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THE DUTY OF THE AGRICULTURAL COLLEGE[1]

A QUARTER of a century ago the sort of education for which the Kansas State Agricultural College stands was in its experimental stage. Its right to a place among the well-directed efforts of our people was seriously questioned.

That in this brief period these agricultural and mechanical colleges should completely break down opposition, allay prejudice and come into a commanding position, was beyond the hope of even their most ardent advocates.

"The influences which were set in motion by the passage of the Morrill Act have already developed a new education."[2] President Schurman, of Cornell University, recently characterized the founding of the land-grant colleges of America, through which universal industrial education was made possible, as the third and perhaps the greatest epoch in the educational history of the world.

The impress of these institutions upon the systems of education has been no less important than that upon the industries themselves. From the very beginning the instruction in the mechanic arts and engineering was successful, and the men engaged in these industries were quickly brought to a realization of this fact and accepted in full confidence the college-made engineer.

[1] Inaugural address of Professor H. J. Waters, on the occasion of his formal installation as president of the Kansas State Agricultural College, Manhattan, Kansas, November 11, 1909.

[2] President W. E. Stone, semi-centennial celebration of Michigan Agricultural College.

While in the public discussions leading to the establishment of these colleges, agriculture received chief attention, yet when they were organized few students applied for instruction in this subject, and for many years little impress was made upon the farm practises of the country. It is, in truth, only within the last decade that a system of instruction and research has been developed and perfected that is shaping the policies and destinies of this, the oldest and most important occupation of man.

It was one of the most fortunate circumstances connected with the creation of these colleges that the act of Congress bringing them into existence was comprehensive enough with respect to their purpose and objects to admit of the teaching of a wide range of subjects. The comprehensive charter with which they were vested permitted of extensive experimentation in courses of study, a wide adaptation in subjects taught, arrangement of courses, methods of instruction, etc. Untrammeled by tradition, they were free to make experiments in the subject matter taught, as well as in the method of teaching it.

Broadly speaking, there has been assigned to this class of colleges, in the natural division of labor, the great industrial problems of our people, including the development and conservation of the material resources of the country, as well as the great economic and sociological questions affecting the industrial classes.

As interesting as the history of the development of these colleges is, and as rich in history as this particular member of the group is, on an occasion like this a glance into the future is perhaps more appropriate, for it is there that our problems lie.

COMPETITION IN EDUCATION

The American ambassador to Great Britain recently facetiously referred to our educational system as America's chief industry. In other ways it is frequently suggested that in this matter the rate of growth has been out of proportion to our development in other directions and beyond our real needs.

Of the eighteen million children in the graded schools in the United States to-day, less than a million, or less than one in twenty, will ever matriculate in a high school or an academy. Moreover, of the nine hundred thousand pupils in the secondary schools, only about two hundred thousand will be enrolled in our colleges and universities, or approximately one out of every four.

It requires, therefore, approximately eighty pupils in the grades to supply one college or university student. Less than one in five of these college and university matriculates graduates. Therefore, over four hundred graded school pupils are required to furnish one college graduate.

Of more significance than all this is the fact that seven out of every eight of the boys and girls of the United States leave school between the fifth and sixth grades and go out into a world of splendid opportunities without the training and intellectual power to enable them to take advantage of these opportunities.

It would not seem, in the light of these facts, that there was much serious competition in education. In fact, it does not appear that we are doing very much to break down human ignorance and overcome human prejudice.

TAKE THE COLLEGE TO THE PEOPLE

While it is of paramount importance that the college give thoroughly sound instruction to the young men and young women in residence, it is equally true that its activity must not end here. More and more must the college be carried to the people. At best but a small proportion of

those who should avail themselves of its advantages can leave home.

Farmers' Institutes.—This phase of the college work, as it affects the farmer, is already well organized and bringing splendid results. Through the farmers' institutes, farmers' conventions, instruction trains, demonstration farms, etc., the whole state is being reached. It is expected that the representatives of the college will this year come into personal touch with fully seventy-five thousand farmers and farmers' wives, or more than one out of every three farmers in Kansas. It is possible that it will soon be found necessary to offer courses in agriculture and home economics of varying lengths in different parts of the state, to accommodate the increasing demand for instruction in these subjects on the part of those who can not leave home.

