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ADDRESS AT THE EDWARD HART CELEBRATION[1]

THIS is a grand occasion, yes, that and much more! And those gathered here are happy. Especially is this true of the chemists in the audience, because it is one of their guild whose completion of the fiftieth milestone in his career as teacher, investigator, printer and manufacturer is at hand, and they proudly rejoice for

> Judge him by no more than what you know
> Ingenuously, and by the right laid line
> Of truth, he will indeed all styles deserve
> Of wise, just, good and true!

But they who've so affectionately arranged this assemblage advised the speakers of the hour to tell something of chemistry in America. Heeding this injunction—free to descant on any phase of the huge, all-embracing subject—this particular speaker, craving your sympathetic indulgence, will hie him back—pretty far back—into the past, for there are some things which "if gathered from the ashes of obscurity" prove interesting, illuminating and worth while.

The wily Subtle, in Ben Jonson's "Alchemist," shrewdly said:

> All arts have still had, Sir, their adversaries;
> But ours the most ignorant,—

True! For there were innumerable, unconscionable charlatans among the professors and practitioners of the alchemic art, whose shameful practices brought the craft into general disrepute. They were the *adversaries* of the simple, sincere devotees who had learned to scorn delights and live laborious days in search of the all-powerful transmuting agent, yet not blind to other new and marvelous changes occurring in their crude, primitive furnaces. Nor did these enthusiasts live in European lands alone. They existed here in America. We who've taught chemistry probably never knew this. We imagined that our science, freed from its early shackles of ignorance, and superstition, proudly stalked through the land untouched, untainted by those "close deeds of darkness, that shun the light!"

No, it is recorded that John Winthrop, the younger, erstwhile governor of Connecticut, living in New London, somewhere in the late sixteen hundreds, used to resort with his servant to Governor's Ring—a

[1] Address delivered on the occasion of the Edward Hart celebration at Lafayette College, October 16, 1924.

mountain in the northwest corner of East Haddam, and after spending three weeks in the woods of this mountain, roasting ores and assaying metals and casting gold rings, he used to return to New London with plenty of gold.

Governor Winthrop was an alchemist and an intimate correspondent of Sir Kenelm Digby—first alchemist in England in his day! Such is the legend on one side of the shield; turn it, and the inscription reads:

> This same Governor Winthrop—the Younger—found plenty of cobalt, which he made into smalt—used in the beautiful blue and China ware. He sought for and obtained zinc, antimony, copper, mercury and iron. Furnaces for the reduction of ores of iron were erected and operated at his command near his home in Connecticut. Winthrop cherished the desire to aid and improve the arts among the people of his Colony.

And there were other respectable alchemists scattered throughout the land now known as the United States. Indeed, they were here—or not far from here—over in the blue mountains of the Lehigh where the people were all the time dreaming of mines and sudden wealth; the German settlers particularly helping to keep the strange hopes alive. Even the farmers, having brought with them their stories of Kobolds and mountain sprites, and treasures lit, declared that in the winter night—"beneath that arch of unmoved and eternal lights"—they still heard the hill homunculi working and knocking—saw the telltale flames, but unluckily could never discover the spots where the mysterious activities described were enacted. Who knows—who dare deny—but what these activities in by-past times, occurring through this beautiful valley, were in some intangible way busy when in July, 1778, Robert Levers said that "the price of iron at Chelsea forge [right here in Easton] was 200 pounds a ton, an advance of 100 per cent. on the price paid by the State a short time previous," and informed "the Council of Easton that Bar-iron could probably be sold to blacksmiths in the neighborhood at 300 pounds a ton."

However, perhaps enough has been said of the alchemists in our land. Their memories should be cherished and passing thought, at least, be given their endeavors, for the latter are truly part of the evolution of civilization in this western world.

In 1683 William Penn, eager for the extension of the reputation of his province, wrote enthusiastically to Lord North of "the minerals of copper and iron in divers places." And, close thereafter (1698) Gabriel Thomas stated in writing that iron had lately been found which far exceeded that in England, being richer and less drossy; copper—far exceeding ours, being richer, finer and of a more glorious color, and further observed:

> Backward in the country lie the mines, which is copper and minerals of which there is some improvement made already in order to bring them to greater perfection. And they will be a means to erect inland Market Towns which exceedingly promote Traffic.

And wise James Logan, secretary of the province, had it impressed upon him

> To remember the mines which the Governor makes yet a secret, even to thee and all the world but himself and Mitchell.

These thrifty, far-seeing, worldly-wise improvers of the alchemical methods adopted to oblige mother earth to reveal her precious treasures were confronted on the way, from time to time, by annoying obstacles and hindrances. Thus, the assembly of the province was petitioned in 1723 by the proprietors of iron works to prohibit the retailing of liquor, except cider and beer, near their works to the workmen!

