The M. A. C. Record.

VOL. 6. LANSING, MICHIGAN, TUESDAY, JUNE 25, 1901. No. 38.

The Baccalaureate Sermon.

The exercises for commencement week were opened by the baccalaureate sermon, which was delivered Sunday, June 16, at 3:30, in the Armory by the Reverend David R. Breed, D. D., Professor in the Western Theological Seminary, Allegheny, Pa.

The platform which was decorated with bunting and palms, was occupied by a double quartette under the charge of Mrs. Marshall, the speaker, President Snyder, and the Reverends Geo. F. Plummer, R. C. Dodds and J. H. Pound. After the seniors had marched in and taken the seats assigned them, the following programme was rendered:

Voluntary; Gloria Patri; Invocation, the Rev. R. C. Dodds; Anthem, "Daughter of Zion," Lowell Mason, double quartette; Scripture Reading, the Rev. R. C. Dodds; Prayer, the Rev. J. H. Pound; Anthem, "Hear My Prayer," Sudds, Double Quartette.

Then followed the sermon. Doctor Breed chose for his subject, "A Working Theory." He began by congratulating the graduates upon the completion of their College course. He said that they must have some guiding principle, some working theory that would be of practical service to them in their life work. He took for his text 1 Timothy IV, 8; "For bodily exercise profiteth little; but Godliness is profitable unto all things, having promise of the life that now is, and of that which is to come." Here is found, the speaker said, a good working theory. It is a vicious heresy that only a few can rise to the top.

"Men at some time are masters of their fates.
The fault, dear Brutus, is not in our stars,
But in ourselves, that we are underlings."

In this quotation from the great major poet is found the true philosophy of success. There are three ways of becoming great, the speaker held, and these are by luck, by inheritance, and by achievement. To trust to luck or opportunity would not make a good working theory. So many who trust to luck forget that the opportunity goes for nothing unless it can be taken advantage of. Trusting in advantages of birth for success would not make a good working theory.

There remains but one way then to win success and that is to achieve it. Dr. Breed then discussed various theories for the achievement of success. He said that to rely on brains for the achievement of success is to adopt the worst possible working theory. It is bad on the man who has not any brains, and upon the man who thinks he has brains. The worst failures have been men who had great brains. Washington was not a genius; he was a success. Napoleon was a great genius, but a miserable failure.

Intellect without godliness is useless. Godliness is the first element of the working theory. It is more than negative; it has power, real power—physical, mental, moral. The reason for this is that moral elements are intellectual. Intellect is the biggest part of brains; and morality is the largest part of intellect. "The fear of God is the beginning of wisdom." It is foolish not to fear God. If one is wrong morally he is wrong intellectually. The foundation of business success is credit and credit is a moral quality. Painstaking labor, the speaker said, is the only sure way to success. If a man cultivates godliness and has the fear of God he is independent of opportunity. Frequently the best opportunity is the lack of opportunity. Look at Moses—an exile, deprived of the opportunity of residence in his native land; the opportunity came to him to be the founder of a nation and the mouthpiece of God. Paul lost the opportunity to become the greatest lawyer in Jerusalem, only to have the opportunity to become the apostle to the Gentiles. The lack of opportunities made Abraham Lincoln's early efforts failures; but these failures led him to study law and opened the way to his later great successes.

Godliness has promise for the life that now is. The life that is to come is incomparably the more important. For that life the working rule of godliness has great promise. We must have a working theory that will pilot us safely into the harbor of our heavenly home, as the speaker saw the little tug "Hazel" piloting the great steamer "Northland" into the harbor at Traverse Bay. If we have such a theory, then we may hope, in the words of Tennyson, to "meet our Pilot face to face when we have crossed the bar."

The congregation then sang the hymn, "Jesus Shall Reign," and the Reverend George F. Plummer pronounced the beautiful benediction from the Episcopal service.

V. E. B.

Meeting of State Board of Agriculture.

The regular meeting of the State Board of Agriculture occurred June 19–20 and 21, with all members present.