Outlying Experiments.—It is not sufficient to conduct experiments at Manhattan and Fort Hays and call the problems finally settled in accordance with the teachings of these results. Kansas is a large state, with a great variety of soils, and great variation in rainfall and in plant and animal adaptation. As soon as funds for this purpose can be provided and the work so organized that it may proceed in each case along lines that are fairly certain to yield profitable results, there should be instituted systematic tests or experiments in every county in the state. This will be found profitable not only because of the exact information secured, but by reason of the greater confidence which the farmers will have in the results, because they were secured under conditions which they recognize as identical with their own.

Then, these experimental fields may also serve an exceedingly valuable educational purpose, by being so planned that they demonstrate some point in agricultural practise of especial importance to the community in which they are established.

Farm practise is developing at so rapid a rate and so many methods are being found to succeed well under one set of conditions and not under another, that for the individual farmer to try, at his own expense, all that good judgment indicated might be worth trying, would mean that his farm must become an experiment station instead of a business enterprise. It is, therefore, the business of the state and federal government to put these things to the test for him, and under conditions closely approximating his own.

State Surveys.—For the first time in our history, we have become interested in the conservation of our resources. A young nation, like a young person, is proverbially profligate of its resources. Ours has been a waste of the resources of soil and forest and stream that is without parallel in the history of the world. This waste has been largely due to improper systems of farming, and can not continue another century without bringing ruin to America's basic industry. Under the teachings of institutions like this, larger returns may be secured without depleting the soil than are now secured under a system of land spoliation. This is a matter of concern not only to the landowner, but to the whole of society, since the future welfare of our cities and factories and churches and schools is directly dependent upon the returns from the farm.

We are now in a frame of mind to consider methods of checking this waste. The first step is to take account of stock. The Kansas landowner needs to know what types of soil he has, what amount of plant food each contains, to what each is best adapted, and how it may be managed to yield the largest return without having its productiveness diminished. The college

should at once organize a state soil survey, and push it towards completion as rapidly as the facilities provided by the state and federal government will permit. This is fundamental to all agricultural progress. Later, surveys of special industries or crops should be instituted, to determine upon what types of soil and under what conditions they are succeeding and under what conditions they fail, that it may form the basis of researches to point out the way to make them successful under all conditions.

A corn and forage plant survey, to extend the boundary of successful farming still further westward, is an enterprise in which this state can well afford to engage.

Conserving Water Power.—These efforts should not be limited to agriculture. A series of investigations and experiments looking toward the conservation and utilization of the water supply of the state, for the purposes of both irrigation and power, is a duty which the college owes to the public. There are doubtless many localities in which sufficient power could in this way be developed to supply the needs of farm and village within the radius of twenty or more miles. In many other places hydraulic power could be developed sufficient to furnish light and power for from one to a dozen farms.

The loss to crops from improperly distributed rainfall in this state is enormous. In many places water could be economically stored during the wet seasons, to be used for irrigation purposes when the rains fail. In other localities, the underground supply of water might be profitably utilized by a proper method of pumping.

The protection of life and property against floods is a matter of serious importance, and commends itself to our favorable consideration. Water purification and sewage disposal are as yet unsolved problems for the greater proportion of the state.

Tests should be carried on to determine the draft and efficiency of farm implements with the expectation of establishing standard designs for the different conditions of soil.

Kansas produces gas, oil and coal in large quantities. Much of this has been wasted in the past and is being wasted under present conditions. A series of tests conducted on a commercial scale will do much towards establishing standard methods for the preparation and use of these materials.

The gasoline engine will, for some time to come, be the principal prime mover for small units in this state. The cost of gasoline is constantly increasing. Under present conditions denatured alcohol can not be used economically. Investigations that will lead to methods of manufacture of denatured alcohol at a low price, and to methods of producing gas from Kansas coal successfully, will do much to extend the use of this type of engine and to cheapen the cost of power.