The picture may now be slightly changed. It is in the last two decades of seventeen hundred. Chemistry, the science, was fast gaining place. Intelligent people realized that, in the revolutionary days, it had rendered a service which could not easily be measured. Even the immortal Washington during his severest military activity had paused to test the toxicity of gases, observed issuing at frequent intervals, from creeks and rivers in which his horses and men had slaked their thirst. All the while he was alert. On the restoration of peace he studied the little industries springing up through the infant republic. Franklin, the practical, had passed on, so Washington, intensely interested and eager, sought by every means to promote the welfare of his people. Wide reading, conversation and correspondence had brought to his attention that in the darkest hours of the Reign of Terror and in the later years when France was growing into a mighty power among the nations of Europe, there was a chemist—Chaptal by name—who had executed most remarkable things; among others, the building up of far-reaching industries based on chemical principles. Chaptal's fame had extended to many lands, whose rulers vied with one another to gain his services. At the time, there were men in America who had known Chaptal personally or had learned to know him through his remarkable writings and books, bringing the new gospel which scholars proposed to offer to industry. These men it was who urged Washington to win Chaptal for America. The result of the effort is told in Chaptal's autobiography:

Finally, the celebrated Washington, then President of the United States, wrote me twice on the subject. In the first letter he made this statement: Although I am the President of the United States, I have not the power to enter into an agreement with you in regard to salary; but useful men, such as yourself, are not abandoned in my Country. Come, and you yourself will be more than pleased by your welcome.

Chaptal did not come.

No doubt there has been in every one of us the unexpressed wish that he might have been about in those early days of the republic, for there is no question that the launching of chemical industrial projects was much on the minds of the people. They were industriously engaged in making nature's products useful, and in the language of old Dr. John de Normandie:

When we want the testimony of experience, a chymical analysis is the best means of investigating the truth.

As one turns the pages of old newspapers, peering into every column and corner, facts appear which illuminate the path of our progress in civilization. Thus there came to the speaker's attention that in 1793, in Philadelphia, one John Harrison was manufacturing oil of vitriol with much success, and was also the first person to attempt the production of nitric acid in the United States. The city directory of that period reveals John Harrison, as druggist and *aqua fortis* manufacturer. But greatly encouraged by his development in the chemistry of these acids he abandoned the apothecary and drug business, so that in the directory of Philadelphia for 1806 he was set down as *chymist* at 75 North 5th Street.

America is greatly indebted to this Englishman—John Harrison—who conducted the vitriol industry with marked ability. All this led naturally to an extension of his activities into other fields of chemical manufacture, with which he had familiarized himself, and which he was enabled to do by the aid of educated foreigners such as Abraham Kunzi, a Swiss, and others. In those days this country was overrun with foreigners, some of whom had been merely laborers in laboratories abroad, with no knowledge of chemistry as a science, and whose skill was confined to their own limited routine work. However, there were men of higher character, of competent education as chemists and of much intelligence. Such were John Farr, Gerard Troost and Eric Bollman. The last of these—Eric Bollman—did a neat piece of work for Harrison, who, like others in those days, concentrated his vitriol in large vessels of glass. The particular favor done for Harrison consisted in working bar platinum into sheets more than 13 inches square, then applying those sheets to the making of a platinum still, weighing seven hundred ounces, with a capacity of 25 gallons, which was employed for acid concentration, by Harrison, for fifteen years! Bollman, a most interesting individual, was indeed a chemist. He plated copper and iron with platinum, and with ease prepared the silver-colored metallic luster or glaze for porcelain with its oxide. Our early chemical books quote him freely. His knowledge had, of course, been acquired in foreign countries. He had won his M. D. degree at Goettingen in 1794 and it was there, under the guidance and inspiration of J. F. Gmelin, the chemical historian, that he had acquired his love for chemistry, his knowledge of which was augmented by travel years in France, Austria and lands where the science was conducted by masters.

Bollman was a Dane with a powerful and versatile mind. He was a political economist and scholar. His writings on economics gave old Dr. Thomas Cooper much concern, and yet these two men were singularly alike in many respects. There was in both a turbulent, radical, revolutionary spirit. Both were members of the Convention in the French Revolution, and Bollman after banishment to this country was, in 1806, deeply implicated in the conspiracy of Aaron Burr. His complete absorption in scientific pursuits developed after coming to this land. His earlier adventurous career had afforded little opportunity for deep thought. Considering the many contributions of Eric Bollman to the infant chemical industries of this country, perfectly well satisfied that they possessed great merit and accelerated old and inspired new undertakings, one conversant in a measure with this extraordinary man's mental predilections is not shocked or even surprised, but merely intensely and sympathetically interested, on hearing for the first time that Eric Bollman and a young American accomplice actually ventured to rescue General Lafayette from close confinement in the prison into which he had been cast in Olmutz, Austria, because of his supposed connection with the insulting degradation and subsequent death of the royal family of France. The recital of this stirring event would probably weary you. But, don't forget that the chief actor was a brother chemist—one who subsequently stood among the first of our American fathers in the science. The escapade, as narrated in old journals, such as the *Edinburgh Annual Register,* is most thrilling! 'It failed, and those engaged therein were incarcerated, gaining freedom only after the intervention of Napoleon! Think for a moment—we sit in the shadow of a college whose patron saint was Lafayette, once idolized by an enthusiastic populace, raised to the chief command of his emancipated coun-