The long delayed reorganization of the Board resulted in the re-election of all the old officers for the two years ending Feb. 22, 1903, viz: Hon. T. F. Marston, Bay City, President, Hon. C. J. Monroe, South Haven, Vice-president, A. C. Bird, Secretary, B. F. Davis, Lansing, Treasurer.

Contracts were awarded as follows: Military uniforms, to Morgan-Puhl & Morris, Detroit. Bituminous coal to the General Hocking Fuel Company, Columbus, O. and Castner, Curran & Bullitt, Chicago. Anthracite coal to A. B. Knowlson, Grand Rapids.

Prof. Mumford was authorized to purchase for the Farm Department one team of horses, one Shorthorn bull, one Aberdeen Angus bull, three Hereford cows, two Gurnsey cows, two Ayrshire cows and one Jersey cow.

The resignation of Hugo Diemer, Assistant Professor of Mechanical Engineering was accepted to take effect August 1st.

The following resolution was adopted: That the Board favors and requests exhibits at the coming State Fair at Pontiac from such departments as will best show the work done at the college: the extent and manner of such exhibits to be left to the heads of the respective departments exhibiting.

The following repairs were authorized: Finishing refloooring of Wells Hall in hardwood. Changing system of electric wiring in Wells and Williams Halls. Improvement of outside electric wiring. Repainting and repapering College Hall throughout. The outside painting of hospital and Station Terrace. Erection of stand pipes on dormitories for fire protection.

The following resolution was adopted: That all College lands now out of the market and which have been reappraised shall be immediately placed on the market; and that the College land agent be instructed to finish the reappraisal of College lands at the earliest possible moment.

The roster of employees for the College year beginning September 1, 1901, was adopted.

Edward Fauver of Oberlin, O., was elected to the position of Director of Physical Culture to begin September 1, 1901.

The Secretary and Prof. Weil were instructed to investigate the subject of elevators for women's building and report same at next meeting of the Board.

By resolution $42,000 from the surplus in the land grant interest fund on June 30, 1901, was set aside as a special fund for building and other extraordinary purposes.

The degree of bachelor of science was conferred upon the thirty-eight members of the graduating class.

The degree of master of science was conferred upon Dick J. Crosby, class of '93, M. A. C. and William T. Shaw, B. S., '99, University of Minnesota.

President Marston and Mr. Monroe were appointed as special committee in connection with permanent State Fair exhibit.

On motion the rebuilding of two wings of the greenhouse was decided upon.

$7,500.00 was apportioned for repairs to buildings during the fiscal year beginning July 1, 1901.

Adjourned.

The President's Reception.

Dr. and Mrs. Snyder gave their annual reception to faculty and students on Thursday evening, June 20, at their home, 1 Faculty Row. The house was tastefully decorated with ferns, palms, and cut flowers. Bristol's orchestra, hidden away behind a screen of palms, dispensed sweet music during the evening. Mrs. Snyder, assisted by the ladies of the faculty, received the guests, a number of whom were from Lansing and from out of town. In the dining room, which was lighted by dainty candelabra, ice cream and cake were served by some of the young women students. In the parlor stood a bowl of delicious punch which was much appreciated during the evening. The evening passed most pleasantly, and seemed to be enjoyed by everyone present.

Commencement Exercises.

The forty-eighth annual commencement exercises of the Michigan Agricultural College occurred in the Armory, Friday morning, June 21, 1901, at ten o'clock. The candidates for degrees, headed by President Snyder, the commencement orator, and the faculty, marched in and took seats on the platform, while Miss Hannah Bach played an appropriate selection on the piano. The Rev. George Humphrey of Adrian, father of a member of the class, pronounced the invocation. The following program was then rendered:

Piano trio, "Imps and Sprites at Work," *Holst*, Misses Smith, Armstrong, Wright.

Oration, "Power," W. W. Wells, mechanical course.

Oration, "Technical Science in its Relation to the Home," Miss Fleta Paddock, women's course.

Oration, "Justin Smith Morrill," N. A. McCune, agricultural course.

Vocal solo, (a) "A Lesson from the Violets," *Marks*; (b) "In Springtime," *Fesca*, Miss Hadley.

Address, "The Personal and National Benefits of Education in Applied Science," Prof. J. B. Johnson, C. E., University of Wisconsin.