THE COUNTRY ROAD

Of more importance than all of these is the country highway. We have, through long use, worn out the natural roads, and have not yet found a successful substitute. Through the recently created department of public highways of the college, however, it is expected that we shall be able to educate the people concerning the importance of this matter. Moreover, through this means the college is now pointing out the most satisfactory way of maintaining earth roads, imparting information in regard to the best systems of permanent culverts and bridges, and as rapidly as the people of a community will assume the cost, will supervise the construction of permanent roads.

At all times the people have been found

ready to pay taxes for permanent public improvements, if they are confident that the money will be judiciously expended. It is through careful supervision by the experts of the college that the ordinary mistakes of the planning and construction of these highways and bridges will be avoided.

PRODUCTION AND DISSEMINATION OF IMPROVED PLANTS AND ANIMALS

The colleges of agriculture must lead in plant and animal improvement. A plan of improvement instituted by an individual is seldom carried beyond his lifetime. In a college, if well managed, a program of improvement may be carried forward without interruption for many generations, indeed indefinitely. It will be highly profitable for the state to encourage the more general use of better farm crops and live stock, by disseminating these improved strains, through the college. Already a large impress has been made upon the agriculture of Kansas, in both plants and animals, and experiments are now in progress which it is confidently expected will yield even more important economic results.

THE EXPERIMENT STATION

The primary function of the experiment station is to extend the domain of human knowledge. It has been the chief factor in creating agricultural knowledge. It was the experiment station which won back to the college the confidence of the farmer, which confidence had been forfeited for lack of ability to lead him.

It is the experiment station which has supplied the teacher with accurate and well-organized knowledge to impart in the class room. It has been the experiment station which has provided the way for these institutions to become real leaders in the realm of agriculture and has exerted an influence upon agricultural practise that is epoch-making.

It is an admirable work to turn out young men trained for leadership on the farm and capable of going among farmers as teachers of correct systems of agriculture, or to lead young men who come to the college to a better knowledge of the subject; but, after all, the greatest work these colleges have to do is to equip men with the proper knowledge and the necessary inspiration to advance the world's knowledge and to supply these thousands of teachers with something to teach.

It is, therefore, a fundamental mistake to assume that the duty of the experiment station is solely or even principally to benefit the farmer directly. A larger responsibility rests upon it—that of making an exact science of agriculture, so that it may be successfully taught in the colleges, the high school, the graded school, the farmers' institutes, and on demonstration farms.

The value of research is not limited to the industries. It is the very life of a teaching institution such as this. It gives point to the instruction. The teacher who is an investigator is a live teacher; no man can long keep alive as a teacher and not conduct researches.

RESEARCH TO ENCOURAGE MANUFACTURES

But research in these institutions has been restricted to too narrow a field. Little attention has been given to problems other than production problems. The effort has all been in the direction of making two blades of grass grow where one grew before; or of increasing man's efficiency with this or that machine. The time has come when its influence should be materially extended. The wastes of a rural community are not all to be found in the processes incident to production. An equal waste occurs in the marketing and utilization of the materials produced.

The investigations should, therefore, include agricultural manufactures and the

utilization of the wastes on the farm. Factories should be developed in the country, near the sources of production, for the preparation for final consumption of the materials grown on the farm. Such factories are necessary for the highest degree of economy in the production of food and to give the laboring man an opportunity to gain a livelihood outside of the congested city. Foodstuffs are already too high to stand the strain of the additional cost of transporting the raw materials long distances in order that they may be manufactured into edible form, then shipped back to the consumer in the very community in which they were grown, and where their manufacture might have been accomplished to better advantage.

In countries where the raw materials of our foodstuffs are chiefly grown, there they should be chiefly manufactured. Kansas wheat should be milled in Kansas. Just as the experiment station has made a profound impress upon the methods of farming, so may it improve the methods of manufacturing the products of the farm. The millers of the state need just such scientific assistance as the station can provide, all with a view not so much to helping the miller directly as to improving the quantity and quality of the foodstuffs garnered from the Kansas wheat fields.

