A Chemurgic Program for the Pacific Northwest

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The application of chemistry to the problems of our daily lives has found expression in a new organized movement known as the Farm Chemurgic Council. It is not a governmental agency nor is it political. It had its origin in the imagination of two famous chemists who unfolded their dream to Henry Ford, who in turn invited a group of farm leaders, industrialists and scientists to be his guests at Dearborn, Michigan, which has now become the center and shrine of the Chemurgic movement in this country. Chemurgy is analogous in its meaning to the word metallurgy. Instead of working with metals, it means working with the annual crops of nature by chemical or scientific methods.

The purpose of the Farm Chemurgic Council is to survey the variety of farm products which through applied science can be transformed into raw materials usable to industry; to define the scientific research problems essential thereto; to stimulate appropriate research both in public and private institutions; to activate American industry to apply the fruits of research; and to encourage the joint cooperation of agriculture, industry and science in promoting this significant development nationally.

It is hoped that this cooperation will result (1) in the gradual absorption of much of the domestic farm surplus by domestic industry; (2) that it will put idle acres to work profitably; (3) that it will increase the purchasing power of the American farmer on a stable and more permanent basis, thereby increasing the demand for manufactured goods, creating new work for idle hands to do, reviving American industry, restoring American labor to productive enterprise and relieving the economic distress of the nation.

Mr. Francis P. Garvan, President of the Chemical Foundation and of the Farm Chemurgic Council, in an article in the Scientific American last December, shows that every depression in our recent history finally terminated because of two things: (1) Expanding markets for old industries; (2) Creation of new industries. He further shows that unemployed acres and men have been absorbed in our national economy in approximately the following ratios: about one-third due to expanding markets for old industries and about two-thirds due to the creation of new industries and the development of new products and new methods.

The natural process of recovery now under way indicates that the expansion of markets for old industries is again occurring in the usual order of things. This should absorb about one-third of our unemployed. But what we are concerned with today is the two-thirds dependent upon new industries for their return to productive enterprise. The new industries that characterized recovery from the depressions in the four decades since 1890 were the products of modern science and invention developed very largely in the fields of mechanical and electrical arts. We might cite one example. In 1920 the first radio broadcasting station was established at Detroit, Michigan. It had one man on its payroll and a few citizens had cheap crystal sets. Now there are 500 commercial broadcasting stations in the United States giving employment to 15,000 technicians and a host of entertainers for the benefit of 25,000,000 vacuum receiving sets in use throughout the country. The catalogue of mechanical and electrical industries that characterize these

four decades is too long to recite at this time.

We are now on the threshold of a chemical revolution which within the next generation will accomplish as much for the well-being of society and for the broadening of opportunity for employment as did the mechanical and electrical revolution of two decades ago. The battlefields of this new revolution are the farm lands of our country. We propose to displace eventually some 250 million tons of raw materials now drawn annually from the mineral kingdom by a like amount of farm products from the vegetable kingdom, all for industrial use in the United States. A century ago the mineral output in this country was one-half the farm output and we had no serious unemployment problems. Today the mineral output is a billion tons and the farm output is one-half billion tons and unemployment threatens our social order. A change in this ratio would require a farm population of about 40 per cent of our total population and would provide employment for every man and woman qualified and willing to work. The Chemurgic movement seeks to make this possible through the objective I have before recited. It is impossible to foresee and to forecast all the ways and means whereby the chemical age will become established. Great numbers of men and women are gathering underneath the standards of the working army. More than 2000 students are enrolled in our chemistry classes at the University. As this generation grows into manhood and womanhood it will be equipped with the implements for moulding a new age of wondrous beauty and service to mankind.

We have already progressed far enough to get a glimpse of the chemical frontiers that soon must be occupied by a happy and busy people. In order that this nation may restore its agriculture and consume its products, several methods of procedure may be followed: (1) The existing farm surplus may be used for industrial commodities; (2) The importation of certain agricultural products may be eliminated, and (3) New crops for industrial use may be introduced.

Some months ago a Chemurgic Conference was held at the University of Florida, Gainesville, Florida. The program laid out for the development in the South over a period of 20 years includes (1) 400 agrol plants utilizing starch and sugar crops for producing a blending constituent adaptable to motor fuel. The way how is determined in the Council's experimental plant at Atchison, Kansas. (2) 200 starch plants using the Southern White Triumph Sweet Potato. The Department of Agriculture's Experiment Station at Laurel, Mississippi, will point the way how. (3) 100 kraft and newsprint mills utilizing the slash pine of the South in accordance with the research of Dr. Herty at Savannah, Georgia. (4) An increase from 85,000 acres to 1,000,000 acres of tung trees in the Gulf States from Texas to Florida.