Degrees were then conferred as follows:

BACHELOR OF SCIENCE

J. GUY ALDRICH	RALPH M. LAURY
FRANKLIN A. BACH	L. BAYARD LITTELL
[illegible]	[illegible]
HUGH P. BAKER	NEWELL A. MCCUNE
ROY L. BROWN	ROBERT S. NORTHRUP
GEORGE E. CHADSEY	ROY M. NORTON
JOHN F. COATS	FLETA PADDOCK
ARTHUR J. COOK	FRED L. RADFORD
HARRY J. ECSTACE	CHARLES P. REED
ALICE M. GUNN	GEORGE SEVERANCE
GUSTAVE GUTEKUNST	VERNON M. SHOESMITH
CELIA A. HARRISON	J. HACKLEY SKINNER
ARTHUR H. HAYES	JOHN R. STEWART
GEORGE C. HUMPHREY	HORACE T. THOMAS
MARK L. IRELAND	GORDON E. TOWER
DON B. JEWELL	WALTER W. WELLS
CHARLES W. KAYLOR	GEORGE D. WHITE
SAMUEL J. KENNEDY	ROSWELL A. WHITNEY
MARY S. KNAGGS	VESTA WOODBURY

MASTER OF SCIENCE.

WILLIAM T. SHAW DICK J. CROSBY

The Personal and National Benefits of Education in Applied Science.

Abstract of Commencement Address by Professor J. B. Johnson, Delivered at M. A. C., June 21st, 1901.

INTRODUCTION.

The beginning of the twentieth century marks the most significant era in the world's history. Westward the star of empire has coursed its triumphal way until West and East have come together in a life and death struggle the end of which cannot be foretold. Wholesale corporate production, also, has swallowed up nearly all individual capital and enterprise, and has captured the world's markets by the greater perfection and the diminished cost of the products.

In South Africa the attempt of a medieval Christian people to shut out from their beclouded land the wave of nineteenth century progress has proved as futile as it was foolish. Progress is in the air, and as the air, it engulfs the globe. Nature does not more abhor a vacuum than she does permanence of form. What ceases to change and grow ceases to live. Even the rocks of the eternal

(Continued on second page.)

THE M. A. C. RECORD.

PUBLISHED WEEKLY BY THE

MICHIGAN AGRICULTURAL COLLEGE.

EDITED BY THE FACULTY,

ASSISTED BY THE STUDENTS.

SUBSCRIPTIONS SHOULD BE SENT TO THE SECRETARY, AGRICULTURAL COLLEGE, MICH.

SUBSCRIPTION, - - 50 CENTS PER YEAR.

Send money by P. O. Money Order, Draft, or Registered Letter. Do not send stamps.

Business Office with LAWRENCE & VAN BUREN Printing Co., 122 Ottawa Street East, Lansing, Mich.

Entered as second-class matter at Lansing, Mich.

For various reasons THE M. A. C. RECORD is occasionally sent to those who have not subscr'bed for the paper. Such persons need have no hesitation about taking the paper from the postoffice, for no charge will be made for it. The only way, however, to secure THE RECORD regularly is to subscribe.

Record Staff.

HOWARD EDWARDS,
VICTOR E. BROWN,

August Frey, of the Adelphic Society.
W. S. Merick, of the Columbian Society.
T. G. Phillips, of the Eclectic Society.
Miss Grace Lundy, of the Feronian Society.
G. C. Humphrey, of the Hesperian Society.
Geo. E. Ransom, of the Olympic Society.
D. D. Porter, of the Phi Delta Society.
Miss Clare Dean, of the Themian Society.
H. E. Young, of the Union Literary Society.
George Severance, of the Y. M. C. A.

Communications and other matter pertaining to the contents of the RECORD should be sent to Howard Edwards, Editor of the RECORD.

Resolutions.

WHEREAS, It has pleased our Heavenly Father to call to his last rest, Norman, the son of our honored Professor, Dr. Edwards; and

WHEREAS, The departed was an esteemed member of the class of 1903; be it

Resolved, That we his classmates, do extend to the bereaved parents our heartfelt sympathy; and, be it further

Resolved, That a copy of these resolutions be placed upon the class records.

