SCIENCE

VOL. 75 FRIDAY, MAY 6, 1932 No. 1949

SCIENCE: A Weekly Journal devoted to the Advancement of Science, edited by J. MCKEEN CATTELL and published every Friday by

THE SCIENCE PRESS

New York City: Grand Central Terminal

Lancaster, Pa. Garrison, N. Y.

Annual Subscription, $6.00 Single Copies, 15 Cts.

SCIENCE is the official organ of the American Association for the Advancement of Science. Information regarding membership in the Association may be secured from the office of the permanent secretary, in the Smithsonian Institution Building, Washington, D. C.

THE EVOLUTION OF THE HORTICULTURIST[1]

By Professor T. H. McHATTON

GEORGIA STATE COLLEGE OF AGRICULTURE

IT was at the very dawn of our modern era, if we accept the historian's division of time, that Columella wrote:

I can not enough wonder why they who desire to learn eloquence are so nice in their choice of an orator, whose eloquence they may imitate; and they who search after a knowledge of surveying and numbers look out for a master of the art they delight in; and they who are desirous of some skill in dancing and music are exceedingly scrupulous in their choice of one to modulate their voices or to regulate the motions of their bodies; also they who have a mind to build send for architects, masons and carpenters; and they who resolve to send ships to sea send for skillful pilots; they who make preparations for war call for men of war; and everyone sends for a person from the society and assembly of the wise to form his mind and instruct him in the precepts of virtue; but husbandry alone, which, without all doubt, is next to and, as it were, near akin to wisdom, is in want of both masters and scholars.

One who peruses the voluminous writings of Columella can but marvel at the keen insight he displayed concerning things agricultural and horticultural. So true was his statement that rural culture was looked down upon that this history of the very heart of Rome, this economic treatise of the times, has been pigeonholed and forgotten by the very ones who should have used its gems of living philosophy in expounding the humanities that they so loudly preach are necessary in cultivating the human mind. Even in the time of Columella, agriculture and horticulture were as teachable as any other subject of the period, but, because the luxury-loving landlords saw fit to

[1] Presidential address before the American Society for Horticultural Science.

abrogate their responsibilities and to delegate the tilling of the soil to their less intelligent servants, agriculture became a sordid occupation and man saw little in it but sweat and toil. He lost sight of that cycle of life of which the soil is the basis; and there came to pass that condition of affairs so greatly feared by our wise philosopher; that is, agriculture had indeed become a sordid occupation, and now, nearly 2,000 years later, there are still living among us those who do not yet realize that of the words agriculture and horticulture, more than half are "culture."

History is of little value except in helping one predict the future. It took men almost twenty centuries to grasp some realization of the importance of agriculture, and it has taken the greatest economic crisis in the history of our world's civilization to crystallize that realization. I sometimes wonder if the phrase that we have heard so often repeated during the past twenty years concerning the "drudgery in the home" is the forerunner of a system of thought that will cause the abrogation of responsibilities and fetter man for another 2,000 years or more.

Horticulture was an amateur calling from the days of Columella to the middle of the nineteenth century; and even yet amateurs are occasionally found among apple and pear trees, or in gardens near cabbages and carrots, sometimes on lawns near clumps of shrubs or beds of flowers from whence they peep out upon the world with bright and shining eyes filled with happiness and contentment, their voices mellowed with the love of nature and the philosophy of living. It is a pity that the age of "internal combustion" has so beset them with "ologies" that they have practically disappeared, and unless the few remaining are carefully protected, this species will soon be counted with things historic.

This benign type of individual was so common during the middle of the nineteenth century as to deserve the name "vulgaris." Ever since the days of Rome they had been on the increase, receiving something of a setback during the "Dark Ages," but after that period of depression they emerged from the monasteries and rapidly increased in number, laying the basis for the establishment of schools and trades in Europe and the development of such aggregations of congenial souls as the American Pomological Society in this country.

These early amateurs were building the foundation of our profession and producing cyclopedic writings and rule books of culture in large numbers; so also were their close associates, the general farmers, laying the bedrocks from which were to spring much of our present-day agriculture.

Let us view for a moment the situation in this country about the middle of the nineteenth century. At the end of the seventeen hundreds this nation was mainly rural and producing just about enough for its needs, exporting some tobacco, cotton and rice. Horticultural products were all home grown and had only a very limited local market. Following the invention of the cotton gin, the opening of canals, the development of the railroads and the disruption of world economic conditions through the Napoleonic wars and our own War of 1812, commerce and industry developed. Thus we find the East industrialized, the South agricultural and the free lands of the West rapidly developing into a great grain and animal section. Agriculture had gone through the stage of home consumption, and the horticulturists were catching glimpses of extensive orchards and gardens in the future. Protective tariffs had been passed and the conflict between agriculture and industry had already brought on the Civil War, and the same conflict may, in the near future, bring some other great cataclysm to this nation.

