

## THE PRESENT STATUS OF SCIENCE IN CENTRAL EUROPE.

PAUL NEUREITER, WESTERN ILLINOIS STATE TEACHERS' COLLEGE,  
MACOMB.

Our machine age produced by science is of such marvelous character that we are filled with pride when we review our achievements. But our satisfaction is considerably reduced by an investigation into the nature of the raw materials which we are using in this era of the engine. Regretfully we have to admit that our industrial system stands in opposition to the dictates of geochemistry. We are exploiting those raw stuffs which are the most precious because they are the rarest and make comparatively little use of those which are furnished by nature in abundance. Our supply of metals is a good illustration. We chiefly rely on the heavy metals, but copper for instance constitutes only one hundredth of a percent of the earth's crust, lead and zinc less than a thousandth of a percent of the earth's crust, and tin is even scarcer than that. In contrast to these elements aluminum and silicon occur plentifully, but are utilized in an inadequate measure.

In no part of the world have these undesirable circumstances been realized to so full an extent and by so large a public as in Central Europe since the time of the world war. By Central Europe I mean Germany, Austria and Czechoslovakia. Had it not been for the German chemists Germany would have lost the war in 1915 instead of in 1918. In 1913 Germany imported 800,000 tons of nitrates from Chile. When in consequence of the sea blockade effected by the British navy, all importation was completely cut off, Germany proceeded to produce her own nitrates from the nitrogen of the air, and was so successful in doing so that at present she exports nitrates.

But the problem of an economically sound selection of raw stuffs has become the great problem of German science since the days of the armistice. The country faces the question: How can a population of 65 million souls be supported on a territory that is considerably smaller than the state of Texas, is deficient in many important resources and does not derive any income from colonial possessions? The answer was given by German scientists within the last ten years.

1. Endeavours must be made to shift a large section of the manufacturing system from the basis of raw stuffs of foreign origin over to those which can be obtained bountifully at home.

2. Scientific methods must be devised to the effect of re-enhancing the agricultural production.

3. A great many of the German industries fall under the classification of refineries. Partly manufactured materials are brought from foreign countries, then finished in Germany and re-exported. This kind of industry depends on the superiority of workmanship. So long as the refining processes are better by reason of their sound scientific foundation than they can be designed abroad, this manufacture is able to exist. As soon as the foreign suppliers of partly manufactured materials are technically prepared and find it economically feasible to finish their own goods equally well and as efficiently as Germany, this phase of German industry is bound to disappear.

These three postulates have been formed by the scientists of Germany and the other Central European countries, Austria and Czechoslovakia, which have to face the same problems with the purpose of remedying the precarious economic conditions. They are the expression of a situation that is unique in the world's history. If we say that Great Britain depends on her commerce and naval preponderance, Russia on her agriculture, Switzerland and Italy on their tourists' trade, we have to conceive that Germany's fate depends on science.

Germany is fortunate in having industrialists who, on the whole, have been awake to the peculiar conditions described. So a number of advances have been made along the line of an increased utilization of domestic resources. A list of the new processes which are carried through on a large and commercial scale would include the following:

1. Nitrogen and ammonia from air and water.
2. Sulfur compounds from gypsum and kieserite.
3. Acetic acid, ethyl alcohol, acetone, from coal, lime and water, through acetylene.
4. Glycerol by fermentation of glucose; glucose from sawdust.
5. Paraffins which can be oxidized to fatty acids from lignite, leading to soaps and fats.
6. Methyl alcohol from carbon monoxide and hydrogen.

### 7. Gasoline and oils from lignite.

In addition there are several processes which have not yet been commercialized on a large scale, but are being investigated with promising results: Synthesis of rubber, camphor, albumens, and resins.

Research work is being devoted to a method of producing aluminum from aluminum silicates instead of from bauxite which is not found in Germany.

