51-65.

[3]Bengt Sundkler, "Bantu Messian and White Christ," *Practical Anthropology,* 7 (July-Aug., 1960), pp. 170-176.

Economic Resources and Population *

WALLACE OGG and WALTER BUTCHER**

Economic resources include all the things that are useful in providing the material needs of people. Land, minerals, sources of power, capital goods, and human resources are included. Some physical resources of an area may be excluded from an inventory of economic resources if, with presently known technology, they can contribute nothing to the production of things that satisfy human wants. We use as synonyms the terms "useless" and "worthless" to describe such things as Sahara desert sand.

The value of economic resources is derived from their capacity to produce goods and services. It follows, therefore, that both the rate of production per unit of resource and the supply of the resource are important. The fact that industrial firms are willing to pay large amounts for patent rights is indicative of the value of a more efficient production process. In fact, it may be helpful to think of technical know-how as in itself a special type of man-made economic resource. Doing so brings an inventory of economic resources desirably closer to the item of real concern—productive capacity.

In the United States, productive capacity has grown so large and society so affluent that attention is now being turned to discovering useful ways to employ this productive capacity.[1] Other "western" nations are approaching the same position. But the situation of a majority of the world's peoples who live at or near subsistence levels provides a marked contrast. The possibilities for using additional productive capacity to alleviate suffering and provide for the "good life" (materially speaking) are indeed great.

For centuries the peoples in the subsistence economies have lived and died without changing their lot in life. Their resources have been in a kind of stable equilibrium. Population has been held in check by high death rates—due primarily to disease but also to famine.

Two important changes in these subsistence societies are putting pressure on the old productivity base. First, the spread of modern health measures (by the United Nations and various philanthropic groups) has drastically reduced the death rate, even in the most primitive societies. The resulting population boom requires increased productive capacity just to keep up the same subsistence level of living. Second, neither the poor nor the rich societies are any longer willing to accept poverty as inevitable.

The interrelations between population growth and economic growth are not yet fully known. In the history of the wealthy nations, population growth and economic growth occurred simultaneously in the early stages of development. Health measures that reduced death rates were adopted at the same time that technology and capital accumulation were bringing rapid growth to the economy. Later, however, with the development of an urban society and cultural adaptation to reduced death rates, birth rates tended to taper off and population growth slackened. An important factor in this decline in birth rates was the acceptance by society of the general philosophy of control of nature. With a rising educational level and spread of the idea of self-determination, people realized that it was no longer necessary to accept what nature gave. Nature could be controlled. So also, could the birth rate be adjusted to a lower level than the natural (biological) rate. Eventually, with the attainment of high per capita incomes, rapid population growth can be accepted without seriously conflicting with other goals. In the United States, we are experiencing this sort of development.

The particular concern here is with the relation between economic resources and population. It is conceivable that productive capacity in the subsistence societies might be increased just rapidly enough to prevent widespread starvation as populations grow. However, the strength of feeling behind the present day drive to raise incomes above subsistence levels is so great as to make it imperative that productive capacity be increased enough to provide higher per capita incomes.

Productive capacity may be increased in the following ways:

a. Discovery of unknown desposits of valuable natural resources.
b. Increasing the size or improving the capabilities of the labor force.
c. Construction of capital goods (tools, machines, structures).
d. Improving the efficiency of resource use.

Economists generally agree that the discovery of unknown resource deposits offers only limited possibilities for expanding productive capacity. Also, increasing the size of the work force implies an expanding population, which in turn means unchanged or lower per capita incomes unless productivity per worker is increased. Construction of capital goods and improving efficiency offer more hope.

W. W. Rostow, in his book *The Stages of Economic Growth,* has studied the historical pattern of growth by the present-day wealthy societies in an attempt to find guidelines for expanding productive capacity in the poor nations. Rostow concludes that there are two preconditions for transition into what he calls the take-off period.[2] The first is that "investment be increased and

*Presented before the 16th Annual Convention of the American Scientific Affiliation, Houghton, New York, August 22-25, 1961.

**Professor of Agricultural Economics, Iowa State University, and Agricultural Economist, Farm Economics Division, Economic Research Service, U. S. Department of Agriculture. The opinions expressed are those of the authors and do not necessarily reflect the viewpoint of their respective institutions.

that the hitherto unexploited backlog of innovations be brought to bear on society's land and other natural resources. . . ."[3] The second precondition involves a reorientation of goals and reorganization of society wherein modernization and change are accepted as desirable and power is transferred from traditionalists to a "new elite."[4]

Investment plays a key role in both of these preconditions. In the first, capital goods — tools, machines, roads, dams, etc.—are needed to modernize the economy. Innovations that employ improved technology can seldom be introduced without some capital investments. In the reorientation of society, education is of vital importance. This requires investment—in schools, teachers, and time spent in studying—rather than at work.

Investment in either working capital or human capital requires saving. For the society as a whole, current consumption must be held below current production. Only then is it possible to use some resources for building capital goods and improving the level of education. Eventually, the consumption given up will be returned with compound interest as investments raise productivity. But, in the earl ystages of growth, some "belt-tightening" is a necessity.

Rostow estimates that savings and net capital formation in the neighborhood of 10 per cent of net national product was needed to get economic growth started in the now wealthy nations. Most of those nations were experiencing population increases of from 1 to 1.5 per cent per year. By comparison, in many of today's emerging nations population is growing at a rate of more than 2 per cent per year. Outfitting these new additions to the population will require additional investment equal to 3 to 5 per cent of net national product.

As a result, if today's emerging nations do not reduce the rate at which their population is growing, they must be willing and able to save at a higher rate than we did during our own early economic growth or else they will not be able to achieve the minimum investments needed for entering into the economic take-off. Saving enough out of current consumption to make the needed investments involves considerable hardship in societies where productivity provides only for bare subsistence. Saving involves living for the future and living for the future may not be very enticing if, in the meantime, present hardships are made too extreme.

There is a serious possibility that maximum attainable levels of savings and investment may not be adequate for both the needs of net population increases and the requirements for beginning economic growth. Restow calls the additional savings required because of rapid population growth a "strain."[5] Others feel that rapid population growth may either be a strong deterrent to economic growth or make it altogether impossible.

This later view has been expressed by Frank W. Notestein, a demographer.[6] Notestein is quite concerned that rapid population expansion is taking place *before* the conditions for economic growth are met rather than at the same time as it did in our own history. He feels that the demands for current consumption and for basic investments to equip the additional population may sop up all potential savings and preclude the investments that are needed to move the economy into the process of economic growth and rising per capita incomes. Notestein feels that an aggressive program of birth control must be used to hold population in check until some measure of economic growth has been achieved. Then with rising incomes and increasing urbanization, birth rates may be expected to fall as they did in the wealthy nations.

Some serious questions are posed for Christians by the relationships between economic resources or productive capacity and population.

First is the Christian's attitude toward economic growth. As incomes rise, much physical discomfort can be eliminated and education, which goes along with economic growth, provides an opportunity for more complete understanding of spiritual concepts. But during the process of capital formation, economic growth has often been associated with human exploitation. Nor is it certain that if and when attained, affluence will not be accompanied by materialism and moral decadence rather than by spiritual growth. Perhaps, at the least, we should make efforts to help today's emerging nations avoid these pitfalls, making such help an integral part of our efforts to help them advance economically. Second, if economic growth is accepted by the Christian as a desirable goal, the question must be faced as to whether or not birth control should be used as a means to facilitate economic growth. It seems clear that for most under-developed countries, an early reduction in the rate of population growth could be a facilitating factor in economic growth and income improvement. Some scientists contend that a slowing of the population growth is, in fact, a necessity. But from an ethical viewpoint, Christians are still divided in their attitudes toward birth control.

[1]J. K. Galbraith, *The Affluent Society*. Houghton-Mifflin Co., 1958.

[2]W. W. Rostow, *The Stages of Economic Growth*. The University Press, Cambridge, Massachusetts, 1960.

[3]Rostow, *ibid.*, p. 22.

[4]Rostow, *ibid.*, p. 26.

[5]Rostow, *ibid.*, p. 141.

[6]Frank W. Notestein, "Population—The Long View." In Theo. W. Schultz, ed., *Food for the World*, Chicago University Press, 1945.

*The Christian's Response to the Population Explosion**

RICHARD FAGLEY**

This brief film reminded me of a comment I made to the United States Conference of the World Council of Churches three years ago when I pointed out that during their two-hour session there had been a net increase in the human race of 10,000. If I were speaking today, I'd have to say 11,000 because the rate has increased. Bishop Sherrill, who was in the chair, banged his gavel and said, "I knew we should have adjourned earlier."

The chairman referred to the involvement of scientists in the current demographic revolution, the population explosion. I think a good starting place would be to understand our involvement as churchmen in this present problem. It is the most neglected of the great world social problems primarily because the statesmen have seen it as a problem surrounded with religious controversy. They have stayed away from it because the only coordinated and articulated point of view, from a Christian perspective, has been that of the Roman Catholic Church. The two groups that have been most opposed to an approach toward population control of any sort have been Roman Catholic countries and communist countries, or those influenced by that point of view. They oppose for different reasons obviously.

Now the point I've been trying to make during the past five years is in stirring our churches, the churches of the ecumenical movement particularly, to give more serious attention to this neglected problem, is that our Protestant churches have contributed to this neglect by their failure to face up to the issues in this field. They have not given the serious attention to the doctrine of parenthood that it deserves; they have not looked at this emerging population problem with the serious attention it requires. This is what has underlain my work in writing the book and in various study groups, to help the churches of the ecumenical movement take a more responsible attitude toward this population problem.

