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# The Chemist, Creditor of the People

By M. F. HARROD

E find that primitive man was equipped with a rudimentary knowledge of such chemical processes as dyeing, fermentation, tanning, and the preparation and use of paints, soap, bricks, and certain drugs. Such processes had been discovered by accident and were closely guarded and handed down to each succeeding generation. To this practical knowledge the alchemist of the middle ages, in his quest for the means of changing the common metals into gold, added many facts and principles which helped greatly in forming the heritage of chemistry of today.

Modern chemistry had its origin about one hundred and fifty years ago when Lavoisier began his experiments with oxygen and hydrogen. In the century and a half since that time chemistry has become a very complex science. A little over a hundred years ago it was believed that such substances as fats, proteins, sugars, etc., could not be made artificially. Today there are about 200,000 artificial compounds that testify to the activity of the chemist.

The scope of the chemist is not limited to the preparation of new things. He is equally concerned with conserving the resources that supply the world with the essentials of life. Just as the automobile is the product of the man who understands not only the construction of valves, gears, cylinders and pistons; but also the fundamental laws of physics and mechanics governing all locomotion, so the modern chemical wonders can be accomplished by men who are masters not only of the technical understanding involved in the composition of their products, but also of the principles and laws underlying all processes of chemical change.

As with every other industry, the success of agriculture depends upon the selection and use of the proper raw materials and their efficient transformation into usable commodities. Thus the live stock industry consists of transforming vegetable proteins, fats, carbohydrates and water into milk, butter, eggs, cheese and meat. This requires the selection of foodstuffs that will enable the animal to make these transformations most efficiently. In the growth of crops the soil fertility is easily exhausted and the chemist must devise means of renewing it with phosphates, lime, nitrates, etc. After the crops are growing it is necessary for the farmer to guard against pests with insecticides provided by the chemist.

In the industries chemistry plays a great part in the conservation of resources by the utilization of the many by-products that have been obtained from coal, oil, wood, etc. Thus we get wood alcohol by the destructive distillation of wood and from this there is obtained

many such by-products as resin, formalin, etc. From wood we also get explosives, collodion, and artificial silks. From coal tar alone we get over five hundred by-products. It is easily seen that chemistry plays a part in every industry.

It has been only in recent years that the triumphs of modern surgery have been performed. The comparative safety with which the modern surgeon can handle serious cases is due to the co-operation between the physician and the chemist. The chemist has provided the hospital with carbolic acid, lysol, iodine, boric acid, and other antiseptics which render an operation no longer a desperate hazard.

Recent studies with the chemistry of foods have shown that the important principles of foods are not only proteins, fats and carbohydrates, but vitamins and other health-giving ingredients have been discovered.

The chemist has also been of service in helping to safeguard the food products which are offered us for consumption. Many harmful drugs such as opium, morphine, heroin, codeine, chloroform and chloral hydrate have been eliminated from the medicines that are sold to the public. Artificial preservatives and colors have been taken from food stuffs. Water is now filtered and purified by different chemical processes. Thus we see the value of the chemist in relation to our own health.

At present the development of chemistry needs industrial laboratories where investigations with a definite aim of supplying results to purely commercial problems, such as lowering the cost of production or developing a new alloy may be carried on. It also needs a laboratory of pure science where the investigator is primarily interested in the discovery of new principles and new facts, regardless of any practical application they may prove to have. These two types of laboratories supplement each other, for the achievements of pure science of one generation constitute the applied science of the next.

We see the necessity of thorough training for the chemist that can be supplied only by competent teachers and well equipped laboratories. The state university is the logical place for this training. There are many fields in chemistry to be developed. The theory of molecular construction, atomic disintegration as a source of energy, and many medical problems confront the chemist of today, and who can look into the future and foretell the wonderful achievements that the science will bring to humanity?

c. The practical degree of protection to be provided to avoid or compensate for such events.

We have then narrowed our action down to a decision to go ahead on the selected scheme or to call for a new panel of schemes.

I hear some one say, "I thought he said 'prompt' decision. This rigamarole would take a month."

Here are fundamental facts:

Correct decision of involved matters is speeded up by experience on kindred lines. This experience consists of having seen decisions lead to success or failure. An-

alysis enters, in recognizing whether sufficient similarity of conditions exists to insure success.

Men in responsible positions continually face the menace of slipping into the belief that their decisions are right because they make them. But physical laws are no respecters of persons and facts will be served.

Therefore, prompt and proper decision is immovably founded on analysis, and the painstaking training of the mind in analysis develops the ability to render prompt and proper decision.