S. B. HARTMAN,
MAY KYES,
RAY R. TOWER,
Committee.

Commencement Exercises.

Continued from Page 1.

hills are changed to clay and are dissolved in the surrounding seas. To attempt to scotch the wheels of progress, therefore, is but to invite destruction. One must "accept the universe" as it is and make the best of it. And our social world is changing with such marvelous speed it is almost bewildering to the most progressive races. It is with the greatest difficulty that these can keep the pace, while the less progressive nations are being left absolutely behind. A little slowing up of one people, therefore, is now equivalent to losing the race. We think we are driven to death already, but the gait is ever speedier, and if our lives become shorter in years they will be ever longer in accomplishment. If we can but find pleasure in our work, then the greater the work the greater the happiness. And why should we not find pleasure in our work? Never before were so many interesting problems opening up for solution. The most stimulating and soul-satisfying experience in the world lie in the overcoming of difficulties and in the solution of new problems. And these problems come trooping upon us. They are of all kinds — material, political, commercial, social. When in the past has the politics of every country been whole-world politics as it is today? It is no longer an American question, or a European question, or the Eastern question — it is a world question with which statesmen of all countries are having to deal. In business, also, the field of operations is no longer the town, or city, or state, or nation; it is the whole inhabited globe. And socially our problems are no longer purely domestic; they include the whole human race. Such questions as the relation between labor and capital; the relative rights and duties of the sexes; the control of business corporations; the rights of property and of inheritance; the inherent rights of man; whether the people shall support the state, or the state the people; the resort to arbitration in place of war, both between nations and between smaller aggregates of men; the right of a more progressive nation to control and direct the destinies of a less progressive one; these and many more such questions are not peculiar to any one country, but are world questions of almost equal interest in all countries. The number of such problems now crying for solution in the political, in the commercial, and in the social field is almost legion. And are we preparing to meet and to successfully solve them?

It is well to remember that wisdom is not a matter of destiny. Neither is it a matter of inheritance. "It cannot be gotten for gold, neither shall silver be weighed for the price thereof." Let us therefore contemplate for a moment some of the essential elements of strength on which this nation must rely in the frantic race she has now set for herself and henceforth will be forced to run.

INTELLECTUAL ACHIEVEMENT.

First, I will place *intellectual achievement*. By intellectual achievement I do not mean a mere trafficking in other men's intellectual wares. I mean *intellectual production*. We need men and women who can be trusted to think for themselves on these great questions. Clear sight must precede wise action. We must realize the divine significance of a fact, and hence must be able to recognize a fact when we see it. We must be tremendous doubters. Most things which pass current for truth are the flimsiest falsehoods. We believe what we wish to believe, or what we are too indolent to question. We should train ourselves to scientific thinking and reasoning. The scientific methods of investigation should be applied to all questions alike. This can only be done by those schooled in the use of such an instrument. Modern education should be at least three-quarters scientific. To "see straight and to think clear" on all questions is not a natural gift. It must be cultivated. Few people know what science is, and fewer still are schooled in its methods.

Most persons seem to think that a science may consist of organized or systematized anything. Thus astrology, alchemy, palmistry, phrenology, were all in turn regarded as sciences, but are so regarded no longer. These all consisted in organized or systematized coincidences, assumptions, and theories, and we are not wanting in many modern systems of belief, quite as fanciful and groundless as these, but which are parading in the garments and adopting the terminology of science. That cannot be knowledge which is not true. Science includes, therefore, only what is known to be true. This suggests Pilate's query, "What is truth?" I admit that in nearly all human affairs so-called truth consists in the highest attainable probability. When one thing is to us more probable than any other alternative we can think of, most persons would say I believe this to be true. This may serve very well on which to base an opinion, if we must indulge ourselves in such luxuries, but it hardly answers the demands of science.

Again we must distinguish between qualitative and quantitative truth, or science. To say that all matter is mutually attractive is to state a truth, and a scientific truth, but it is a truth we could do nothing with. It is qualitative only. But to say that all bodies attract each other with a force which varies directly as their masses and inversely as the squares of the distance between their centers of gravity, is to state a quantitative truth which can be used as a tool of investigation and analysis. This is the law of gravity which Newton discovered.