THE ECONOMICS OF MARKETING

Such vital questions as how to dispose of the products that they may yield the largest returns, or how to spend the income so as to bring the best results in the highest sense, have been practically neglected.

To correct this one-sided development and meet this larger demand, the department of history of the college should be so strengthened and enlarged as to cover, both by instruction and by research, the industries of our country. The department of economics should be prepared to fully cover the range of transportation, manufactures, marketing, etc., as they relate to the farming and industrial classes. The department of sociology should deal with the life of the people in the open country and in the districts supported by the industries, and be able to suggest plans for their immediate and permanent improvement.

The department of architecture should make a large impress upon the homes and public buildings of the state, and upon the location and arrangement of the accessory buildings that they may conserve the strength of the housewife, afford the sanitary conditions essential to health and add to the comfort and pleasure of country life.

AMERICANS LIVE WASTEFULLY

Americans, poor and rich, live wastefully. This can not continue. A new basis must be established which shall, while avoiding the extreme care and economy of continental Europe, which destroys initiative and kills pride, stop the major wastes in our system of living.

But of more importance than mere economy of living is the influence of the environment and method of living upon the race. Will out of it all in the long run come a strong and virile race of people—a race capable of meeting the complex problems of the future and advancing still further our civilization?

It is especially appropriate to emphasize this point in the institution which, among the land-grant colleges at least, has been a leader in this line, and which to-day boasts the largest and perhaps best equipped department of domestic science and art in America.

As much, however, as has been done in this direction here and elsewhere, and proud as we have a right to be of the record of this college in this direction, real

work has been hardly begun and we scarcely realize what this great movement means and what will be its future development. Certain are we, however, that it means something more than the mere teaching of young women how to sew and how to cook. It has involved in it the whole question of home building and the rearing of a strong and virile race of people. The dream of the ancients, a strong mind in a sound body, is thus beginning to be realized. But we have only just come to take this view of the matter and have scarcely begun work on this broad basis. Times are strangely out of joint when we justify the extensive scientific inquiries into the way to rear a strong and vigorous race of pigs or sheep or colts or cattle, and are content with the very meager knowledge which we possess of the nutrition of men. We have millions for research in the realm of domestic animals, and nothing for the application of science to the rearing of children. Exhaustive studies are made upon the life histories of animals of the lower orders, while vital facts in regard to the life history of our children remain a sealed book. We know how the *amœbæ* develop, but are content to remain in ignorance of what factors contribute to the development of a strong body and a sound mind in mankind. For centuries we have let the injunction "Know thyself" go unheeded, and have forgotten that "The greatest study of mankind is man."

For every dollar that goes into the fitting of a show herd of cattle or hogs or into experiments in feeding domestic animals, there should be a like sum available for fundamental research in feeding men for the greatest efficiency. The Kansas State Agricultural College ought to take advanced ground here, and build up the greatest institute of research in human nutrition in the world. The federal government should be interested and cooperate with the state and community in matters of this sort.

THE EXODUS FROM THE FARM

It is common to lament the tendency of the best men and women to leave the farm and go to the city as a modern or present-day tendency, whereas it is as old as civilization itself.

Plutarch in his "Præcepta Politica" protested against the threatening invasion of large cities; Cicero thundered against the depopulation of the rural districts through similar attractions to those which draw young men and young women from the farm to-day. Even Justinian, the great law maker, was in favor of legislation designed to keep the people on the farm.

The great Roman Emperor Augustus before the Christian era saw that his empire was being undermined and the strength of his people sapped by the exodus from the country to the city, and called to him the poets of the nation and commanded them to sing of the beauties and profits of country life, in order to attract his people back to the land. This trend cityward has been to a great degree due to the half education which has prevailed in the rural districts and which has given the farm boy glimpses of the more attractive city life without teaching him at the same time how he may attain such a life at home.

For the first time in history this situation is sought to be met by making a profession of farming, so that it may be attractive to the intellectually strong, at the same time that the returns are large enough to command the reasonable comforts and luxuries of life. These countervailing influences, however, will be found to be inadequate unless they strike at the very root of the difficulty—the farm home, the country road, the rural school and the country church.