I think we also need to see that there's a real contribution to the problem itself, not just to the neglect of it at the governmental levels. On the one hand there is the continuance of high birth rate. There had to be high birth rates in most of the underdeveloped world to offset the high death rate for untold generations. But the continuance of these high birth rates have a number of religious factors behind them. They may not be the most important, but they are factors. One is the opposition of the Roman Catholic ethos, of course, to any form of contraception. It's a double standard. For example in Malta, prophylactics are issued to single men in the navy but not to married men. And the double standard applies to much of the Latin world. In Islam the ethos there could be described as one of procreation unlimited. There are other factors coming into the picture, but the predominant, the traditional point of view is an extreme pro-fertility point of view. In Hinduism, sons are required to pray for the dead, to release the soul from hell. In Confucianism there is a saying that there are many things that are unfilial but the most unfilial thing is to have no sons. Now I think we need to understand that in most if not all—Buddhism may be a partial exception—of the great world religions there is a strong pro-fertility emphasis because all of them developed against the background of a world under-population. This has been the traditional situation. It's only been in modern times that the death rate has been brought under increasing control. And it's in this other area—because this is the dynamic, this is the revolutionary area of the equation—it's in regard to the death rate that religious missions, medical missions, particularly have made their impact. They have pioneered in public health programs, and thank God that they have. They have helped to prepare the way for this tremendous medical revolution of our times, the application of the new insecticides and antibiotics, particularly since World War II, to tropical diseases which have had tremendous and marvelous effects throughout the underdeveloped world with such paradoxical results. Of course the fault does not lie with these medical programs. The fault lies with the failure to match these programs with comparable effectiveness in the field of agriculture, of education, of family planning. But we are involved as churchmen through our mission work in this population explosion in tampering with the balance of nature—a balance that was ancient and tragic, in which too many mothers died before their time, too many children were snuffed out at an early age. This is all part of a contribution which Christian missions have made which is of tremendous significance and for which we must thank God. But we are also involved in the consequences. We cannot tamper with the balance of nature—a harsh and tragic balance—we cannot tamper with it responsibly in a one-sided way. We have to cope with all the consequences if we are to be fully responsible, and this has not been done.

Now the Roman Catholic Church has continually said, and said most recently in the recent encyclical of John the XXIII on the need to step up assistance to the poorer countries, that the answer, basically, is to be found in increasing food supplies, in economic development as a whole, that this is the way to solve

*Evening Address given before the 16th Annual Convention of the American Scientific Affiliation, Houghton, New York, August, 1961. (Taken from taped recording of the address)

**Dr. Fagley is Executive Secretary of the Commission of the Churches on International Affairs, a joint endeavor of the World Council of Churches and the International Missionary Council.

the population problem. Of course it would not follow. Roman Catholic articles themselves have pointed out that within 5,000 years there would be less than one meter of land. No,it's much less than that. In 600 years, the United Nations points out, there'll be one square meter of land per person at the present rate of increase. In 5,000 years the weight of humanity would be equivalent to the total weight of the earth. So that development by itself is no answer.

But the Roman Catholics have by and large given the impression that they are concerned about economic and social development. They quote frequently the saying of Chesterton that if you find there are more heads than there are hats, the thing to do is not to cut off some heads but to produce more hats. And they suggest that the Protestant church leaders, in talking about family planning, are concerned about chopping off heads rather than building more hats. Well, of course, this is not the case. I think perhaps our work in the field of economic and social development, the support given by Protestant Churches, has not been publicized as well as that by the Catholic Church, but there has been even more persistent attention, I would say, in some quarters, given to the whole strategy of economic and social development. There is the same basic concern throughout the Christian world for helping the poor societies of Asia, Africa and Latin America to improve their economic and social livelihood. Our churches have pioneered in these areas, too, through the missions. But we have not done enough, nor are the nations doing enough, and we are working as best we can to bring constructive influence to bear upon governments to step up their work in this field. This is most urgent. On the other hand, our Protestant Churches have not tried to create illusions about this struggle for better livelihood, the idea that there is some easy panacea to be found through economic and social development that will make unnecessary an effort to bring down the birth rate through the extension of voluntary family planning.

Let me give you a few examples of the efforts to avoid the whole question of fertility regulation. One of the ideas is the automatic aging of the population. Father Zimmerman and others have put this forward. There are more older people, it is argued, because of the medical revolution; there will be more people living past the bearing age, and consequently, as time goes on, there will be a larger and larger segment past the bearing age and therefore the birth rate will go down. Well, this is a very convenient theory. However, no serious scientist that I know of supports it, because the medical revolution, the international disease control, as Kingsley Davis calls it, applies to the whole range, the whole age scale, of the population. Of course it provides more older people, but also more people of middle age, more young parents and parents to be, and particularly more children and babies. The attack on infant mortality has been particularly striking in the current public health program. No, this is no way out.

Then there is the approach through migration. The International Catholic Migration Conference has been stressing this Msgr. Swanstrom, of that conference, speaks of a right to migrate, and so on. This has been a major emphasis among some of the Roman Catholic groups. Now migration has traditionally served a very important role as a safety valve for population pressures. During the Industrial Revolution in Europe some 70 million people came to the Americas, North and South, over a period of two centuries. And this eased population pressures there. But 70 million today is the increase of less than two years in the under-developed world. And where would they go? Well, a generation ago we might have thought of the Central African rain belt area, or the Amazon basin. But the people in these areas are themselves in the forefront of the population explosion. They're occupying their own living space as rapidly as it can be opened up. Even Jesuit scholars like Father Gibbons admit that migration offers no real help for problems of a continental character like that of India. It would take a thousand to two thousand goodly sized ships to transport one-fifth of one year's increase of India alone.

Well, then there is a space age variant of the migration approach. The idea of sending space ships to greener planets as a means of relieving population pressures on earth. Msgr. DeBlanc and Colin Clark have made references along this line. Unfortunately for this thesis, as one scholar at the University of California calculated, even with improved space ships, it might cost three million dollars per passenger and there would have to be absolute population control on this journey because it would take some 350 years to reach the nearest suitable star.

Then there's the approach of Josué deCastro, a Brazilian nutritionist, that has been widely quoted in many Catholic publications. He, on the basis of some old and rather inconclusive experiments with rats, concluded that there was some correlation between fecundity and the protein level. The more meat there was on the table the fewer babies in the nursery—this was his thesis. If you just could raise the protein intake of the poorer countries the population problem could be brought under control. Well, no serious scientist, that I know of, has argued that the reduction of birth rates in Western Europe or in the U. S. has been the result of reduction of fecundity, certainly not from eating more meat. Malthus himself found that our meat-eating ancestors in America in certain sections were doubling the population every 15 years, which even the present population explosion cannot top. No, the obvious fact is that in the more developed countries the people have been able to afford both meat on the table and family planning.

Then there is the approach of Colin Clark, advocating the application throughout the world of Dutch

methods of agriculture. He argues that if this were done the world could support ten times the present population. What it doesn't explain is how you apply or develop throughout the world the equable climate of the Netherlands, the long spring and summer days, the mild rainfall. As one of my evangelical friends in the Netherlands, who is an agriculture expert, points out, if the Netherlands were located on the equator it could not begin to produce what it produces in its present location.

There's no easy way out. The possibility of miracles in the production of food, I would be the last to deny. We don't know what can be developed through photosynthesis or other chemical processes, the application of yeast to carbohydrate wastes, or what have you. The development of the resources of the sea was suggested in the film. One of my friends who tried it says that he finds that plankton is quite nourishing even though it tastes somewhat like ground glass flavored with cod liver oil. There are real possibilities. But the point is that they all require time and money, and these are the commodities in shortest supply in the underdeveloped world. And we must remember that at present agriculture is not keeping pace with population growth. There's been a lot of nonsense spoken on this score. On the world level, yes. But the increases have been taking place in the developed countries—Canada, the United States and Australia—not in the underdeveloped world. In the underdeveloped world as a whole, per capita food production today is slightly less than it was before World War II. This is the actual state of affairs. Moreover, it's by no means adequate to achieve and maintain levels before World War II, projecting them into the future. Not at all. The whole revolution of rising expectations calls for better diets. There's not only deficiency in regard to calories but particularly in regard to the protective foods and any real response to the needs and claims of the underdeveloped world must provide more adequate diet as well as diet for more people. No, there is no tolerable way out unless there is a massive extension of voluntary family planning in the countries of the population explosion.

Of course there are some not-so-tolerable ways out. We had a session on some atomic problems in our local church that got rather heated and I passed up to the chairman a few lines of nonsense which helped to break the tension:

"Let's all keep collected, calm
As we meet beneath the steeple,
Let's not deprecate the bomb,
It may provide the cure for people."

There's no tolerable way out unless there is a massive increase in voluntary family planning. This I am convinced of.

Now, it does not mean that this of itself is any easy task. The non-Christian cultures pose a number of doctrinal obstacles to the increase of family planning. They are not insuperable, as far as I have been able to find out, but the social and cultural obstacles are very great. Large families are a mark of prestige. Children traditionally have been used in the fields in most of the peasant economies. Now, of course, which came first, the children or the using in the fields is a debatable point. But present agriculture in many of these countries relies on child labor. The larger the number of children the better your chances for old age security. It's the only form of old age security in some of these societies. There is the religious note of the need of children for some of the pious practices. There is the fatalistic approach, symbolized by the term "it is the will of God," which it applied to the whole realm of the mystery of procreation. All of these create very grave obstacles, problems in regard to the extension in an ignorant and illiterate society of any kind of well-motivated family planning. It's an enormous educational challenge. It's a religious challenge because motivation is the heart of the problem. And it's a technical problem. I understand you've had a presentation on that this afternoon. But as the Indian demographer, Chandrasekhar, has pointed out, believe it or not it is cheaper in the Indian economy for a peasant to have a baby than to afford western-type contraceptives. And this is one element in the problem that cannot be ignored.

Still, on the whole, I think it can be said, the countries that need family planning the most, countries like India and Pakistan, are more eager to be helped than the western countries are prepared to help them. We had some examples of this in the last two years. During the debate that developed in this country during the last months of the Eisenhower administration when the President was saying that family planning was no business of the government, that it was a matter for private organizations, three representatives of the Indian government expressed the hope that aid from the west would be given in this field. And during the recent weeks, under the Kennedy administration, when again the government shied away from this issue, the head of the government of Pakistan, at the National Press Club, expressed the hope that help would be given to his country in this field. The countries that need it most are more eager to be helped than the west is to help them. And this is where the churches come in. Because unless the Protestant Churches are prepared and able to build a counterweight to the Roman Catholic position, to free this issue from the present stalemate in which we find it, the future will be dark indeed as far as any aid from the west is concerned.

