accordance with physical reality. Perhaps prime number theory, like the conic sections of the Greeks, is waiting for some future Kepler to derive from it important theories concerning the physical universe.

The point that I would like to insist on in closing is the essential unity of all that can be designated as science. One outstanding purpose lies at the basis of all scientific endeavor, as the etymological origin of the word science indicates. We wish to increase our knowledge, both of ourselves and of the world about us. In carrying out this purpose each individual works best along lines dictated by his own tastes and inherent capacities. Some of us are for this reason mathematicians, and more particularly mathematicians working in certain special fields. If the theories we develop had no bearing at all on other scientific work, they would still have a value as exhibiting the capacities of the human mind. But the interrelations of the various scientific fields adds much to the solidarity of scientific interests. We should therefore rejoice that the relationships between mathematics and the other sciences are of such great service in the general development of scientific thought. It may not make our work any more interesting to ourselves, but it adds much to its broad human interest.

AGRICULTURAL PLANNING AS AN ASPECT OF STATE AND NATIONAL PLANNING[1]

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AGRICULTURAL planning is proceeding in this country in two distinct but not unrelated forms. These two forms are perhaps best represented by the production control program of the Agricultural Adjustment Administration, on the one hand, and by the work of the Land Policy Division of the Agricultural Adjustment Administration and of the National Resources Board in conjunction with state planning boards, on the other hand.

The first of these types of planning, economic planning, tends towards a "planned agricultural economy" as that term is currently applied. It seeks to determine the quantity of certain agricultural products which the markets and consumption on the farm will absorb under existing and anticipated conditions, and the optimum carry-over in addition thereto, and to apply inducements, chiefly but not wholly financial, to accomplish such production. Before the inducements can be applied there must be the most thoroughgoing determination of the size of the agricultural plant most likely to yield the desired production under existing conditions without yielding disturbing surpluses. From production control as an immediate instrument this type of planning reaches out toward permanent adjustments in production, commerce and consumption of farm products such as will reestablish a normally balanced and compensating agricultural economy. This form of agricultural planning will receive somewhat extended treatment on the program of this meeting.

The second form of agricultural planning, and the one which is an integral part of state and national planning as contemplated in the title of this paper, is an aspect of the effort to plan the highest economic and social utilization of the natural resources of the nation in the interest of present and future generations. Its essential character is revealed in the declared purpose of the National Resources Board to prepare a program on all "aspects of the problem of development and use of land, water and other national resources in their physical, social, governmental and economic aspects." As the National Resources Board and its predecessor, the National Planning Board, is responsible for the present nation-wide movement for state planning, the work of the state planning boards is designed to accomplish similar purposes with respect to the natural resources within the several states. In the pursuit of these purposes the interests of agriculture are served in highly significant ways. Agricultural planning, in respect of some of its more fundamental features, emerges from the work of the national and the state planning boards.

While the two types of planning proceed from basically different intentions, they inevitably meet at a number of points.

BASIC SOCIAL TRENDS

The requirements of the nation for land and its products, for transportation routes and services, electric power lines, water supplies, stream control and many other utilities and services are affected by certain social trends which require evaluation. The first essential in the making of any plans for the future development of a state or of any other area is an understanding of basic conditions and trends. The

[1] Address of the retiring vice-president and chairman of Section O, American Association for the Advancement of Science, Pittsburgh, 1934.

facts must be assembled to establish the past trends and migrations and the present tendencies in agriculture, in industry, in commerce and in population distribution and concentration. Has agriculture been expanding into or receding from any areas under study? If so, why? If the character of farming is changing, what is causing the change and what is its significance for the future development of the area? What changes in location, size and character of mechanical industries have been taking place, why, and of what significance are the changes? What is the effect of these changes on migrations to or from the farms and on the demand for farm products? To what extent and in what industries and localities is decentralization of industry taking place or reasonably to be anticipated, and what adjustments in agriculture or the use of land, the development of highways and power lines, and the like, does such relocation of industry require?

What has been, and is, the trend in the size, the composition and the location of the population? What shifts are taking place in the proportion of the population engaged in the principal occupation groups, as in farming, mining, manufacturing, commerce, the professions, etc., and what bearing have these shifts on the future agricultural development of the state and the nation? Planners can not omit the implications of the slowing down of population growth and the changes in the age distributions within the population on the requirements either in physical development or in the creation and location of social institutions and utilities.

In many parts of the country the suburban trend has reached such proportions that it requires recognition in state and local planning. Consideration must be given to the increase in the number of rural non-farm homes and of small part-time farms within the environment of cities out to distances of perhaps thirty miles, and to the effect of good roads and motor vehicles on the movement from the more congested centers to suburban towns and villages. Studies have revealed some very striking facts concerning this movement and its significance for the future development both of the central cities and of the suburban towns and neighboring villages, as well as for the countryside. Questions also arise as to how the process of rapid suburbanization in certain areas, especially those outside the limits of incorporated cities and towns, can be regulated so as to avoid present evils.