trymen; then proscribed and hunted by associates; a fugitive in a foreign land, obliged to seek an asylum amongst his enemies, after combatting for the cause of liberty under the banners of Washington, and lastly, seized as a traitor and delivered up to the Emperor of Germany, who threw him into prison, from which one of our craft, Eric Bollman, risked his all and suffered unspeakable torments, that he might set free the idol of his young manhood!

Even chemistry has had its romances.

Other pictures might easily be sketched before you. Their novelty and their display of technical skill would promptly arouse earnest thought and profound mental absorption. But they would lead us far afield. The line of demarcation between past and present would fade into nothingness, and those interested would be surprised and yet happy to hear that the War of 1812, with the commercial restrictions preceding it, caused such a scarcity and dearness of the more prominent and valuable substances, so that one may safely declare the reestablishment of chemical manufactures dates from this time (1812). Foreigners conversant with chemical procedures in German, French or English factories were among the very first to undertake these ventures. Capitalists among our own druggists engaged this foreign skill that their own works might again be brought into operation, so that ere long factories for the making of Prussian blue, Scheele's green and other pigments, and heavy chemicals were quite rapidly inaugurated; hence 93 years ago thirty chemical establishments were in operation in the United States, with an aggregate capital of $1,158,000 and an annual output valued at not less than $1,000,000. Those fostering these undertakings had heeded the injunction of the chemically wise:

> Thrust in thy sickle, and reap; for the time is come for thee to reap! The harvest of the earth and factory is ripe.

And thus runs the story of our science with its many divergent lines. We cherish it, for experience has told us "to hold each strange tale devoutly true."

And how are we to adequately express our joy at the achievements of our friend whose fiftieth milestone in the cultivation of his favorite science is now reached? We have followed him through all his years as student, teacher and industrialist. We've rejoiced in his success, known to the world, and observing his still youthful step—his keen interest and intelligence in the multitudinous activities on every side, we're sure he contemplates even greater things in the coming years. So we'll content ourself by saying—

> Press on, true soul!
> Thou wilt win the prize.
> Thou wilt reach the goal!

UNIVERSITY OF PENNSYLVANIA EDGAR F. SMITH

FIFTY YEARS OF CHEMISTRY IN AMERICA[1]

WE are accustomed to thinking of our country as young, and so it is when compared in point of years with China. Its beginnings were extremely modest and its future to those who founded it must have been very doubtful, in spite of their courageous optimism. It took years to establish even an approximately firm foothold and a great many more years to solidly establish the position. When we look back upon the work of the early comers we can not but admire their dauntless courage, their industry, their thrift, their prudence. Our whole nation was built upon these and similar virtues, and I hope it will never come to pass that the uneasy quest for what is glibly termed progress will tempt us to look elsewhere than to eternal verities for the real progress of the nation.

Our forebears with everything to do and very little to do it with recognized the supreme importance of educating their children, and very early in their history institutions of higher learning were established. As they progressed with the building of a nation, the need of education became more and more clear, and institution after institution was founded, usually with very slight means, in order that higher education should advance and be more generally obtainable. One hundred years ago, Lafayette College was thus established, and you are to-day celebrating this fact with commendable pride and exultation. The history of the college has been a splendid one and its future is assured. Its long list of honored teachers and distinguished alumni is a visible sign of the success of its work. Its influences, however, which are not visible and are not even known, can not be measured. I congratulate the college on its history and on its work.

During the last half of its life, a man has been associated with the faculty who has made his mark not only within these walls, but outside of them. It is not my purpose to go beyond my text and deliver a eulogy of Edward Hart, but I desire to add my testimony to that of many others who have known him well during that time and appreciate his faithfulness, efficiency and singleness of purpose, happily joined with a saving sense of humor. The college does well in celebrating at its centennial time the semi-centennial of this worthy man's connection with the institution.

It is appropriate in honoring this man who, during the fifty years, has been constantly teaching chemistry and adding to its theoretical and prac-

[1] Address in connection with the celebration of Professor Edward Hart's fifty years of continuous service in the department of chemistry, Lafayette College, October 16, 1924.