Some months ago I tried to make these points in a discussion of United States policy, in the Foreign Policy Association bulletin. A more candid examination of the demographic aspect of the development problem could be made. We don't need to try to escape from looking candidly at the issues. Secondly, the United States could do much more without raising directly the birth control issue, to help in the educational field and in the field of community organization which are the most costly

elements in any extension program for family planning. Thirdly, a larger amount of over all aid would enable the poorer countries to allocate more of their scarce resources to developing their own programs, which is probably the best way. I'm not myself one strongly advocating a direct bilateral program in the family planning field. It's too easily misinterpreted, coming from a wealthy country like the United States. And fourthly, there is a great need for intensified research in this field. Frederick Osborne, who used to head the Population Council, told me that, aside from what the drug companies may be devoting to research, the total amount being devoted to the development of better methods of fertility regulation is something like a half-million dollars a year. There are several million devoted, he said, to physiological studies which might have some bearing on some of these programs but the research in this particular field, he said, would be covered by about a half-million dollars a year.

Most of all, and this is where we come in as churchmen, I think, there is the need to develop throughout our churches a deeper and more biblically-rooted concept of responsible parenthood, a positive and conscientious position grounded in the scripture—not anti-Catholic but pro-Protestant, something which would be understood and shared by our pulpits and pews, something about which we would really care.

There is a problem in Connecticut, for example, where laws, put there originally by Protestants and now kept there by a Catholic minority, make it illegal, at least technically, either for doctors to advocate or prescribe contraceptives, or for husbands and wives to use them. This interferes with the rights of most Protestants, with part of their religious freedom because if they are to be responsible parents, which is part of their religious duty, they need to have the means for such a responsible course. It's particularly important because their freedom does not infringe the right of others not to use such means. But unless the Protestants of Connecticut care enough to make their position understood in the legislature, this condition will no doubt continue. If they want to have the law changed the Protestants have to stand up and be counted.

Now, what about this Christian position? I think to understand it we have to see it in some historical perspective. Christianity, like the other major religions, grew up in a time of under-population and this is one of the facts we need to see to understand the teachings of the Old Testament particularly. Here we find the increase and multiply verses of Genesis; we find the concept of the abundant society, a society of teeming flocks, and teeming families; and we find a great concern for what could be called social immortality, the preservation of the family name which justified both polygamy and the levirate marriage. There is a strong pro-fertility note found in the Old Testament. There's an abrupt change in the New Testament because the focus there is not on the natural continuation of life but on its supernatural transformation.

In fact, the main text, historically, in the New Testament in regard to parenthood is one in I Timothy 2:15 where it is said that a woman shall be saved by childbearing if she continues in faith and love and holiness with modesty. She not only needs to have the Christian virtues but to have children in order to be saved. Now this is the traditional interpretation which does not seem to me to fit in well with Paul's great doctrine of justification by faith. It's a difficult text. There's a possible different interpretation which some modern translators have given it. Weymouth and Moffat and Phillips and the footnote in the New English Bible present the idea that this may apply to safety in the physical sense rather than salvation in the spiritual sense. "A woman shall come safely through childbearing." This would fit in much more with the great doctrines of the church. But in any case it is a difficult text and certainly not one on which Christians today could build an adequate theology for parenthood. The eastern churches still cite this verse. I have not seen any modern Roman Catholic reference to it.

When the early church confronted the gnostic heresy which held that procreation was the imprisonment of souls in evil bodies, the early fathers had to turn to the Old Testament, the increase and multiply verses. They did not find in the New Testament the help they needed in order to affirm the basic goodness of procreation in the Christian view. But even here there was a certain ambivalence in their attitude because of the increasing preoccupation with celibacy. As Tertullian said, the increase and multiply injunctions had been replaced by the command to continence. This was a fairly prevalent attitude among the leaders of the early church. There were other factors which helped to shape the point of view of the early churches. There were charges in the pagan world of promiscuity among Christians, a rather odd charge coming from the world described by Paul in the first chapter of Romans. But, nevertheless, it was a misinterpretation, I'm convinced, of the old primitive church supper, agape, which was interpreted in an erotic sense by the pagans and by way of reaction the church fathers gave a more ascetic character to marriage than it probably would otherwise have had. Then there was the Graeco-Roman concept of marriage, a very utilitarian contract for the procreation of legitimate issues. This had an impact on the Christian understanding of the purpose of marriage. There was the influence of Greek philosophy, the idea that any sex passion, whether within marriage or outside, was the enemy of reason and essentially bad. And this has been one of the major influences in the Christian attitude historically. I do not think it is biblically sound and we are in the current period moving back to a biblically-centered understanding, I think, in this respect.

And finally, there was the misunderstanding of the physiological process. Many of the ancients felt that the male contribution to conception was seed in the full sense and therefore any non-procreative use was virtually equivalent to murder.

Now this attitude of the early church, these various strands that were brought together, still influence the Eastern Orthodox Church. They reflect this ethos of early Christianity particularly since none of the ecumenical councils spoke on the issue. The teachings of the hierarchy, which of course as you know is made up of the monastic order, are generally opposed to any non-procreative use of sex within marriage. Abstinence is the only method sanctioned by the Orthodox in their statements. But we also need to understand that the Eastern Church does not have the same legalistic concept of moral principles or religious or spiritual teaching as is true in the Western Church. Thus, there is no difficulty in the fact that an orthodox country like Greece has no ban on contraception. The Pan-Orthodox meeting which will be coming in September on the Island of Rhodes is going to wrestle with this problem. I do not have large expectations because basically it is easier for the Orthodox to modify practice than it is for them to clarify doctrine.

In the Western church the main influence, I think, was that of Augustine. His conversion took the form of a revolt against sexual indulgence. He made offspring the chief end and justification for marriage and condemned any non-procreative use of sex including the rhythm method. Incidentally, in his teaching I find the first clear reference in early Christian writings to what could be called contraception—he refers to evil appliances. Aquinas put Augustine in an Aristotelian mold. Procreation for him became the end or nature of marriage and the marital act, a theory which provided Catholicism with a means of re-inforcing the Augustinian attitude. Aquinas also gave more attention to the benefits of non-sexual aspects of marriage—a more positive and humane approach than Augustine had made.

Since the scholastic period, and I'm just giving you a brief outline, there has been a painful and slow process in the Catholic Church to modify the rigorous position of Augustine as preserved by Aquinas. These are some of the ways. The end of marriage has grown into a two-fold end. Not just procreation now but procreation and education, and it is only within the last two years that I've seen Catholic discussions recognizing that the quantity of procreation may injure the quality of education, that these two ends are not just one but one may limit the other, although they still speak of them as a single primary end.

Secondly, there is greater stress in modern Catholicism on mutual love, on mutual perfection. Pius XI in his encyclical of 1930, *Casti connubii,* said that from one point of view mutual perfection could be regarded as the primary reason for marriage. This so shocked what I've called the fertility cult among the Romans that in both Britain and the United States they censored the pope, they cut out this paragraph entirely in the early editions and some of these editions, I'm told, still circulate in the United States. But here is a growing edge of the Roman Catholic position, an effort to get away from the exclusive focus on procreation.

A very important development beginning in 1853 was the gradual sanction for periodic continence for serious reasons. I was rather amused in the recent encyclical over the reference by the pope to materialism on the part of those who advocate family planning, birth control, because the peculiar weakness of the Roman position is its materialism. It is the manner of the act that becomes important in the Roman teaching rather than the moral intent. No matter how valid the intent may be, the act must maintain the manner of procreation; there must be no interference with the procreative manner of the act. This is a really materialistic approach rather than an adequate one.

On the whole the new encyclical of Pope John sets back the effort on the part of Roman Catholic scholars to arrive at a doctrine of responsible parenthood within the framework of the Roman Church. He gives no reference to justification of family planning by any method in his encyclical and condemns almost without discrimination efforts to bring population pressures under control. I think this is a set-back—it may be a temporary one—to those Catholic scholars who are trying to arrive at a more constructive position. I think we Protestants need to look with sympathy on some of the struggles of the Roman Catholics in this area. They have to carry their history on their backs. Any new change has to be made to look as if it were consistent with what has taken place before. And the road forward here is very difficult. And they themselves know how many lay people are falling away because of their inability to accept the teaching of the church in this area. The birth rate in Italy, Spain and Portugal has fallen below that of the United States. Even in the United States a religious sampling in the census in 1957 indicated the Protestant birth rate was slightly higher than that of couples calling themselves Roman Catholics.

Well, what about Protestantism? The Reformation developed in a time of under-population in northwestern Europe. The Black Death losses had not been made good; the Hundred Years' War losses had not been made good. This had its influence on Luther and Calvin. The reformers had many new insights going back to the Biblical understanding of marriage. But they made no real examination of the doctrine of parenthood; they were not goaded to look at the teaching of the western church. And Puritanism helped to delay any realistic examination of the Biblical doctrine. For about 400 years there was no real difference in the approach of the Roman church and of Protestantism in this area. But in the 19th century our Protestant lay people began to make their own conscientious decisions

as methods of family planning became more available. The birth rate of northwest Europe, predominantly Protestant, went down from about 32 per thousand in the 1870's to around 19 by 1920—over a 50 year period.

Then came the depression and the population explosion. Then also came, and very important, new theological studies, new psychological insights, so that we had, beginning with the 1930 Lambeth Conference, an accelerating development of church pronouncements on this subject, the most important, perhaps, being the Lambeth declaration of 1958, the Mansfield Report and Ecumenical Study of 1959, and the National Council's pronouncement of 1961. Some 13 denominations during the past two years have taken a positive stand in support of responsible parenthood. Many other churches continue to leave this question to the individual conscience. I myself think this is inadequate guidance, that the churches have a responsibility to provide some principles to help the individual conscience in this field. But at least this Protestant consensus is broader than the churches in the conciliar movement. I've not been able to make much of a study outside but I know from what little I've seen that it is a swelling consensus across many different lines, at least at the level of church leadership. It is emergent if not complete.