In some states the problem of stranded populations must be dealt with. The first step is to locate the cities, villages and rural areas which have a large permanently unemployed population. Then the task is to determine whether industries, and what industries, can be located in such areas, and whether the stranded populations can be assisted by subsistence homesteads, small farm or allotment projects or other specific means.

As all expenditures and procedures for state and national development should be related to the actual and the potential needs of the people, all other elements in planning must be undergirt with the pertinent social or population facts.

RURAL LAND-USE PLANNING

The largest contribution to agricultural planning arising from the current national and state planning activities will apparently lie in the determination of the most socially desirable uses of the rural lands of the nation and how those uses may be effectuated. As a basis for such determination there must be available knowledge of present uses, the requirements of the nation for agricultural and forest lands, the nature of the soil resources, the factors which may affect the size of the necessary agricultural plant—especially the implications of any change in the foreign market for agricultural products and the increasing mechanization of farming—and other facts essential to dependable judgments concerning the uses of the nation's non-urban land resources.

In approaching a better planned use of the rural lands, the planning agencies are facilitating a broad classification of the lands into their most appropriate uses, whether for agriculture, forests, fish and game refuges, parks or other uses. Both the physical and the economic classification of lands are essential. For these purposes the studies involve, together with all pertinent economic data, the mapping and careful consideration of soil fertility, topography, length of growing season, rainfall, present intensity of use, school population and facilities, accessibility and other matters. A predominant purpose is to map the problem areas, the areas clearly submarginal for agriculture, and similarly to map the various categories from the marginal to superior farming areas, as a guide to the location of improved roads, electric power lines, recreational facilities, forests, wild life areas and other social utilities.

In many states, as a result of forest removal, loss of soil fertility, erosion, shift of population, changes in farm practises, especially the growth in machine farming, and other changes, great areas have gone out of cultivation, or nearly so, and have become problem areas. Much of this land is submarginal for agriculture. It must be located, mapped and described, and its possible alternative uses determined. While the chief alternative uses may be grazing, tree growth, water conservation, fish and game preserves, recrea-

tion and scenic or scientific reservations, there are many minor alternatives.

With the question of determining the alternative uses of submarginal areas goes the determination of how such lands should be owned or administered; by what legislative or other processes the desired developments may be inspired under private ownership; what areas should be purchased by the national, state or lesser governmental units for public reforestation, wild life preserves, water control, checking erosion, recreation or other desirable public enterprises.

Planning calls for careful determination not only of the uses to which the various types of land are best suited but also the requirements of the population for different categories of farm land, for forest products, water conservation, recreation areas, especially fishing and hunting areas, parks and camp grounds, wild life preserves and any other economic or social requirements which the non-urban lands may serve. The practicability of combined or multiple uses of land to serve these varied purposes requires determination.

Special problems of many sorts arise, such as those concerned with the possible development of extensive pasture areas on some of the hill lands in the east and the control and utilization of the range lands in the west; problems of the readjustment of size of holdings and types of farming, where maladjustments in these respects are evident; and problems arising from the menace of the soil and wind erosion, the former of which, at least, is taking heavy toll in all parts of the nation.

Closely related to these problems are those which deal with the changes in local governmental organization, in public services and utilities, in state aid to schools, and in road construction that are desirable in view of the probable future uses of these lands. Should the submarginal lands be zoned against future farm settlement? To what extent can the present population of these non-agricultural areas be absorbed in the activities, such as reforestation, recreation, game preserves and the like, which will take the place of such farming as is now practised? What procedures can be adopted to induce some of these submarginal farm families to settle on the more productive farm lands? These and kindred social questions obviously confront the planning agencies.

The Transportation Systems

In the field of transportation the facts must be assembled for all existent or prospective types of transportation, rail, water, highway and air transport. The mapping of all existing facilities, differentiated as to character, and the trends and the intensity of use are first steps. The questions of truck routes, farm-to-market roads, the place of the improved highway in a complete transportation system, the extent to which the public highway should supplement or supplant the railroad, the development of the highway and its borders to increase highway efficiency and to create or preserve beauty of the countryside, are some of the questions which enter. The relation of the development of transportation facilities to prospective land use is obviously very important if costly errors are to be avoided. So also are the relations to the trends or migrations in population, in industry and in commerce.