These four Chemurgic enterprises will require 25 million acres of land, a billion dollars of capital and the labor of 3 million men.

In the Pacific Northwest a different chemurgic program is contemplated. Here the annual crops are of a different nature. We have no corn, cotton or sugar cane, but we have 10 million tons of wood that is wasted or destroyed by fire each year. From the snow that melts under the heat of the sun upon the mountain tops and the water that falls from the highland to the lowland, there may be generated each year 15 million kilowatts of electric energy easily transformed into light, heat, power or into chemical commodities for use in distant parts of our country. We have

millions of acres of idle lands with rich and highly mineralized soils under sunny skies, awaiting only the bringing of water to yield rich harvests of crops. Even now we have agricultural surpluses. There is an annual excess of 20 million bushels of wheat, 10 million boxes of apples grow each year that cannot be marketed and 10 million bushels of potatoes are culls. To found and establish industries that will utilize these idle acres; that will convert these great masses of energy into commodities; that will use every stick of wood that grows in the forest as a raw material for new articles of commerce and that will transform the surpluses of farm, orchard and garden into new and useful products, that is the Chemurgic challenge of the Pacific Northwest.

How may this challenge be met? The answer is not an easy one, but in general it is the same as that which solves every crisis or emergency, viz., leadership. The Chemurgic Conference held in Spokane during March, 1937, provided for a Chemurgic Council of 5 members each from the states of Oregon, Washington, Idaho, and Montana. This council is now in process of formation. Under its direction research projects will be set up that will seek to study the fundamental facts governing the industrial use of our recurring natural resources. In the forested areas of Oregon, Washington and Idaho the application of science, particularly chemistry to wood, is of prime importance. The logging and sawmilling industries by their mechanical methods use only one-third of the tree as it stands in the forest. The pulp industry by its chemical method utilizes only the cellulose of wood—less than one-half of its raw material. The residue consists of lignin and wood sugars, now washed into the rivers and sea as a waste product. Chemical research must be undertaken in an organized way and with trained personnel before the lignin waste can be salvaged and turned into the channels of trade and industry.

The second great industrial waste is that of the energy of falling bodies of water. It is foreign to the ordinary way of thinking to regard hydro electric power as a recurring crop or natural resource. But it is just as much so as the annual growth of wood or any farm crop. The energy of the sun light, the water from the ocean in the form of vapor which condenses to rain or snow on the higher elevations until the summer season causes it to melt and fall from the highland to the lowland.

The conversion of electrical energy into chemical energy or chemical commodities is not a mystery and is not any more difficult than its conversion into any other form of energy. From water, air and electricity nitric acid can be made. Synthetic ammonia and phosphoric acid utilize electricity as does also calcium carbide and the light metals industries. At Trail, British Columbia, the State College at Pullman, at Kellogg, Idaho, and Anaconda, Montana, are groups of workers now engaged in research and in actual production of commodities from energy that may be derived from one of our greatest resources.

Our farm surpluses of wheat, apples, potatoes are capable of diversion into industrial channels. California now utilizes 30 per cent of its citrus fruits for pectin, fruit juices, wines, flavoring oils, citric acid, stock feeds and the like and is doing it at a profit. It is gratifying that the University of Idaho has taken leadership in the conversion of the starches in cull potatoes and other carbohydrate crops into alcohol that will ultimately find its way as a blending constituent into gasoline to make it more suitable for use as an automobile fuel.

The introduction of new crops into

this region is not without the range of possibility. At the present time nearly all of the cigarette paper is made from old rags in France. The owners of these plants are much interested in similar and better papers that have been made from Oregon flax. A research project in Oregon would be timely in laying the foundation of a cigarette paper industry in the Northwest.

These and other tasks must be assumed by the people of this region. We must seek more and more knowledge concerning these things and uncover more and more facts that lie at the base of chemical industries. The only way is the way of science and that is the chemurgic way: the mobilization of science through research in behalf of agriculture and industry.

May I repeat once more the four major research projects upon which the chemurgic progress of this region depends: (1) a pure science research of lignin, the greatest wood waste in the world, together with technologic researches looking to the 100 per cent utilization of wood by chemical processes; (2) electrochemical researches in appropriate locations to convert electrical energy into chemical commodities from air, water and minerals; (3) technical and economic researches to convert agricultural wastes into products marketable at longer ranges of time and space; (4) chemical investigations of flax products to replace imports of cigarette paper, linseed oil and oil cake.

The Proceedings of the Chemurgic Conference in Spokane last March are now available for distribution. In them an even larger program is unfolded for this region.