On the other hand, scientists are constantly challenged by their literary friends to explain the essence of things as well as the laws in accordance with which the essence manifests itself. Thus, they say what is this force of gravity you talk so learnedly about? What is light, and heat, and electricity? What is the medium known as the impalpable ether which pervades all space and which transmits this light and heat without absorbing it? What is the mysterious life principle which causes every plant and animal form to produce its kind with such marvelous exactness, times without number? And, finally, what is the mind itself and where does it reside? From whence came it and where is it to go? These and an unending series of like questions we cannot answer, but must we hence admit that there is no science of these things? By no means. While we freely admit our ignorance as to the essence, we boldly proclaim our knowledge of many of the laws of being and of the manifestation of these secret substantial and spiritual forces. And this is quite enough to know, for most practical purposes. So rapidly as the knowledge of a subject can be generalized into laws, therefore, it becomes scientific, even though there remain whole realms of unknown and undiscovered truth still enshrouding the same subject matter.

This new knowledge is now coming to us with marvelous rapidity and from sources which increase in number in a geometrical ratio. This scientific knowledge has been turned also to such practical account in a thousand ways, and miraculous marvels follow each other in such rapid succession, that the average man finds himself dazed and his reason almost dethroned by daily observing the accomplishment of what but yesterday he had thought impossible. He is like Alice in Wonderland, quite ready to believe any improbable thing, if it only wear the garments of science. In this way only can we account for the extreme credulity, not to say gullibility, of this the greatest scientific age the world has known. To the average citizen all things are possible, and they only await the coming of the scientific magician to discover the trick by which the thing may be done. The very language used in describing the latest fake, if it be only an unknown tongue, will be accepted and adopted as properly accompanying the hitherto unknown forces of laws. In fact the greater the fraud, and the more mystifying the language, the easier it is to deceive the wary capitalist. From these facts we should conclude that the greater the possibilities of a given agency, the greater the necessity to determine its limitations.

While it is well to know something of the best that has been thought and said in the past, we must beware of limiting ourselves to this pleasing sipping of the stored honey of all past ages. It induces mental dyspepsia. This is the education of the Chinese. He studies only the sayings of his ancestors. His face is always backward, and hence he never goes forward. If the acquisition of a knowledge of the best that has been thought and said by our ancestors is wisdom, then the educated Chinaman should be the wisest of men. The western world starved over a thousand years on this sort of scholasticism. Europe had nothing else throughout the middle ages, and nothing came from it but stagnation. New truth and ever more new truth is the only nourishing food on which a people can grow. And this is *intellectual achievement*, and it lies at the very basis of all progress, and hence of all national prosperity. And as scientific education trains one in the perception and use of facts, and in the ability to separate the true from the false, so we can plainly see today that national progress is directly measured by the prevalence of scientific training in education. The three nations in which science enters largely into the school training of all children are Germany, America and Switzerland. In France the popular educational methods are shaped only to the passing of certain state examinations, and so have largely lost their vitality. In England the masses are practically uneducated, and in such schools as they have science finds little or no place. The notorious inability of the English generals in the present war to realize a situation not cognizable by their sense of sight, is but one of the thousand illustrations of the almost entire absence of the faculty of the imagination in the English mind. This ability to perceive the invisible is a distinctive product of a scientific education. Both England and France are relatively dropping behind other nations, and in the opinion of many this can be traced to their methods of education, while Germany, America, and Switzerland are all forging to the front. This is because these countries contain so many citizens who have learned what to do and how to do it. There are, however, many ways of acquiring an education in the realities of the world, besides going to school. The American pioneer has probably acquired this knowledge of things as they are, and has learned what to do and how to do it more effectually than any other class of men in the work. He has also learned self-reliance and has developed a tremendous amount of private initiative. He stops at no task, however impossible it may seem to others. He has achieved a continent and created a nation. As compared to a mere man of books, he is a giant in all matters which

give strength to a nation. I cannot stop here to insist on the absolute necessity which rests upon every man and woman who aspires to serve as a significant factor in society, in any capacity, to cultivate at all times and on all proper occasions, a clear and forcible style of expression in conversation, in formal address, and in written composition.