VOCATIONAL SUBJECTS IN THE PUBLIC SCHOOLS

This means that vocational subjects must be introduced into the courses of study in the grades and in the high schools, as well as in the colleges and in the universities. So rapidly and so fully has instruction in vocational branches been developed, that the best and cheapest places to learn farming or stock raising or dairying is now, not on the farm, but in a college. The horse doctor has been displaced by the college-trained veterinarian. The place to learn to sew and to cook and to build and manage a home is, not in the home, but in a college. The period of apprenticeship of the machinist has been supplanted by a course at college, and the employers of engineers no longer look elsewhere than to the colleges for this training. But gratifying as all this is to us, we must realize that at best the problem of bringing industrial education within the reach of the masses, and this is the great problem, is very far from being solved. In the nature of the case, but a small proportion of the people can attend college. It has already been pointed out that less than a dozen of every thousand pupils in the graded schools go to college. When we consider that these twelve are divided among the various courses offered by our colleges and universities, such as academic theology, law, medicine, teaching, journalism, agriculture, engineering, etc., we realize how small a proportion of the boys and girls of the country really come under the influence of this sort of instruction when it is confined to the college. To reach the masses with this work, it will be necessary to introduce it into the high schools and grades the country over. In the city schools, home economics and manual training, with agriculture optional, and in the country schools, home economics and agriculture, with manual training optional.

To the objection that these subjects, especially home economics and agriculture, of a character suited to the grades and high schools, are not yet teachable, I urge that they are far more teachable than were these same subjects of college grade twenty years ago, and that if we will apply ourselves to the problem of reducing them to pedagogical form with the same zeal and determination that characterized the efforts of the college teacher, equally satisfactory results will be forthcoming.

To the objection that the teachers are not prepared, I answer that the demand for teachers so prepared is all that is necessary to fully meet this difficulty.

INDUSTRIAL SUBJECTS IN HIGH SCHOOLS FIRST

Success will come first in the high school, and next in the grades, for the same reason that it came first in the college. The high school to-day must be something more than a mere connecting link between the graded school and the college or university. It is more than the successor to the academy with the burden of support laid upon the public. It is in the strictest sense the people's college, and affords the highest education that the majority who go beyond the grades will ever get. It should do something more than merely fit for college the great masses who will never attend college; it should fit for the duties of life.

Already the city high schools have reached a fair degree of development in this direction, and the trend towards the industrial and vocational has been as rapid as could be expected or as is perhaps desirable. Their courses of study are already reasonably well adapted to the needs of the people who live in the city. It is a serious mistake, however, to pattern too closely after these city high schools in planning to meet the needs of those who live in the country. Careful consideration

should be given to the pupil's environment and experience as well as to his probable future occupation.

AGRICULTURE IN THE RURAL SCHOOLS

This is the next great educational problem. In fact the rural school to-day, considered broadly, presents the most serious educational problem with which we have to deal. How to shape the instruction in this unorganized, isolated and poorly equipped school so that the pupils may not lose sight of the farm, its life, its problems, its beauties, and its profits, is the great question now before us. The hope of these schools and of our system of public education lies, not in the abandonment of these country schools, not in the attempt to substitute something else for them, but rather in making them serve their constituency in the best way and contribute most to the development of the boy or girl who is fortunate enough to have been born in the country.

The problem does not consist in the long run wholly or even mainly in finding a suitable teacher, although this is perhaps for the moment the limiting factor in progress.

As Professor Bailey has well said:

> If a room or a wing were added to every rural school house, to which children could take their collections and in which they could do work with their hands, it would start a revolutuion in the ideals of country school teaching, even with our present school teachers.

In short, our rural school system needs to be so revised that from the very outset the courses, to quote the words of a distinguished English educator, "shall be woven around knowledge of the common phenomena of the world. . . . For it should be the purpose of these elementary schools to assist boys and girls according to their different needs to fit themselves practically as well as intellectually to the work of life."