The keystone of this new consensus is a new understanding of the centrality of the one-flesh union, the two become one in Genesis, in the teachings of Jesus and in the fifth chapter of Ephesians. This is now being taken seriously. We see it as a spiritual reality which includes the physical but transcends it. We understand more deeply the meaning of "what God hath joined together." God Himself is the author of genuine marriage. Marriage therefore is lifted into the realm of the spirit, the realm of freedom and responsibility. Man and wife are not bound to procreation by the laws of nature as are the lesser species. Their parenthood becomes, in the Christian view, a free, ethical decision. And this, I think we can say, has always been the case in essence, but the new knowledge of ovulation and of contraception enlarges, undergirds, and makes concrete this freedom.

Secondly, in the emerging Protestant consensus, marital companionship and parenthood are seen, not as subordinate one to the other, but independently valid. There is a return here to the Biblical understanding of the essential goodness of sex in marriage, a part of God's creation. It can be abused, it can be diverted to selfish or sensual ends, but it is in itself a good gift of God that can be used for the service of the one flesh union.

Thirdly, the main concept in regard to children is that of responsible parenthood—a recognition of the claims of the child to love and nurture, the needs of the mother-wife for the spacing of children to preserve her health and service to the family, and the need to take into account the social situation. There is validity in the increase and multiply verses of Genesis. The basic Christian attitude throughout is a positive one towards parenthood obviously. But increase and multiply and subdue the earth does not mean to overfill the earth and be subdued by the pressures of population. It does not mean procreation unlimited. The concern of the Church must be not just with the number of children, but must be primarily with the quality of family life, with this basic community of God's economy.

And finally, in regard to means, the Protestant consensus recognizes no hierarchy. It does set up certain criteria: mutual acceptability in Christian conscience, non-injurious effect on either spouse, and sufficient effectiveness to meet the conditions of the given couple. This applies to periodic continence or to various methods of contraception; there is no inherent moral distinction recognized here. It is not the manner but the moral purpose and the intent which constitutes the primary moral issue.

In regard to more extreme methods of fertility control the Protestant ethos is even more strongly condemned to abortion than that of the Roman Catholic, to judge from the legal provisions. Protestants are not agreed in regard to sterilization. The Mansfield report found no moral objection to the pill, the oral contraceptive, provided its effect was temporary and the side effects were not injurious to either partner. But in regard to long term sterilization, I think on the whole Protestant churchmen are mainly concerned with warning over such a drastic approach to the problem because responsible parenthood is seen as a day to day process of decision making.

Now, I've just indicated a few of the elements in this emerging consensus but they are some of the key points, I think. And what is basically needed throughout our churches at the level of the pulpit and of the pew is a positive and constructive development of this consensus, a personal sharing of it until it becomes firm and Biblically-grounded, not a negative approach but one that is positive and constructive. This can become truly a major contribution that we as churchmen can make to a more worthy and realistic approach to the whole question posed by the population problem.

Discussion

Chairman: I hope that you realize that when we had the film this automatically extended the speaker's time by that equivalent amount so that he is not overtime. (Call for questions)

Question: I would like to ask if within the Protestant ecumenical movement there is some feeling of tension that this emphasis on family planning birth control may block any efforts to get closer together ecumenically with the Roman Catholics?

Dr. Fagley: I think it's recognized that many of the problems in the field of human rights are real issues between these branches of Christendom. The whole approach as I've understood it is not to try to push these things under a rug or something like that but to bring them out on the table and look at them. During the recent year or two the discussions that have taken place informally have dealt with human rights and with the whole question of the population-parenthood problem. No, I think that it's precisely in these areas where there are differences that there must be a candid approach if there is to be any kind of improvement of relationships. And the fact that there have been possible private discussions, I think, is one sign of some progress. I myself would not be interested in any approach that blinked at these issues on which Protestants have very strong differences from Roman Catholics.

Question: Dr. Fagley, it might be inferred from some of your remarks that some of the southern European countries, you mentioned Spain, Portugal and Italy, might in fact be using methods of birth control forbidden by the church. Now, are contraceptive materials actually available in these countries illegally or by law?

Dr. Fagley: I did refer to a kind of double standard. It's true that most materials are not available by law. On the other hand, certain contraceptives are available as prophylactics for the prevention of disease. And it's under that guise that it's possible to procure them legally. Many others are available illegally. There was an article in a recent issue of *Time* about the situation in France. There is now a more or less open revolt on the part of a number of medical groups against the old 1920 law which forbade the sale of any such materials. And I think on the whole this is acknowledged. There is also an increased practice of periodic continence. I think this is also the case and would be one of the factors. But by and large both legal and illegal materials have been secured.

Question: Dr. Fagley, you mentioned that in addition to the Catholics the communists are not in favor of controlling the population or the birth rate. Is this a weapon that they're using in order to achieve dominance by the mere numbers after a period of time? I was told that communist parents don't have any incentive to have children because they can't accumulate property to pass on to their children. Is this a fact?

Dr. Fagley: I think communism has not stopped the love for children on the part of human beings and in fact I suspect in some cases, say in China, the having of children has been one of the few ways by which individuals could assert their independence of the regime because during this period the birth rates are quite high there and they've continued high despite efforts by the authorities to reduce the birth rate. The situation in the communist world is complex. Communist teaching and doctrine says that there is no population problem under socialism or communism but that it is wholly a capitalist problem. Nevertheless, as one French publication pointed out, there is a very sizeable item in the Soviet budget for the production of contraceptives. We cannot conclude that they are using population increase as a weapon. Actually, among modern industrial states a large and growing population may be more of a handicap than a source of power. It could be used as an argument for the need for expansion but military power is becoming concentrated more and more in the hands of a few people and a large number of toddlers is not a military asset in contemporary warfare. Tito claims, so I've heard, that one reason for the shift was that the Chinese communists believe that atomic war is inevitable and there's no point in limiting the population particularly since with their large population they'll have more to survive after atomic war. I don't know what the answer is but I do know it's no simple answer from studying some of the material.

Question: We have seen the film about the population explosion and you have made reference to that. Now if there is going to be anything really efficient done that would stem this so-called explosion would it not have to be on the level of social planning by the governments involved, government laws, etc.? And furthermore, you mentioned that the communist bloc is generally not amenable to this type of thing and yet they control half of the world's population, and further the Roman Catholics, up to now are not in favor of this and as you say they have to reinterpret their history in order to bring themselves into line with any such thing. What practical possibility is there then of stemming this population explosion?

Dr. Fagley: It's a fair question for which I have no clear answer. I do not maintain that there is any easy combination or any combination that adds up to a sure and tolerable way out. I'm sure there's no way out that does not include a large scale increase in family planning, no tolerable way out. But I'm not convinced that if we do what seems to be necessary that the result will add up to a new and acceptable balance. But that's the challenge. I think that in countries like India and Pakistan, Indonesia, Egypt and the like, the immediate danger is that they will be swamped by their own population pressures. And they are eager to help bring about a new balance, primarily by voluntary methods. Sterilization is growing somewhat in India but it still is a small scale thing. There is a chance to do this by voluntary methods. It's more costly, but it's more congruent with human dignity, with the values that I as a Christian cherish, and it's the method that I personally think that we ought to support. It may be that as countries become more desperate they will use tax provisions to discourage population growth, they will give larger inducements for sterilization operations and the like. This is all possible. But the big threat is to these countries that are trying to develop within the frame-

work of freedom. We can't do much about the communist world. I think for their own survival they themselves will increasingly have to take measures but I certainly think for the free society in the poorer continents this is a life and death matter and the quicker the countries of the west begin to help them in realistic ways the better the chance that some way out will be found before it's too late. I don't have any completely optimistic conclusion at all.

Question: Just taking this last point a little further, what do you feel the church should propose to really get a worldwide program going? Should it try and put pressure on governments like the government of this country and of other countries that perhaps could afford to help and try and change the thinking of those governments so that they do, or what do you suggest?

Dr. Fagley: I think the fundamental task is to build a much stronger and locally-rooted Protestant consensus before we try to engage in a lot of political action. I think the level at which action is most needed is for pastors and lay groups to sit down and look at this issue and to study it and pray over it and to find new and deeper convictions themselves. Without this we can't do much. Too many Protestants do not give it the conscientious attention that it needs. And that's why, politically, Protestantism doesn't have too much effect as of now in this issue. There are a number of things which I think we need to advocate but we will do it effectively only as the more important foundations are laid right. I mentioned a few. I think we need to try to get more serious attention for the population problem itself, to urge our representatives in the congress to give more attention to this issue. We need to stress the need for greater educational help and help in the field of community organization. We could well support more overall aid with the idea of helping these countries to develop their own programs in this area. We need more research and I think that this is a legitimate use for public health funds which are being spent for other branches of public health. It should not be limited just to methods of contraception; making periodic continence more reliable which is of concern to Catholics also could also be one of the objectives. These are some of the areas in which I think we can act. I think our mission boards ought to give more attention to ways in which their hospitals and dispensaries can be of help. The Christian Medical Council for Overseas Work was telling me that most of the mission hospitals have no provision in their budgets for help in this area. When they developed, this was not on the conscience and consciousness of the people setting up the programs. Doctors are feeling the pressures locally but they do not have much to work with in this field. I think we ought to look more realistically at this area. I'm glad to see that some foundations, particularly the Ford Foundation, is moving into this area in a more significant way. I think our Christian medical work certainly ought to too. These are a few of the things that occur to me.

