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THE INFLUENCE OF CHEMISTRY ON
CIVILIZATION¹

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THE future of a country depends on the education of its youth, and the education of its youth must be in competent hands. Whoever first spoke these truisms knew his subject, for we have only to look at those countries where education is not enforced, or even easily attained, to find a country so backward that its relations with the rest of the world are stunted. In many of the countries of Europe illiteracy is universal. In Hungary, for example, we still find that the signs in front of a shop are painted pictures of the wares offered for sale, because many intending purchasers can not read, but they know that the graphic portrayal of a hammer and a saw indicates that tools are sold within. What have those countries like Roumania, Bulgaria, Bohemia, Hungary, Russia, and dozens of others, ever amounted to, and what are their commercial relations with the rest of the world, compared with Germany, France, England or the United States?

The law in the United States and England recognizes only three professions—law, medicine and theology—and long before law and medicine became professions, theology was the only profession, because only the priests and the scribes could read and write. The theologians of ancient times were the early teachers, and one of the first institutions of learning which was carried on systematically (excepting the teachings of Gotama and Confucius) was the Sanhedrin where the Mosaic and

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¹ Address by the chairman of the Society of Chemical Industry.

Deuteronomic codes were taught, and the twenty volumes of the Talmud are to-day the classics of that college of learning.

It so happened that preachers became teachers, and down to our present time we have many colleges, all over the world, where preachers are in charge and dictate the policy of the institutions.

I must not be misunderstood in any criticism which I am about to make, for I have no quarrel with any religious profession, but if we examine into the mental status, and analyze the mind of the theologian, we find that he is accustomed, once or twice a week, to preach from the pulpit, relieving his mind of opinions on questions and subjects which have been thrashed out time and again, and from the very nature of his audience, and the sanctity of the edifice from which he speaks, no one contradicts, no one argues, no one says him nay, until by that mental process with which we are familiar, he believes himself unanswerable, and takes even his glittering platitudes as facts undeniable.

Such a man placed at the head of a university where science is taught is evidently not as good as a man who has been trained to judge cause and result, and whose scientific work has been criticized by his equals, and as a comparison we have at least three large and well-known colleges that I know of—and, for all I know, there may be many more—at whose head there are, or were, chemists and scientists of distinction, and every one of these has turned out men who have given a good account of themselves. Nor do I want to except those excellent universities which are guided by literarians and other intellectually developed men other than theologians, for the success of those colleges is equal, comparatively, to those presided over by chemists. A school of medicine is best presided over by a doctor, a school of engineering by a man who is educated in one of its branches,

a military school by a soldier, and a school of theology by a minister of the gospel. Our greatest success in schools of chemistry will therefore come from the very chemists who direct their policy.

Chemistry needs no sponsor, but its effect on civilization has been more marked than that of any other science. True, it has reached out and taken electricity and physics as its aides, but withal, engineering made but little progress until steel and cement, two chemical products, were cheapened, simplified and made universal. Medicine has claimed great honors, but the masterful work done in coal tar chemistry, in the production and discovery of synthetic drugs, the discovery of anesthetics, the marvelous work done in the metabolism of matter, the excellent analytical schemes for the waste matter of the tissues, are all due to the researches of chemistry, and their civilizing influence is greatly felt.

Many a chapter has been written on the regeneration of Germany. Where once barren fields stood, so barren that food-stuffs would not grow, there have arisen vast works bristling with the stacks of factories, and thousands of commercial flowers grow where once not even a weed would flourish. And in all these plants chemists are working, controlling the products that are made, and creating new things, and for every new and useful compound more work is found, and whereas, emigration was the rule in Germany thirty to fifty years ago, and its best people left it like rats from a sinking ship, to-day many are immigrating, for it's a flourishing land which chemistry has retrieved. Germany was always poor up to ten or fifteen years ago. With one or two possible exceptions, no vast industries existed, and it had nothing to export, but to-day its exports are enormous, its people prosperous, in sad comparison to its neighbor, Austria, where

industry is making slow progress compared with Germany.

The United States is practically an agricultural country, for its wheat, cotton, flaxseed, corn, cereals and lumber are larger than its manufactures, yet it soon will lead in metals, and it is fast coming to the front in its chemical industries.

The engineer may brag of his skill, but he has done nothing greater than the pyramids, nor finer than the temples of Greece and Egypt. The monuments he has wrought in steel were given to him by the ability of the chemist to control carbon in iron, and the economic principle involved in the production of steel supplies work, puts money into circulation, and keeps the wheels turning.

If it were not for chemistry and the knowledge that has been gained in the fertilization of soils, we would have often exhausted the miles of ground which have made this country what it is, and even now the very work which is going to maintain the entire civilization is the production of nitrogen from the air, a purely chemical investigation which may be the greatest civilizing factor of the age.

Twenty-five years ago the chemist was a man who made analyses, and whose knowledge was confined to inorganic materials, and a few organic substances. To-day there are very few analytical chemists in ratio to the population, for nearly all works maintain laboratories where chemists are employed and researches are continued, so that by-products which formerly were waste, to-day are converted into commercial products.

The brewing industry years ago looked upon the chemist with considerable doubt, for the first influence the chemist had upon the brewing industry resulted in the manufacture and use of bicarbonate of soda to produce froth, and salicylic acid to prevent fermentation. It took the chemist

many years to convince the brewer that he could do without these materials, and to-day the modern brewmaster has a chemical training and conducts the process of brewing upon scientific principles.

It is only a few years ago that some of our members assembled at the grave of Priestley and marked the centennial of the discoverer of oxygen.

For a science so young, its civilizing influence is enormous, and there is no doubt that the rapid progress which it made in the nineteenth century will be outstripped in the twentieth, for the control of our foodstuffs, the application of the raw materials in the earth, and the refining of metals, create positions, give progress to a country, and help largely in the establishment of that profession in which we are all factors.

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A PROBLEM IN LABORATORY ADMINISTRATION—ITS SOLUTION

A READING of the excellent article by Professor Baskerville on "Laboratory Organization" which appeared recently in *SCIENCE*, has prompted the writer to speak of one of the difficult phases of laboratory administration and an attempt at a suitable and efficient solution of the same. This note is written in the hope that it may offer some suggestion to those working on the same general question, modified, of necessity, by local conditions.

For a number of years there has been a steadily increasing growth in the number of students taking general elementary chemistry in this laboratory, until the gross registration for the present academic year shows an enrolment of 725. For lecture purposes this number is divided into four sections of 220, 220, 180 and 105 each; for quiz into groups of 25 to 30 each. For laboratory purposes, the classes are divided into eight sections, which are accommodated in two large laboratories, each containing 126 desks of three lockers each, or a total of 756 lockers. The general