I do not wish to be understood, in quoting the foregoing approvingly, to advocate the making of the graded or high schools narrow or provincial. Nor would I permit these schools to become in any sense professional—except possibly the last two years of the course in a first-class high school. This might appropriately be made as severely professional as the funds for providing the additional teachers and equipment would permit.

INDUSTRIAL SUBJECTS WILL VITALIZE

The benefits to accrue from the successful introduction of agriculture, home economics and manual training into the schools will not be confined to the direct influence which this instruction may have upon the industries involved, but this will be found to be the best way to vitalize elementary schools, and especially those in rural communities. Just as these useful subjects gave new life to our college courses, so will they be found capable of vitalizing the elementary courses.

TRAINING THE TEACHER

As before intimated, the lack of suitably trained teachers for this work is temporarily the limiting factor in our progress. Where the teacher shall receive his training, and of more fundamental importance, of what it shall consist, are questions not yet answered. Thus far no very satisfactory place for securing this training has been provided. A number of agricultural colleges of the country are offering courses in agriculture, etc., especially for teachers, and these in the main have been successful.

Congress recently recognized this lack in our educational system, and provided, in the Nelson amendment to the Morrill Act,

that a portion of the increased support thereby given the colleges of agriculture might be used for "providing courses for the special preparation of instructors for teaching the elements of agriculture and mechanic arts."

Whether experience will in the end show that the normal school, with agriculture, home economics and mechanic arts added, or the agricultural colleges, with sound courses in education added, will best meet this situation, or whether it may not indeed become expedient to employ both methods, I will not at this time hazard a guess. We are all, I take it, more interested in having this work done and done well, than in the question of where or by whom it shall be done. Certainly there are many people now teaching who desire to equip themselves to teach agriculture. These naturally would be best served by courses at the agricultural college.

EXPERIMENTS IN TEACHING INDUSTRIAL SUBJECTS

To my mind, there can be no question as to the propriety and profitableness of establishing at the agricultural college, where agriculture, home economics and mechanic arts reach their highest development, and where there is the greatest interest and enthusiasm in these subjects, systematic investigation of the methods of teaching these subjects of a grade suitable to the requirements of high schools and rural schools. A sort of pedagogical experiment station for the systematic study of these and kindred problems is no less important than are agricultural experiment stations, to study questions relating to corn and wheat growing and the raising of live stock, and no less logical than engineering experiments to study questions in relation to bridges, highways, sanitation, etc.

KANSAS'S OPPORTUNITY

Much as we may deplore the lack of suitably prepared teachers to introduce these vocational subjects into the schools of the rural districts, and much as we may feel the lack of adequate knowledge and experience along this line, the really fundamental difficulty in the way of a satisfactory system of rural schools, primary and secondary, is the lack of sufficient funds. Wealth in rural communities is not sufficiently concentrated to afford the revenue necessary for this purpose. In many portions of the country the returns from the farm are so meager as to scarcely permit the schools to be maintained on their present low plane. The farmers of Kansas, however, are prosperous—perhaps more prosperous, on the average, than the farmers of any other section of the world. They therefore owe it to themselves, to their less fortunate neighbors, and to their profession, to give of their means in sufficient amount to develop the most efficient system of rural education the world has known.

FARMER OR PEASANT

It is not primarily a matter of increased financial return, but has involved in it the future welfare of America's agriculture. Further advancement must be based upon the increased intelligence of the man who is to till the soil, together with his better understanding of the fundamental laws of nature with which he has to deal.

If the American farmer is to prove an exception to the history of the world and remain the independent, thinking, reading, progressive individual that he has thus far been instead of becoming a peasant, as he has before in all history, it is necessary that he be given the broadest possible training, and be educated most thoroughly in the fundamental principles underlying his profession.

THE INDUSTRIAL AND THE CULTURAL MUST GO TOGETHER

It is said that an ancient and honorable university once wrote over its portals: "No useful knowledge taught here." I would not go to the opposite extreme and write over the portals of even this institution—the child of a strictly utilitarian age—the legend: "No subject that is not useful taught here." I would make all the courses practical enough to fit men for efficient service in their several professions and pursuits of life, and at the same time liberal enough to prepare them for the highest service as citizens.