Question: This is by way of a comment. I might point out that some of the western governments at least aren't particularly concerned about this problem apparently, based on their approach on the tax question. (Rest of comment lost from tape)

Dr. Fagley: All right, and in North Africa, for quite awhile a number of the Arab fathers made quite a living out of procreation. The family allowances, which were designed to build up the population of France, actually provided some of the Arab fathers with a fairly good living, I understand. Now it is true, our tax structure in this country has implications for population policy. They've not been looked at from that point of view; I think it's all unconscious. Here you might say that in social security legislation, survival benefits, the maximum are for two children, there's no more for a third. You get the same in your federal income tax, that is, the same exemption for each additional child. In your local school taxes, the number of children is not taken into account, but it is based on your property. So there are differing policies, you might say, to be deduced from the different tax structures, and I think that as time goes on these will need to be looked at. This is not the most important area, but it's one that has been largely ignored.

Chairman: Because of the good response with questions I think it perhaps wisest that we not attempt to have any small discussion groups. I myself have appreciated this presentation very much. I think it's clear that Dr. Fagley has read widely, he has a greater command of the materials, of the historical developments, than any one of us, and maybe even a combination of us, might have. Also I have appreciated the emphases upon the positive aspects of resposible parenthood. I think we all sense even for the A. S. A. that as we emphasize a positive ministry it is much more effective than simply being against something.

Biology

IRVING W. KNOBLOCH, Ph. D.

The Acceleration of Progress in the Sciences

Looking back into history, one cannot help being amazed at the phenomenon of acceleration. Whether one believes in evolution or creation, there was one human being at some past instant of time. Then there were two, three, four and so on until at the present time we have billions of human beings. It is said that the rate of increase is geometrical or approximately that. At any rate, we have a population problem more deadly than any other immediate one. It is not our purpose to deal with this problem here but rather to use it as an example of rapid acceleration. The spreading out of human populations over the earth from their center of origin also speeded up as better methods of transportation were invented. Undoubtedly there are areas where little if any speed-up can be discerned but these are becoming the exception rather than the rule.

In regard to science, studies of this speed-up have been made and it is apparent to most people that the day of the all-around naturalist is over, sad though this may be. Even within a specific discipline, such as genetics, no one person can be conversant with all of the literature in that field. This is an indication of rapid acceleration. We cannot attempt to document this phenomenon in science from its early beginnings but it might be instructive to list some of the more spectacular developments that have occurred in science in only the last 60-65 years. There have been many spectacular breakthroughs and we are probably on the near verge of solving some of the problems that have plagued us for centuries. Some of these problems lie in the field of medicine, or in genetics, or in evolution or in population control.

Biology textbooks of the 1900's did not mention many of these advances because they were not even dreamed of. Even modern textbooks are several years behind the times and the instructor must supplement the textbooks from his reading. It will be instructive to list some of these exciting advances.

The sciences of genetics, enzymology and plant virology were unknown to many mature scientists in their student days. This is likewise true of hormones and vitamins. About 1927, Muller and Stadler made the first use of x-rays to produce mutations, and this work has stimulated an untold number of researches. In the same year, Karpechencho made an artificial plant cross of the radish and cabbage thus confirming what some had suspected for a long time, namely, that hybridization was important in speciation. Since then many thousands of crosses have been made. Omitting dates, we shall simply list some of the great advances made in fairly recent years; Hans Spemann's work on animal embryo organizers, Arthur Kornberg's work on the duplication of DNA molecules by bacteria, Fritz Lipmann's discovery of the functions of ATP in metabolism, Wendell Stanley and his work on the life history of the tobacco mosaic virus (an epoch-making discovery), the discovery of antibodies and plant hormones, the work of Fraenkel-Conrat in showing that the hereditary part of the tobacco mosaic virus was in its nucleic acid core and not in the coat of the virus particle, the development by many people of the miraculous antibiotics, the discovery of chromosomes and sex in bacteria, the connection between genes, mutation and metabolism in the bread mold (largely the work of Beadle and Tatum), the discovery of insulin and so forth.

It must be admitted that these are important discoveries and there has been no such rapid growth of knowledg in any previous period of history. One reason is that as the population increased, so did the proportion of scientists. We have a lot more of them working and in almost every conceivable area. There are more working in applied science than there are in pure science. A quick glance at the above list, plus a slight amount of deduction, should convince most that the important researches that have shaken the foundations of the biological world and that have greatly affected man's welfare, were at the beginning and in some cases still are, splendid examples of pure research. Greatly aiding in the acceleration of science has been the development of all sorts of machines for analysis, all designed to augment the human senses, rule out the subjective element and save time.

Some church groups are outspoken enemies of science and reject many of its findings. Many individual Christians are antagonistic toward science. Both science and the Christian religion are dedicated toward the truth. The scientist searches for it by reproducible experiment. If we define a verifiable fact as the truth, then science has discovered many truths such as that gymnosperm sieve tubes do not have companion cells. Science also erects theories on the basis of its facts. These, it must be admitted, are in a lower realm of probability than facts, but they are useful. Christians do not need to fear the facts of science. Both they and the scientists need only to hold the theories as tentative. It must not be forgotten that science has verified the Bible on many occasions (especially in archeological research). It must be remembered that science has not disproven the existence of God, the possibility of the creation of life or the theory of salvation. Finally, let us not worry too much about acceleration in science. It is inevitable and inexorable. Our attitude, it seems to me, should be one of cooperation and patience.

Sociology

R. Heddendorf, M.A.

Sociology: A Defense
Part I

The history of science has proven that a branch of learning, in order to have an impact on society, must not be introverted. It must deal with the problems which are relevant to that society at that time. Since the field of sociology deals most directly with the subject matter of society, it would be expected that conflict would early develop concerning its interpretation of society. As a result, people in the field have spent much time defending their views before the various critics.[1] Perhaps in the past, the prosecution has had a stronger case than the defense, but the question before us is whether a defense is now valid, particularly for the Christian.

The Christian View

The most common Christian view of sociology, repeated in many contexts over the last 50 years or so is well summed up in a Christian publication of several years ago.[2] First, there is complete opposition between Christianity and sociology. "These two approaches (Christianity and sociology) seem to be as opposite as day and night and as mutually exclusive of each other."[3] The author later states that the sociologist "being a naturalist and materialist in his philosophy has no place in his thinking for a divinely inspired, supernatural Bible."[4] Secondly, there is a definite need on the part of the Christian to deal with the problems of society. "(The minister) must have an intimate, personal knowledge . . . of the colossal human struggles in which all human society is writhing."[5] Later, the statement is made that "one of the strongest courses in all schools of Christian training should be that of Christian Sociology."[6] Thirdly, there is the implication that sociology cannot develop a view of society which is acceptable to the Christian. Instead the Christian must mold the field in terms of his own views.

There are two significant errors which may be assigned to Christians and most laymen on these points. First, there is the lack of awareness of the present disfavor in which such personal and philosophical views are held by most sociologists. Secondly, there is not the understanding that a scientific study of society would indicate, in many circumstances, that a Christian approach to social problems may be more accurate than a secular.

Early Sociological Views

If youth may be characterized as a period in which there is complete confidence in dealing with one's surroundings, then it is the youthfulness of sociology which most Christians would remember. Fortunately, many of the growing pains of sociology have been endured and the social world is observed with a more mature eye.

The period of transition could be best located at the turn of the century. Up to this point, the pioneers had developed the original views which have since been discarded, revised, or supplanted. Yet, the impact which has been made by these principles has continued into the twentieth century. It would seem that these early views stressing evolution, positivism, naturalism, and utilitarianism would be those with which the Christian would have the greatest argument. The superstructure rising upon these early foundations, however, tends to be taking a decidedly different shape.

It should be made clear at this point that this defense is not an attempt to indicate that such early concepts have been entirely removed from the field. The key to our thinking is that these principles no longer exist in their original forms. The changes which have been made and the new developments which have appeared have tended to neutralize the earlier views. In addition, the promise of the future now seems to be that the Christian will find concepts with which he will be able to deal more comfortably. This is not to say that he will be able to place his sociological views congruently upon his spirtual. Such a privilege has not even been made available to the natural scientist. It does imply, however, that he will be able to find enough material with which to develop limited theories based upon Christian principles.

Evolution

It would seem that the concept of evolution in sociology is even less alive than it is in biology. Most of the early attacks, however, were not made by sociologists, but by anthropologists. In their field studies, it became quite apparent that not all societies were predestined to progress, a view sometimes held by Herbert Spencer. It was Spencer, more than any other nineteenth-century sociologist, who espoused the principles of the evolution of society as a consequence of applying the prevailing scientific view to all theoretical science.

What has remained of evolutionary views, however, has been significant, though not always easy to trace back to the original ancestor. First, Spencer conceived of the organic analogy, in which society was identified with a biological organism. Later, the idea of the organic nature of society was developed by Toennies and Durkheim until it found a new form in present day functional theory. Secondly, Spencer stressed the principle that homogeneous forms developed into heterogeneous. Although such a view is still held today, there is a more clear understanding of the limits imposed

upon the possibility of infinite variation of forms. This principle will be considered in more length in the second part.

Positivism

The earliest statement of the use of a positivistic approach to the study of society was made by August Comte, usually referred to as the "father of sociology." In addition to establishing the basic scientific procedure to be used in studying social phenomena, Comte also described the data with which the new science was to deal and also pleaded for an application of findings to the betterment of society.

The Christian would hardly be justified in attacking the principle of a scientific study of society. Without it, there could only be random philosophizing which has developed some of the views with which the Christian most disagrees. He would perhaps be on more solid ground in opposing the latter two principles. Even contemporary sociologists, however, would not agree with Comte that all subject matter to be observed should be reduced to the "social fact," since they have stressed with greater insistence, the need to include the psychological essence of man. For the Christian, of course, there is also the need to analyze the spiritual, for without it, it must be shown that there is no accurate description of social phenomena.

The weakness inherent in an attempt to use the findings of sociology for the betterment of society is obvious to the sociologist who delegates such responsibility to the "social engineer," whoever he might be. For the Christian, there is only the need to call to mind the fallacy of the Social Gospel to realize that such a view may lead to error.