The Water Resources

The water problems are always important and in some areas are paramount. There is the question of securing and protecting adequate supplies of water for the large metropolitan areas, a matter of grave concern in the more densely populated sections of the country; of adequate supplies for the smaller centers for commercial and domestic use; the overcoming of serious stream pollution, which is a burning question in many places. There is the problem of flood control and its relation to soil erosion, afforestation, land use, swamp drainage and water storage and conservation. There is the problem of declining reservoirs of ground water and the control and protection of water for irrigation purposes. Attention must be given to the regulation of developments along streams and beside the public waters.

Power Production and Distribution and Industrial Location

In any study and mapping of the water resources of a state the question of power production is likely to gain prominence. This requires mapping and measuring both the developed and the undeveloped water power resources within the state, and determining what is involved in developing potential but now unused resources. Power production and distribution bear directly on the location of industries, existing and potential. Mapping the existing high tension distribution lines throws light on what the future problems of power distribution and utilization are. In the industrial states, a vital question is the relation of electric power distribution to the decentralization of industry. There are questions of major social significance bound up with the question of industrial location. In probably all the states the requirements for farm electrification should have clear recognition in planning; the relation of prospective land use to the extension of rural electric power lines scarcely requires discussion. In a number of states consideration must also be given to locations favorable to the production of electric power by steam.

PUBLIC WORKS PROJECTS

In state and national planning much emphasis has been given to public works which might relieve unemployment. This is an immediate phase, and it is also a major concern of long-term planning. As all manner of public works are appropriate for consideration, many items which directly concern farming and country life have place: the requirements of the population in the matter of highways, including farm-to-market roads, bridges, canals, parks, forests, fishing and hunting preserves, irrigation and drainage works, stream and flood control and water conservation are examples. There is involved consideration not only of what is required, but where and how it should be provided, its relation to all other pertinent state developments, and an effort to indicate the relative urgency of the many proposed public works.

MISCELLANEOUS ITEMS AFFECTING THE RURAL POPULATION

While state and national planning, having as its central objective the conservation and wisest utilization of the natural resources of the nation, places major emphasis on such questions as have just been enumerated, in many states much attention is given to other matters which are essential elements in arriving at reliable judgments. As examples of these may be cited the bearing of land values, taxation and tax delinquency on the actual and the potential use of various types and areas of land. In some states planning with respect to the social resources and needs are a definite and coordinate part of the program. Here one finds attention being given to housing and living conditions, both urban and rural; problems of health and sanitation; the facilities and requirements for mental hygiene, social welfare and education, especially public-school facilities; governmental reorganization for the various units of government; landscaping and beautification of public properties. Such matters may be of quite as great concern to the rural as to the urban dwellers.

While the limits of this discussion have necessitated treatment only in somewhat broad categories, it will be obvious that before even tentative plans can be formulated in any major segment of the field, extensive and varied bodies of detailed facts must be assembled and analyzed. Much of the basic factual material is available, but it requires to be brought together, integrated or correlated and interpreted. The planning agencies, however, have found it necessary to fill many gaps in essential knowledge by conducting or inspiring additional surveys and investigations.

THE POTENTIALITIES OF THE PLANNING MOVEMENT

While forty-two states have created planning boards to cooperate with the National Resources Board and their programs contain many common elements, it is inevitable that there will be much variation not only in the scope of the work and the extent of collaboration among the responsible state departments and agencies, but also in the vigor and competence with which the work is pressed. The values for agriculture, as for other interests of the respective commonwealths, will correspondingly show great variations. None the less a great new light has shone upon the possibilities and significance of agricultural planning, and facts of compelling importance are being marshalled. If the present planning movement survives, and if in even modest degree it approximates its potentialities, farming and rural life in America stand to gain in many ways vital to rural social and economic progress.

The whole movement has not only yielded vast bodies of knowledge and correlations of survey and research findings hitherto unavailable in such revealing form, but more significantly it has fostered comprehensive thinking about the land and water resources of the nation, the facts which influence agricultural prosperity and attractiveness in this country, and the place of agriculture and the amenities of rural life in any proposals for state and national development. For the first time large numbers in the population have come to see the unity of national life and the interdependence of the elements in our social economy. It should be less easy in future for certain kinds of public undertakings of questionable value or likely to serve special interests at the expense of more general interests to make headway. It should be possible to proceed with public enterprises with more confidence because of the wider horizon which the planning studies afford.

OBITUARY

OTTO FOLIN

OTTO FOLIN, who died in Boston on October 25, 1934, was a widely known biochemist. He achieved distinction by important contributions in the field of metabolism, by the inspiration and guidance he gave to many students and associates in his laboratory at the Harvard Medical School and by his skill and resourcefulness in designing numerous analytical methods which proved widely useful both in biochemical research and as valuable aids in medical practise. He will be missed by numerous colleagues and friends, who from personal contact as well as from acquaintance with his work came to regard him with admiration and affection.