The best part of an educational institution is its spirit—is the point of view which it gives its students—the ideals which they carry away from its halls and through life, for of more worth than fine gold is a quickened conscience and a capacity to distinguish between what is right and what is wrong.

A high ideal is the noblest gift man can bestow upon man. Feed a man, and he will hunger again; clothe him, and he will become naked. Give him a noble ideal and that ideal will abide with him through every waking hour, giving him a broader conception of his relation to his fellows. The ideal must be so far above us that it will keep us looking upward all our lives and so far in advance that we shall never overtake it.

Those whom we send out must make a large contribution to the welfare of the world.

GREAT TEACHERS MAKE A GREAT SCHOOL

We point with a pardonable pride to our splendid group of buildings, the broad expanse of fertile soil which constitutes the college farm, the improved plants and animals, boasting of both a distinguished lineage and an honorable career, to the shops and equipment of laboratories and libraries, to the new athletic fields and gymnasium in immediate prospect, and to our other material possessions, and unconsciously make the sum of these, the college.

It is, however, the teacher who determines the worth of the school. We have no means of measuring the value of a great teacher. It was in the musty law office of John Wythe that Thomas Jefferson studied, as did also one of the greatest judges that ever sat upon the supreme bench, John Marshall, and also the greatest orator that ever electrified an audience in his period of the world's history, Patrick Henry. John Wythe was himself chancellor of Virginia, and a great man, but great chiefly for the men he made.

Given a good teacher, and locate him in a cellar, an attic or a barn, and the strong students of the institution will beat a path to his door. Given a weak teacher, and surround him with the finest array of equipment that money can buy, and permit the students to choose, as in the elective courses, and his class room will echo its own emptiness.

A poor teacher in a German university, where all subjects are elective, is a matter of comparative indifference, but in an institution such as ours, where the courses of study are fixed, to keep a poor teacher year after year and require hundreds of young men and women to waste their time in his classes, is little short of a crime.

Economy in teachers' salaries is false economy, and will quickly react upon the institution and upon the state. Low salaries mean cheap teachers and low-grade work. The twenty-five hundred or more students who come here annually to secure an education have a right to demand the best. To lose our best teachers the moment we have developed them to a high degree of efficiency, because we can not meet the salary paid in kindred institutions is deplorable in the extreme. Or to secure good teachers and so load them with work

that they can not render the most efficient service is an equally poor policy.

It should be the business of those entrusted with the administration of a college to secure the best men available, supply them with such facilities as will make them content, and then have the wisdom to let them alone.

WORLD LEADERSHIP REQUIRED

Large and important as is the service this institution has rendered to the industries of the state, and great as are the problems of this sort for the future to solve, the service of greatest moment, the principal return which the Kansas State Agricultural College and similar institutions make for the large outlay of public funds —the real justification for their existence —is their capacity for developing in men and women the qualities of leadership. The public mind does not grasp and successfully grapple with great fundamental principles, but is apt to concentrate itself upon some detail—of one sort to-day, of another to-morrow. It is essential that we have leaders of public thought who see broadly and clearly, for, as Mirabeau says, "It is equally as important for those to be great thinkers who are to execute the laws as for those who made them." Homer realized the scarcity of such men, and, as given us by Pope, said:

Too few and wondrous few has Jove assigned
A wise, extensive and all-consid'ring mind;
They are guardians, these, the nations round confess,
And town and countries think their safety blest.

Situated as we are, in the very center of the largest expanse of fertile land the world has, with a climate neither so warm as to weaken nor so cold as to dwarf, but the climate which has produced the most virile and progressive races of people—the races which have in all recent history dominated the world, no one can foretell what the future holds. Certain it is that here will be the greatest concentration of population and wealth. Here all things for which we are striving must reach their highest development. No longer will it be necessary for us to look to the east or to Europe for inspiration and guidance in education, in engineering, in agriculture, in how to live rationally. In very truth, the men of the east and of Europe will come here to learn. This means that the men of to-morrow, the young men who are now in school, must assume larger responsibilities than have devolved upon us—the responsibilities of world-leadership in the entire range of human affairs. It is imperative therefore that our systems of government, education, agriculture, manufactures, etc., shall be such as to withstand the severest test of science and human experience in order that they may furnish a rational example and guide for those less blest.