Naturalism

Inherent in all of the early views of society was the belief that man could understand the laws of nature as they applied to society and then control them. It must be remembered that sociology was born at a time when such beliefs were prevalent.[7] Although sociologists still do not conceive of supernatural forces as causative factors in society, they have learned that man does not have complete control of the social environment. In addition, research has shown that a completely naturalistic approach to society is not possible. Since some people are motivated by superempirical ends, their needs must be considered and fitted into a general theory.

In their attempt to be objective, early formulators ruled out the possibility that ethical considerations were valid in studying social phenomena. Although there are some who would still be governed by such a limitation, the tendency is to evaluate the moral implications of findings. This is not to say that a scientific approach is slanted by value judgments or that philosophizing is the basis for making theoretical statements. The implication is that amorality is no longer a dominant criteria for research.

Utilitarianism

Much of the utilitarian expression found outlets in what is referred to as the social action theory.[8] Though still one of the dominant orientations in contemporary theory, it has had to retreat from its original position. No longer is the individual conceived of as the "economic man" who is entirely rational in his quest for an objective goal. Parsons himself has retreated from some of his earlier statements and leaves more room for the influence of sentiments and emotion in action.[9]

The earliest cracks in the utilitarian system came about 30 years ago in industrial studies which proved that people were more highly motivated in their action by the emotional frame of reference than by the rational. Hence, man is no longer conceived of as a rational actor who acts within a rigid means-ends system. The principle of economic exchange as a basis for social behavior still is used as a conceptual tool in the analysis of social behavior.[10] It is, however, no longer conceived of as a closed rational system. Rather, the individuals in interaction are viewed as being motivated to obtain whatever is of most value to them. There is much provision for the Christian who is motivated by spiritual values in such a system.

Hence, the recurring gaps in current sociological theory seem to offer the most hope for an understanding of society which is more favorable to the Christian view. The emphasis in the next article will be on some of these gaps and the newer theoretical emphasis.

[1]For a recent and particularly lucid defense see "Now the Case *for* Sociology" by Robert Merton, *The New York Times Magazine,* July 16, 1961.

[2]"Theology and Sociology" by Carl M. Sweazey, *Bulletin: Los Angeles Baptist Theological Seminary,* Vol. XXX, No. 1, January, 1957.

[3]*ibid.* [4]*ibid.* [5]*ibid.* [6]*ibid.*

[7]Comte died in 1857, the *Origin of Species* was published in 1859, and *The Communist Manifesto* in 1848.

[8]The most complete statement of the utilitarian system as used by sociologists may be found in Parsons, *The Structure of Social Action,* The Free Press, 1949.

[9]The classic example of such studies is Roethlisberger and Dickson, *Management and the Worker,* Harvard University Press, 1949.

[10]Especially see Homans, *Social Behavior: Its Elementary Forms,* Harcourt-Brace, 1961. The stress here is that the value of an action may not be measured in terms of its usefulness but in terms of its value for the individual.

Philosophy

Robert D. Knudsen, Ph.D.

A Question of World View

Words, like old clothes, are in the habit of being thrown around. In the process both are likely to be pulled out of shape. Any word in ordinary usage will acquire certain emotional overtones, which lend it a meaning over and above its strict dictionary definition. Philosophical words also attain a wide variety of meanings, especially when they have come into vogue. We can think, for instance, of the words, "objective" and "existential." Closer to home, we as evangelical Christians can turn the spotlight of criticism on our own much used word, "spiritual."

The occasion for writing on this word, "spiritual," is a statement by the former president of the General Electric Company, Ralph J. Cordiner, "Business is not only the source of those material goods and physical services that can make lives richer and happier, but an instrument also of a rising level of rewarding spiritual living. A housewife freed by a machine from the drudgery of hand washing of dishes or laundry can reach out for more humanly constructive things to do for others and for greater spiritual satisfaction from her own life."

Mr. Cordiner uses the word "spiritual" in an accepted way. There is nothing unusual about his usage. The fact is, however, that the bulk of Christians today fail to distinguish this usage from what I believe is a different one in the Christian faith. This is reason for some concern.

The common usage distinguishes spirit and matter. Things are catalogued vaguely as being spiritual or material, and often the spiritual is equated with the eternal and the material is equated with the temporal. I have very often heard Christians commend thinkers because they paid attention to spiritual, non-tangible "values" instead of being interested only in "material things." By material things they mean physical things, such as houses, furniture, cars—things that money can buy.

Obviously there is a distinction between the spiritual and the material, the tangible and the intangible. There is reason to believe, however, that we should draw the line of distinction more carefully than we have in the past.

Let us take the example of money, since we have said that it will buy the tangible things. Money in the way we ordinarily think of it is physical. It is the quite necessary, cold, hard cash that we carry in our wallets and in our purses. This money is certainly hard physically; but a little thought convinces us that to have purchasing power money must be "hard" not only physically but economically.

Recently I heard the story about a man who inherited a fortune of thousands of dollars. Since he was living in Germany at the time, he exchanged his dollars for German marks. Then came the horrible postwar inflation. His fortune of thousands was suddenly turned into a paltry few dollars' worth. The money was tangibly the same; but economically it had become almost worthless.

Economic worth is something quite different and more intangible than physical bills and coins. To express this fact it is often said that the value of money is not its face value but the amount of goods and services it will buy. Be that as it may, it is clear that money is first of all an economic thing, dependent for its value as money on economic relations. It is also clear that these economic relations are intangible in nature, not being material in the sense that we have been using the word.

Another line of thought leads us also into complications. If we say hyperbolically with the Scriptures that the love of money is the root of all evil, we cannot refer to the mere possession of physical pieces of money. This statement does not refer to money as such but to the love of money. The latter includes the accompanying non-tangible factors of inordinate desire for luxury, lust for power, etc. These are things that often accompany the possession of economic power.

A question now arises. How can we so blithely use the contrast of spiritual and material, thinking of the spiritual as good and of the material as indifferent or bad, when economic power cannot be equated with material things and when the sin of one who loves money and material things is at bottom not tangible at all.

Love for money simply as metal might be satisfied in the accumulation of scrap. Love for money because of the beauty of the inscriptions or out of historical interest might be the start of a profitable hobby. The evil occasioned by money does not arise because it is physical and material. Heavy coins may wear holes in our pockets, but pockets are easily mended. The sinful love of money, an intangible, is not easily rooted out.

My purpose is to show that the thing that we are most ready to call material is valuable only because of certain non-material relations and that the source of sin with respect to money (as all sin) is also of a non-material, intangible nature. The purpose of this writing will be accomplished if we become more careful in our use of the words "material" and "spiritual."

If we look at the Scriptures, we discover that the word "spiritual" does not refer simply to non-material, intangible things. It means primarily that which is of the Spirit, that which is motivated by the Spirit. In this sense, spiritual things are always good. Material things

in themselves, however, are neither good nor bad; their moral value depends on the relationships they sustain to man's moral life. Furthermore, the source and the dynamic of sin is non-tangible, and in this sense "spiritual." Hatred of God is intangible; is it then "spiritual"?

Freeing the housewife from household chores is a fine thing; but that does not automatically free her for spiritual pursuits in the biblical sense. According to biblical standards, she can be spiritual even while she is washing dishes and scrubbing clothes without modern conveniences, if she does so cheerfully and unto God. She can be much more spiritual than the housewife who is free from drudgery but who then uses her free time in frivolous pursuits. It is to be hoped that housewives will retain their automatic dishwashers and combination washers and dryers; but being free from drudgery is not the equivalent of being free for spiritual occupations. Ultimately that freedom is only given by the Spirit, as he converts the heart.

Westminster Theological Seminary
February 7, 1962

Psychology

Stanley E. Lindquist, Ph.D.

Mental Hospital at the Castle of La Verriere, France

One of the most interesting attempts at building a modern mental hospital, using the latest concepts in treatment and environment is being made at Le Mesnil St. Dennis, near Paris, in an old castle.

Having made arrangements to visit with Dr. Swadon, the medical director, we arrived about 2:30 on Saturday afternoon. The French have very different ways of doing things. This is especially noticeable on weekends. Saturday is just another day to them. Schools meet Monday to Wednesday, are off on Thursday, then go on Friday and Saturday. Most stores close from 12:00 to 2:00 or 3:00, and sometimes 4:00 p. m., and stay open until 8:00 or 9:00 at night. Therefore, the strange time for an appointment with the director at 3:00 p. m. Saturday was not unusual.

The first impression one gets in this hospital is that of peace. The setting is large—200 hectares or about 500 acres. Landscaped gardens of a formal type take up most of the space in front of the castle. Pools, greenhouses, basketball courts, etc. were in evidence alongside the garden.

To the left as you go into the castle, is a large forest, criss-crossed with paths. Again the predominant impression is peace and quiet. As we were early, we looked over the grounds thoroughly. The castle and inner court itself is surrounded by a moat.

Dr. Swadon was in his office as we returned from our stroll. He had just arrived from Paris where he was opening a day center for mentally ill patients who stay at home and spend 8 hours a day in the clinic, undergoing treatment.

It took some time before the picture of this unusual hospital became clear. It is established by the *Mutuelle Generale de l'Education Nationale*—which according to our best understanding was like a teachers and professors trade union, that provided hospital care for its members. This was but one unit of a rather large group of hospitals. Some funds likewise come from the government. However, control of this particular hospital is pretty much in the hands of Dr. Swadon.

Actually the hospital is only four years old, and has 90 patients. The modern plant is in process of being built. Plans have been completed and some of the new buildings are nearly finished. The castle itself will not be a part of the hospital proper, but will be used as a school, and as guest rooms, when the plant is completed. The total number of beds will be 300.

This hospital is a model one, which was planned with the World Health Organization. There are to be three main "villages" where the patients will live. The first one is rather compact, four buildings making a square. Within this square are smaller squares. The idea here is that when the severely disturbed patient comes in, he first finds security within his room. As he improves, he can venture into a larger sphere, but with the limits still carefully defined. As he gains security here, his horizon expands to a larger area composed of several buildings, but still confined, and clearly structured.