Such conditions brought rural problems to the forefront in the minds of thinking men; mayhap they sensed the great industrial-agricultural conflict that was on and caught a glimpse of its future magnitude. Be that as it may, the Congress of the United States, in the midst of national strife, legislated into being a system of education that, through the land-grant institutions, would pay its dividends during the time of peace. Thus after eighteen hundred years was the lamentation of Columella fully answered—there were to be scholars and teachers of agriculture.

If 1870 is accepted as the approximate date at which these institutions really began to function, it is only fair that some estimate be made of what horticulture was at that time. Though there had been efforts at instruction in this subject in Europe and a few in America, the handling of it had been along apprenticeship lines; the teaching of a trade by rule of thumb, based upon a literature consisting of calendars and catalogues of varieties. Professional horticulturists, if we might call them that, were really managers of estates, or florists and gardeners about large centers of population. There were many amateurs and some several nurserymen also interested in the subject purely as home projects.

When one realizes that at the time of the passage of the Morrell Act botany and zoology were still in the systematic stage; bacteriology had not yet been born; genetics was still philosophy; and organic chemistry, though a lusty infant clamoring for recognition, had made little impression in learned circles; that physics had progressed mechanically, but the realms of heat, light and electricity largely remained unexplored; that the biochemist, the biophysicist, the

soil scientist, the phytopathologist, the entomologist and many others had not yet come into being; it is easy then to understand the attitude of the academic mind when horticulture and other allied agricultural subjects were raised to the dignity of a college curriculum. Such subjects were not teachable in universities, as they were not based on well-organized information and backed up by a literature centuries old—besides, they were merely trades and had no right to academic standing.

In the main this was largely true and was reflected in the organization of institutions with standards considerably below those set by the humanities. In the older states, already supplied with higher education, these new colleges were established separately; in others, they were connected with the budding university, and in still others they were destined to be the hub around which great institutions were to develop. In the beginning, they all had the ideal of preparing artisans in horticulture. The students were to go back to their orchards and gardens, increasing their production and bettering the living conditions throughout America. It was natural that such ideals should prevail, as there were really no well-established, well-understood horticultural facts; science had not, as yet, removed our profession from the realm of astronomy.

Things did not happen, however, as anticipated; departments rapidly expanded and demanded these trained artisans as teachers, and gradually there developed a different ideal of horticulture. The period of 1870–1890 was one of great activity in our field. The constant search for well-established facts and their organization into a body of teachable matter developed above all else the great fact that little was known. So noisy was the clamor for definite information and its dearth so apparent, not only in horticulture, but along all agricultural lines, that the Hatch Act found its way through the hoppers of Congress and gave us a new ideal of what a horticulturist could be.

Between 1890 and 1910, many more things happened to change our ideas of horticulture. The public still expected the product of the college to be an artisan, while the colleges themselves, the experiment stations and the rapidly expanding national Department of Agriculture recognized the demand for experimenters, teachers and scientists. The amateur was rapidly disappearing. There was, of course, still a lot of interest in the production of quality fruit about the homes, but the development of refrigeration and the railroads, into what we then considered rapid transportation, reorganized our industry. Extensive orchards spread themselves throughout California and the South; the vast vegetable fields of Texas and of Florida had begun to pour their out-of-season products upon the markets of the East. The experiment stations had amassed an enormous number of facts and the inquiring minds of the profession were asking questions that were vitally more fundamental than the date of planting or pruning. The sciences had taken hold of horticultural problems. Pasteur, Koch and others had conjured bacteriology into being. The problems of evolution had become things of every-day discussion. Botany had slipped from its classification era into embryology, physiology and more basic discussions. At the beginning of the century the work of Mendel had been resurrected from dusty archives, and horticulture was launched into its economic and scientific being.

In academic centers science was fighting the humanities for its place in the sun, and it was during this era that there came into being that new species called the "pure scientist," unsullied and untouched by practicality, but willing enough to use the public monies, appropriated so that science could render more productive and remunerative the basic industries of the nation. It is well to remember that the scientists who have written their names across the pages of history have been those who had advanced mankind and relieved humanity of its burdens. They are honored in direct ratio to the advancement civilization has received from their discoveries. All science is pure: it matters not whether it is digging into the sewers of a great city or studying the elusive perfume of a spotless lily.