COLLEGES MAKE LEADERS

In the absence of a great epoch or crisis in human affairs, such as the opening up of a new continent, the invasion of a country by a foreign foe, or an internal strife such as our recent civil war, the college and university must be depended upon to develop the world's leaders in all lines of activity. The state and nation, to make certain that every youth with latent qualities of leadership may have within his reach, be he poor or rich, the uplifting and stimulating influence of the highest education the world affords, did establish and endow this and kindred institutions. It is upon this basis only that our civilization can be secure. No class of people, however large, cultured, or refined, is large enough, or intellectual enough, or refined enough, to supply all the leaders the state and nation require. It is only when all are drawn from all classes that we shall have enough, and be certain that we have

the best. It is as Carlyle has said of the tragedy of ignorance:

> It is not because of his toils that I lament for the poor; we must all toil, or steal (howsoever we name our stealing), which is worse; no faithful workman finds his task a pastime. The poor is hungry and athirst; but for him also there is food and drink; he is heavy laden and weary; but for him also the Heavens send Sleep, and of the deepest; in his smoky cribs a clear dewy heaven of Rest envelopes him, and fitful glitterings of cloud-skirted Dreams. But what I do mourn over is that the lamp of his soul should go out; that no ray of heavenly, or even of earthly knowledge should visit him; but only in haggard darkness, like two spectres, Fear and Indignation bear him company. Alas, while the Body stands so broad and brawny, must the Soul lie blinded, dwarfed, stupefied, almost annihilated? Alas, was this, too, a Breath of God, bestowed in Heaven, but on earth never to be unfolded?—That there should one Man die ignorant who had capacity for knowledge; this I call a tragedy were it to happen more than twenty times in the minute, as by some computations it does. The miserable fraction of Science which our united Mankind, in a wide Universe of Nescience, has acquired, why is not this, with all diligence, imparted to all?

Mr. President: Assured as I am of the loyal support and cooperation of the board of regents, faculty, students, alumni and citizens of this great state of Kansas, at the same time realizing the full weight of its responsibilities, and conscious of my own limitations and weakness, and pleading for both charity and patience, I accept the high office of president of the Kansas State Agricultural College. May He who marks the sparrow's fall take us all into His keeping and guide our thoughts aright.

PHYSICS TEACHING IN THE SECONDARY SCHOOLS OF AMERICA[1]

WE understand the present fully only in the light of the past. Hence, if we would grasp the meaning of the present situation so clearly as to be able to see the way out, we must first study the history of science teaching in America.

Mathematics has had a long and an honorable academic career. But the natural sciences are relatively new as subjects of formal instruction in schools. Although physics appears to have been taught to freshmen at Harvard for two fifteen-minute periods a week as early as 1670, the sciences do not appear on the list of subjects required or accepted for entrance to college until the year 1870, when Harvard added the elements of physical geography to its list. Physics appeared in 1876. The demand for popular and useful studies had led the academies to introduce the sciences of geography, natural philosophy and astronomy early in the nineteenth century. The colleges did not recognize these, however, till about fifty years later.

When we remember that the academies were founded in response to a popular demand for an education that should train boys and girls so that they might be useful members of the community, we see: (1) That the sciences were brought into the schools for their practical utility; (2) that the colleges followed the schools in their recognition of the value of science after an interval of about eighty years, and (3) that science was introduced into the schools in response to a demand on the part of the people who supported the schools and in spite of the colleges.

In order to make clear the subsequent development, I shall consider largely the subject of physics, partly because physics has been more prominent in the schools; partly because I am better able to follow its changes with sympathy; and also because I believe that the history of physics is typical of that of the other sciences. Let us then glance at the methods of teaching physics in 1876 when that science

[1] Address delivered at the conference of the University of Illinois with the secondary schools of Illinois, November 19, 1909.