His next vista is the rehabilitation shop which is still part of his "square." Here he meets patients from other "villages," and as he again gains security, he is led toward the social center, a part of a much larger social and environmental area.

When the patient's growth is such as to merit it, he is transferred to another "village" which has less structure. As a final stop, he goes to the third village where there is an attempt to duplicate the crowded atmosphere of the actual village or town where he was from. The small community nearby is drawn into the picture through the sports area, and the recreation units. He thus begins to feel a part of the community before leaving the hospital. A special school will be constructed nearby where the mentally ill, and by now nearly cured, teachers will spend time observing and gradually participating. Thus the break from the hospital to community and the job will be very gradual.

In connection with the above is the hospital's "hospital." Severely disturbed patients may start out here. Any illness or emergency operations will be taken care of here as well. Any stay in this part will be only temporary.

In this "hospital," treatment of various types will be utilized. Hydrotherapy, physiotherapy, chemotherapy and in some cases psycho-surgery may be used. In most cases patients will come for treatment but will remain in their own rooms for the greater part of the time. The rooms are built in such a manner that they can be used in a flexible manner with the maximum use of personnel involved. Two, three or four rooms may be joined by an open corridor where one nurse may have ready access and observation.

As has no doubt already been surmised, the hospital operates on an "open door" principle. There are no locked doors, and patients are free to come and go at will. It is hoped that the security of the hospital is of greater attraction than the surrounding woods or open fields! The primary type of therapy used is in small groups, although individual therapy is also utilized.

The hospital is not a typical French one, but it is one that is fascinating to see. If anyone of you comes near at any time, be sure to include it in your itinerary.

BOOK REVIEW

The Natural Sciences and the Christian Message, by Aldert van der Ziel, Minneapolis: T. S. Denison & Co., 1960.

Reviewed by I. W. Knobloch

This book of 259 pages is by a Professor of Electrical Engineering and a member of the A. S. A. There are 16 chapters of which five are general in nature and the rest deal with physics and astronomy. Dr. van der Ziel's approach is quite novel. His theory is that the natural sciences and the Christian Message are neither in harmony nor in conflict. Miracles and the story of creation are outside the scope of science and should be accepted on faith. The difficulties that science poses for the Christian are due in part to misunderstandings of theology and of science. On page 38 he gives his definition of an hypothesis which is—*it is one of the assumptions, not directly based upon experimental evidence.* My understanding of the common use of this term is that a hypothesis is a tentative guess and always has some facts back of it, otherwise it could not be made. An assumption is an even greater extrapolation than an hypothesis. Such an argument could go on endlessly and is probably fruitless. Another word upon which biologists and physicists evidently split is the word "analogy" as found on page 97. Later the author compares the mental habits of a scientist and a believer. The former usually "sits on the fence" and delays making a decision whereas the Christian must make a decision for Christ, and on faith.

Since the book is largely devoted to physics, it will give some of us a chance to brush up on this branch of learning. We may not all agree with his approach but the author has certainly given us something to think about in this area.

NEW MEMBERS

Daniel Andersen, 641 Prince Street S. E., Grand Rapids, Michigan, is an instructor at Grand Rapids Junior College. He holds the B. S. degree in Electrical Engineering with a minor in Mathematics from Union College, and the M. A. degree in Mathematics Teaching from the Teachers College, Columbia, University.

Barrett D. Anderson, 2222 Carmelita Drive, San Carlos, California, an orthodontist, attended Wheaton College two years (pre-dental), going from there to Northwestern University where he received the D.D.S. degree in 1952, and the M.S. degree in Orthodontics in 1958. **Edmund G. Anderson** is an assistant professor in Seton Hall College of Medicine, Jersey City, New Jersey. He holds B.S., M.S., and Ph.D. degrees from the University of Washington. His home address is 134 Gifford Avenue, Jersey City, New Jersey.

John H. Baker of 1624 Philadelphia S.E., Grand Rapids, Michigan, is an instructor at the Grand Rapids Junior College. He attended Calvin College where he received the A.B. degree with a major in Mathematics and a minor in Science. He holds the M.A. degree from the University of Michigan, and the M.S. degree in Physical Science from Michigan State University. He has completed the course work for his doctorate.

Robert Davison Banker, 1742 Laurelwood Circle, Cincinnati, Ohio, is a chemical engineer employed by Proctor and Gamble. He holds the B.Ch.E. degree from Cornell University.

Ronald La Mar Barndt is a student in the Harvard Graduate School of Education. He holds the B.S. degree in Electrical Engineering from Lehigh University, and attended M.I.T. one year. He also holds the A.M. degree in Teaching of Mathematics from Harvard. His address is 15 Langdon Street, Cambridge, Mass.

Wendland Beezhold, 3902½ Sunnyside North, Seattle, Washington, is a Research Assistant at the Uni-

versity of Washington. He received the B.S. degree in Physics from the University of Washington.

Paul Boonstra of 3242 31st, Grandville, Michigan, is an instructor of mathematics at Grand Rapids Junior College. From Calvin College he holds the A.B. degree with a major in Mathematics and minor in History and English; from the University of Michigan he received the M.A. degree with a major in Education and a minor in Mathematics. He has taken additional studies in Mathematics at Purdue University.

John A. Brumbaugh, 1445 Hawthorn, Ames, Iowa, is a National Science Foundation Graduate Fellow. He holds the B.S. degree from Cedarville College with a major in Biology and a minor in Chemistry. In 1958-59 he attended Grand Rapids Baptist Theological Seminary. In 1960-61 he studied Genetics and Embryology Physiology at Iowa State University.

Charles Albert Clough, 204 Commonwealth Avenue, Boston, is a 2nd Lieutenant in the U. S. Air Force. He holds the B.S. degree with a major in Mathematics and a minor in Meteorology from M.I.T., and as part of his Air Force training is currently studying Meteorology at M.I.T.

Herbert De Vries, 4710 Blaine S. E., Grand Rapids, Michigan, is an instructor in the Grand Rapids School System. He attended Calvin College where he received the A. B. degree, and Wayne State University where he received the M.S. degree, with a major in Physics, and Minor in Mathematics.

Howard L. Dinsmore, 1443 West Minnehaha Avenue, St. Paul, Minnesota, is Professor of Chemistry at Bethel College, St. Paul. In 1942 he received the B.A. degree from Johns Hopkins University, and in 1949 he received the Ph.D. degree from the University of Minnesota, with a major in Chemistry and a minor in Physics.

Ronald L. Edwards, 2675 Forest Grove S.W., Grand Rapids, Michigan, is an instructor at Grand Rapids Junior College. He holds the B.S. degree from Ball State Teachers College, with majors in Chemistry and Mathematics and a minor in General Science. From the University of Michigan he received the M.A. degree with a major in Chemistry and a minor in Physics.

Albertus H. Elve, 1519 Rosewood S.E., Grand Rapids, Michigan, teaches Chemistry at Grand Rapids Junior College. He holds the following degrees: A.B. from Calvin College with a major in Biology and a minor in Physics; M. S. from the University of Michigan, with a major in Zoology; M.A. from Stanford University with a major in Chemistry and a minor in Education; M.S.T. from the University of New Hampshire with a Chemistry major.

Chris Daniel Geisler, 1134 East Seventh Street, Plainfield, New Jersey, is a temporary member of the Technical Staff of Bell Telephone Labs. From the Massachusetts Institute of Technology he holds the B.S., M.S., and Sc.D. degrees with a major in Electrical Engineering and a minor in Mathematics.

John B. Ham, 1941 Chamberlain S.E., Grand Rapids, Michigan, is a Zoology instructor at Grand Rapids Junior College. He received the A.B. degree with an English major and a minor in Organic Science from Calvin College. He also holds the M.A. degree from the University of Michigan with a major in Education and a minor in Sociology, and the M.S. from Michigan State University with a major in Zoology and a minor in Botany.

Lester E. Harris, Jr., 7641 Carroll Avenue, Takoma Park, Maryland, is Chairman of the Biology Department, Columbia Union College. He received the B.A. degree in 1949 from Columbia Union College, with a major in Biology and in minor in Chemistry. He also holds the M.S. degree from the University of Maryland where he majored in Zoology, and has attended Cornell University where he majored in Zoology.

Dean Hartman, 202 Michigan Road, Goshen, Indiana, is a Science and Mathematics instructor at Bethany Christian High School. He holds the B.A. degree from Goshen College, with a major in Physics and a minor in Mathematics.

Byron L. Hawbecker, 309 North Second Street, Monmouth, Illinois, is Assistant Professor of Chemistry at Monmouth College. He holds the B.A. degree with a major in Chemistry and a minor in Mathematics from Manchester College in Indiana. Pending is the Ph.D. degree in Organic Chemistry and Inorganic Chemistry from the University of Arizona.

Warren E. Hoffman, 1006 Hollyhill Drive, Fort Wayne, Indiana, is Assistant Professor of Chemistry at Indiana Technical College, Fort Wayne. He attended Union College, Schenectady, New York, where he received the B.S. degree with a major in Chemistry and minors in Physics and Mathematics. From the University of Buffalo he received the Ph.D. degree in Chemistry.

William H. Kersey, 216 West Terrace Street, Altadena, California, is Assistant Professor of Chemistry at Pasadena College (Nazarene). He holds the B.A. degree with a major in Chemistry and a minor in Mathematics from Pasadena College, as well as the M.S. degree in Chemistry from Baylor University.

Gordon B. Kuipers, 2433 Raymond Avenue S.E., Grand Rapids, Michigan, is a Junior High science teacher in Grand Rapids. He holds the A.B. degree with Mathematics as a major and Bio-Physics as a minor from Calvin College. He has studied the past three summers at Michigan State University, Michigan State Gull Lake Bio. Station, and Eastern Michigan University.

Martin Mathews La Bar, Route 1, Birchwood, Wisconsin, is a Research Assistant at the University of Wisconsin. From Wisconsin State, Superior, he received the B.A. degree with majors in Biology and Chemistry-Physics and a minor in Mathematics. He has since attended the University of Wisconsin for three years, studying Genetics and Zoology.