During this period, the Adams Act came into being. We then found ourselves launched upon definite scientific studies, and, if we look back upon this time, those of us who were in it can well remember the trials and troubles we had in organizing experimental work upon a scientific basis. To my mind the passage of the Adams Act was one of the most beneficial things that has happened to the profession of horticulture as a whole. This act again changed our ideal of a horticulturist. The experimenter had become a scientist even more than a fruit grower, and for a while we laid away the idea of simple demonstrations, but this was not long, for it was realized that valuable information was not getting back to the farms where it could be profitably used and the Smith-Lever Act was the result.

This was rapidly followed by the Smith-Hughes Bill; a response to a demand for farmers and fruit growers on the soil which it was finally seen could not be met by the colleges, as estimates show that a large rural state requires in round numbers 4,000 new farmers annually. These acts brought into being other species of horticulturists, namely, men

with scientific training and practical ability who could teach in secondary schools or by demonstration in the rural districts and thus get back to the country information that it really needed. Also during this period of 1910–1920 the commercial horticulturist came to the forefront. He was found with railroads, spray companies, fertilizer companies, machinery companies, marketing organizations, and the like.

Since 1920 specialization has increased, and with the passage of the Purnell Act the economist has become important, injecting into our already complex organization other demands. Industry, in its selfishness and under artificial stimulation, had turned the United States from a rural into an urban nation, and the great industrial-agricultural conflict had practically throttled farming in its various forms before a realization was attained that the power, wealth and balance of trade of this country were in reality dependent upon the products of its soil and the labor of its rural population, which had for decades been producing against an impenetrable barrier of protection, for other interests, and forced to sell in open competition on the markets of the world. Is there any wonder that since 1920 the economical production and handling of our horticultural products have become prominent in our thoughts? The horticulturist can look with pride upon the fact that of the brotherhood of agricultural subjects his was the first to realize the importance of coordinating individual effort in projecting better methods of handling farm commodities; and, out of this experience of more than a quarter of a century, there should come to him the realization that he is better able to maintain himself under stress of modern conditions than other members of the rural fraternity; even though his advice has neither been sought nor listened to in the formulation of schemes and the passage of legislation intended to control the immutable laws of economics. It is a great pity, my friends, that money is not endowed with brains as well as power.

THE GEORGE EASTMAN RESEARCH LABORATORIES FOR PHYSICS AND CHEMISTRY

By Dr. KARL T. COMPTON

PRESIDENT OF THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY

THE new research laboratories of physics and chemistry, which are now nearing completion at the Massachusetts Institute of Technology, are built in the belief that these fundamental sciences are destined to play an even more important rôle in our civilization than they have played during the past, for not only do they underlie all branches of engineering, but they are necessary to that sympathetic understanding and appreciation of modern life which is so important a part of present-day culture.

These laboratories are devoted entirely to advanced instruction and research and embody the most approved features, together with numerous new features of laboratory design. Briefly stated, these features are: rigidity and freedom from vibration; flexibility and completeness of electrical service; flexibility of internal arrangements; unusually adequate shop, lecture room and departmental library facilities; and provision for encouraging, in a cultural and artistic setting, social contacts among staff and students.

The spirit and purpose of the laboratories are typified by the three marble panels which are set into the limestone walls just above the main entrance to the laboratories. To the left, which is the chemistry side of the building, is a medallion taken from a block medal showing the head of the young scientist, Jacobus Henricus Van't Hoff, discoverer of the important principle of molecular asymmetry, which is represented on the medallion by two tetrahedra, one the reverse of the other. To the right, which is the physics side, is a medallion of Sir Isaac Newton with an inscription epitomizing his three laws of motion. Between these two panels is a third containing a Latin quotation from Vergil, which may be translated literally as follows: "Happy is he who has been able to learn the causes of things and has cast beneath his feet all fears and inexorable Fate and the roar of greedy Acheron."

GENERAL ARRANGEMENT OF THE LABORATORIES

On entering the building, which is about 300 feet long and five stories high including basement, the chemistry laboratories are found on the left, the physics laboratories on the right, and in the center of the building are found successively, going from basement up, the shops, switchboard, generator and battery rooms, main lecture room, directors' offices, class rooms, departmental library, reading room and social room. Connecting with the physics side of the building is the special new spectroscopy laboratory of unique design for convenience, freedom from vibration and temperature control. This spectroscopy laboratory, which is now in use, is to be described separately in another article.