With regard to the improvements in agriculture appreciable results have been obtained. Fortunately Germany possesses the largest known deposits of potassium salts in the world. The potassium fertilizer industry is under control of a powerful trust which has recently submitted all its plants to a radical process of reorganization by way of which a great many small plants with lesser efficiency were shut down and the production concentrated in the largest plants of greatest technical perfection.

This potassium trust produces 75 per cent of the world's supply with a yearly output of 5 million tons. The German trust has concluded an agreement with the potassium industry of Alsace-Lorraine, now under French control, with the result that the two trusts combined have a monopoly of 95 per cent of the world's supply of Potassium fertilizers. From the scientist's view-point it is noteworthy that one clause of the agreement which was emphasised by both parties dealt with the cooperation in the field of scientific research. This intensified industry enables the furnishing of a product that is within the reach of the agriculturist. In addition to the potassium fertilizers, sulfates are available at a reasonable price. According to German data the average German farmer is able to produce on a given plot of land 2.1 times as much wheat, 1.8 times as much rye and twice as many bushels of potatoes as the average American farmer. In addition to the advances in scientific fertilization science has also combated plant and animal pests.

The outlook for the refining industries is less hopeful. On account of labour troubles efficiency and workmanship have been below the standard of pre-war times. What is more important, the other nations are developing their own manufactures in fields in which they did not compete before the war. This is particularly true with regard to chemical industry. The German share in the production of chemical goods all over the world has dropped from 24% before the war to 17% after the war, or

from 1/4 to 1/6. It is not without concern that Germany watches the rise of the American chemical industry. One of the captains of the corporations addressed an assembly of scientists and industrialists with the following words, "In chemistry we are still ahead of the other nations, but how long is this superiority going to last? Probably in ten or fifteen years they will have come up to our level." No doubt, serious danger is impending which to avert Germany will have to gain in the diplomatic field what she loses in the commercial one.

Considering the breakdown of the economic life at the end of the war, the moral catastrophe following the revolution, the labour turmoils, the occupation of the Ruhr district and the destruction of the State finances, it must be said that the present status of science is still remarkably high, and it is worth while for the scientists in the rest of the world to consider the efforts which have been made successfully to relieve science from the static condition into which it was thrown immediately following the war.

In 1920, the situation seemed most precarious. It was particularly the universities and polytechnical schools and state supported research institutions which depending on the government were almost compelled to stop their work on account of lack of financial support. An Emergency League of German Science was formed with a leading politician as its president, and Professor Haber, the inventor of the ammonia process, as its executive secretary. It consisted of 20 committees of experts from the various fields of science and chemistry, who were elected by the faculties of all the universities, polytechnical schools and academies of science. Representatives of this society appeared before a committee of the 'Reichstag', the German national assembly, and pleaded their cause. The Reichstag made an appropriation of twenty million marks for science relief and requested the individual states of Germany to do likewise. Financial backing was also obtained from the industrial corporations, an effective campaign was carried on in domestic and foreign papers which resulted in much valuable aid being received especially from the U. S. The 20 committees of experts which composed the League had to consider the requests of the research workers for appropriations. It was not the intention of the organization to give financial backing to the universities in general, but to allot varying amounts to certain scientists with the purpose of enabling them to carry on some

particular investigations. With regard to the kind of investigation, it has always been the policy of the scientists as well as the industrialists to encourage all research work, regardless of its immediate practical value.

The activity of the Emergency League was of special benefit to science enabling it to weather the stormy period of the inflation of the currency.

Judging from the indications of the recent progress toward economic recovery in Central Europe the future of science may be regarded as optimistic. This is evidenced by the relatively great number of institutions outside of the universities, devoted to highly specialized fields of research and furthermore by the scientific periodical literature of which there are 155 publications listed in the American chemical abstracts as compared with 170 for the U. S. and 90 for Great Britain. To no small extent this is due to the intense and sincere interest which the public at large takes in scientific questions; hence a favorable vote is obtained when requests are made for the appropriation of state funds for scientific purposes.