Ian H. Lennox, 1633 Sycamore Avenue, Hatboro, Pennsylvania, is a Research Assistant at the University of Pennsylvania. He holds the A.B. degree from Houghton College, with a major in Sociology and a minor in Psychology. From the University of Pennsylvania he holds the M.A. degree in Sociology.

John George Lepp, 521 Douglas Avenue, Villa Park, Illinois, is field representative for the Christian Medical Society, Oak Park, Illinois. From Bowling Green State University (Ohio) he received the B.S. degree with a major in Biology and a minor in Chemistry, and from Ohio State University he received the M.Sc. degree in Anatomy.

Wilbur C. Lewis is a doctor of medicine now practicing in a hospital in Asuncion, Paraguay, under the auspices of the Southern Baptist Foreign Mission Board. In 1951 he received the B.S. degree from Oklahoma Baptist University, and in 1955 the M.D. degree from Oklahoma University, School of Medicine.

Edward L. Lind, 16 Manning Lane, Lawrenceville, New Jersey, is employed by the Radio Corporation of America, RCA Laboratories, Princeton. He holds the B.S. degree with a major in Chemistry and a minor in Physics from Brown University. From Duke University he holds the Ph.D. degree in the same fields.

Walter S. Massanari, 2613 Martin Manor, Goshen, Indiana, is a physician. He holds the B.S. degree and the M.D. degree from the University of Illinois Medical School.

Robert A. G. Montgomery, Jr., 3520 Vista Street, Philadelphia, Pennsylvania, is a physical science teacher in the Philadelphia School System. He is a graduate of Philadelphia Bible Institute, and holds the B.A. degree with a major in Chemistry and a minor in Physics from Wheaton College in Illinois.

Fred W. Moore, 220 East Oliver Street, Owosso, Michigan, is employed by the Owosso Board of Education. He holds the A.B. degree with a major in Education and a minor in Chemistry from Wheaton College, and the M.A. degree in the same fields from the University of Michigan.

Robert Harlan Peacock, 1611 North Hayes, Springfield, Missouri, is an assistant instructor in biology at Evangel College, Springfield. He received the B.S.A. degree in Vocational Agriculture from the University of Arkansas, and the M.S. degree in Agronomy from the University of Arkansas.

John H. Petter, 13 New Haven Avenue, Nanuet, New York, is employed as a Senior Programmer by International Business Machines Corporation. He received the B.S.E.E. in June, 1950, from the University of Michigan.

Glenn L. Quist, 2660 East Beltline N.E., Grand Rapids, Michigan, is an instructor in chemistry at Grand Rapids Junior College. He holds the A.B. degree with a major in Chemistry and minors in Mathematics and German from Hope College, Holland, Michigan, and the M.S. degree with a major in Bio-chemistry and minors in Physiology and Micro-anatomy from the University of Tennessee, Memphis.

Frank E. Rose, 162 Grandview Court, Ithaca, New York, is on leave from General Motors Institute, Flint, Michigan, and is now a Graduate Research Assistant at Cornell University. He holds the B.S. degree with a Physics-Mathematics major and a Psychology-Education minor from Greenville College. At the University of Michigan he earned the M.A. degree with a major in Physics and minors in Mathematics and Chemistry. Since 1958 he has been at Cornell University.

Roth R. Waldo, Upland, Indiana, is Director of Mens' Activities and Instructor in Mathematics at Taylor University, Upland. From Taylor University he holds the B.S. degree in Education with a Mathematics major and an English minor. He expects to receive the M.A. degree in June, 1962, from Ball State Teachers College, where he is majoring in Mathematics.

R. Darrel Sager, 2400 Pine Valley Drive, Alhambra, California, is a member of the Technical Staff of Hughes Aircraft Company, Culver City, California. He received the B.S. degree in Electrical Engineering with a minor in History from U.C.L.A. From U.S.C. he holds the M.S.E.E. degree.

Lewis F. Scheffler, Sr., R. D. 2, Moore Haven, Florida, is an electronics engineer. He has studied Physiology, Psychology, and Religion at the University of Akron, Ashland College, and Cincinnati Bible Seminary.

Herbert Schlossberg, 908 Seventh Street S.E., Minneapolis, Minnesota, is a teaching assistant at the University of Minnesota. He holds the B.A. degree from Bethel College, St. Paul, with a history major and speech minor, and the M.A. degree in History from the University of Missouri. He is teaching half-time at the University of Minnesota while beginning Ph.D. work in History and Philosophy.

Robert D. Scott, Houghton, New York, is an instructor in Mathematics at Houghton College. He holds the B.S. from Purdue University, with a major in Chemical Engineering and minors in Mathematics and the Sciences. He holds the M.A. degree in Mathematics from the University of Buffalo.

Harold Z. Snyder, 1530 Woodcliff S. E., Grand Rapids, Michigan, is an instructor in Botany at Grand Rapids Junior College. He holds the following degrees

from the University of Michigan: A.B. and B.S., with a major in General Science and a minor in Social Science; M.S. with a major in Cons. Ed. and a minor in Geography. In 1961 he received the Ph.D. degree in Cons.Ed. and Botany from Michigan State University.

Sam A. Squire, 122255 N. E. 2nd, Bellevue, Washington, is a Technical Writer for the Boeing Company in the Aero-Space Division. He is a graduate of Lewis and Clark College, holding a B.A. degree with a major in Biology and a minor in Education.

Paul Szto, 143-55 84th Drive, Jamaica, New York, is a home missionary under the Christian Reformed Church. He holds the following degrees: B.A. with a major in Geography and a minor in History from National Chekiang University, China; B.D. and Th.M. in Apologetics from Westminster Theological Seminary; S.T.M. in Philosophy of Religion from Union Theological Seminary, New York, where he is also a candidate for Th.D.

Charles W. Tatter, 18433 Martin, Homewood, Illinois, is a Senior Research Chemist for Beatrice Foods Company, Chicago. He holds the B.S.Ch.E. degree from the Illinois Institute of Technology.

Theodore L. Vander Ploeg, 132 East 29th Street, Holland, Michigan, is an instructor in Chemistry at Grand Rapids Junior College. He received the A.B. degree with a major in Chemistry and a minor in Mathematics from Hope College. From Ohio State University he received the M.S. degree in Organic Chemistry.

William J. Watson, 4535 Reiger, Apartment 205, Dallas, Texas, is a Project Engineer employed by Texas Instruments, Inc. He holds the B.S.E.E. and M.S.E.E. degrees from Oklahoma State University.

Jonathan G. Wegener, 9 Old Kiln Road, North Haven, Connecticut, is Assistant Professor of Psychology at Yale University. He received the A.A. degree from North Park College in 1947 and the Ph.D. degree in Physiological Psychology in 1954 from the University of Chicago.

Richard G. Welden, 10845 S. E. Mill Court, Portland 16, Oregon, a dentist, received the B.S. degree in 1954 from the University of Oregon, Eugene. He received the D.M.D. degree from the same university in 1957.

Kenneth T. Whitby, 5228 28th Avenue South, Minneapolis, Minnesota, is an Assistant Professor of Mechanical Engineering at the University of Minnesota. He holds the B.S.N.T., B.M.E., and Ph.D. degrees in Engineering from the University of Minnesota.

Donald S. Wiersma, 6408 102 A-Avenue, Edmonton, Alberta, Canada, is a chemist employed as an Analytical Section Head in the Research Department of the Canadian Chemical Company Limited. He received the B.A. degree from Calvin College, Grand Rapids, Michigan, in 1951.

Daniel E. Wonderly, P. O. Box 89, Wingate, North Carolina, is an instructor at the Wingate Junior College. He holds the A.B. degree in Anthropology from Wheaton College, Illinois; B.D. and Th.M. degrees in New Testament and Old Testament from Central Baptist Seminary; and the M.S. degree in Zoology and Botany from Ohio University.

Merlin W. Zook, 715 Walnut Avenue, Scottdale, Pennsylvania, is presently working with the Mennonite Central Committee as Audio Visuals Assistant. He holds the B.A. degree with a major in Physical Science from Goshen College, Indiana, and the M.S. degree with a major in meteorology and a minor in Geography from Pennsylvania State University.

NEW ASSOCIATE MEMBERS

Perry James Bigelow, 4456 Edgewater Drive, Orlando, Florida, is a student at Illinois Institute of Technology in Chicago, where he is majoring in Civil Engineering. He attended Taylor University two years and the University of Orlando one year.

Edward Harshaw, III, of 322 North Lansdowne Avenue, Lansdowne, Pennsylvania, has completed one quarter of study in Pre-Engineering at Ursinus College.

W. Maxey Jarman, 3610 Woodlawn Drive, Nashville, Tennessee, is chairman of GENESCO, Inc. He attended the Massachusetts Institute of Technology three years, majoring in Electrical Engineering.

Albert Charles Maynard of 105 Rosebery Street, Inglewood, Perth, Western Australia, is pastor of the Bedford Park Baptist Church there. He is a graduate of the Baptist Theological College, Sydney, N. S. W., Australia, (affiliated with Sydney University), having completed a five-year theological course there.

Charles M. Randall, 933 A. Cherry Lane, East Lansing, Michigan, is presently a graduate student in Physics. He holds the B.A. degree in Physics from Union College, Lincoln, Nebraska.

John Conrad Scheffler, Route 2, Box 17, Clewiston, Florida, holds two positions: he is pastor of the Church of Christ (Christian) in Clewiston, and an accounts payable clerk for the United States Sugar Corporation. He has studied Bible at Southern Christian College, San Antonio and at Cincinnati Bible Seminary. From Paducah Junior College, Paducah, Kentucky, he holds the A.A. degree in science.

Bernard Simmons, 42 Howard Street, Cambridge, Massachusetts, attended the Philadelphia College of Bible one year.

John C. Zacharias, Crickettown Road, Stony Point, New York, holds the B.Th. degree from Nyack Missionary College, and the M.A. degree in General Education from New York University. At the present time he is an Associate Professor of Science at Nyack Missionary College.