MORAL UPRIGHTNESS.

I have placed clearness of mental vision before *moral uprightness*, not because it is more important, but because it is more fundamental. The mind must perceive the right before the conscience can enforce it. This field of moral education and training belongs to the teacher and minister alike. As a teacher I am convinced that the education of children and young people should be largely occupied with the eternal verities. And this again means a training in the exact and natural sciences. A hypocritical scientist it is impossible to even conceive. How can a sophist or a hypocrite be a searcher after truth? This passion for the true, whatever it may be, and regardless of preconceived opinions, is the peculiar and dominating characteristic of all scientific investigators. What more wholesome moral atmosphere in which to raise a child? The boy who has acquired a passion for any line of scientific study can safely be trusted to follow his bent. He will come to no harm and is likely to come to something great and good.

As many of the traditions of religion fail and fall, the eternal truths of science will take their place, and we shall build on this sure foundation a new religion and a more rational and just morality which will be to nations a bond of union instead of a perpetual flame of discord and disruption, as religion has been in the past.

MATERIAL PRODUCTIVENESS.

Following intellectual achievement and moral uprightness, I will place *material productiveness* which results from our modern scientific achievements. Here on the threshhold of the world's workshops, we are struck at once with the magical transformations which have been effected in the methods of production. The skillful mechanic, who with great manual dexterity, and with a complete knowledge of his art, fashioned a product from the raw material to the finished state, is no more. His like is no longer found outside of Asia; these workers who entirely made up the guilds of former centuries, and who were the pride and glory of Europe in the renaissance, were first reduced to the performance of single manual operations, the complete product being then the work of many hands, and finally, with the introduction of the automatic and labor-saving machinery of today, they have become mere overseers and tenders of such machinery. As we walk through any great modern factory, therefore, we see not manual workers, but machine attendants. But let us not make the very common mistake of supposing that these men and women, or boys and girls, are mere automatons, or animated attachments to the machines they operate. This is the mistake our literary and clerical friends nearly always make. They deplore the age of steam, wind, water, and electricity, and of labor-saving and automatic machinery, and sigh for the good old days when the blacksmith was the only worker in iron; when the wheelwright and the cabinetmaker did all the work in wood; when the shoemaker and the saddler were the workers in leather, and when their grandmothers had added to their other labors the spinning, weaving, and making up, by hand, of all the family wardrobe. These workmen, by laboring from twelve to sixteen hours a day, at small wages, managed to earn only enough to provide the bare necessities of life. But the steam engine and multiple production has now changed all this. Not only has the slavish muscular toil been graciously lifted from off our industrial workers, but the wearing and anxious care formerly placed upon all such workers in order that they might bring their work up to the requisite standard of exactness, has also been taken over by mechanisms which not only never tire but which will turn out a million pieces exactly alike. The attendant upon such a mechanism, charged only with keeping it in order and well supplied with the raw material, has time and opportunities, yes, and the necessary stimulus, to engage in profitable study and invention. The very complexity and the marvelous ingenuity displayed in the machine itself is a perpetual challenge to the operator to comprehend its construction and to improve its accuracy or its output. In place of a more or less degrading physical toil we now have for these workers a most wholesome combination of physical and mental exercise which is peculiarly conducive to mental self improvement both in the workshops and also when the day's labor is over. The shop conditions were in fact never so favorable to mental effort out of hours as they are today, and the industrial worker was never before so well provided with self-helps.

SCIENTIFIC EDUCATION THE BASIS OF MATERIAL PROSPERITY.

But you ask how has this wonderful industrial revolution been wrought? How comes it that the 19th century marks a far greater industrial progress than all the untold previous centuries combined? By what newly discovered species of magic has the world been so transformed that our revolutionary fathers would not recognize the planet if they were allowed to revisit it, but would insist they had been transported to some other celestial sphere? There can be but one answer to these questions. The industrial revolution is but one of the many fruits of the scientific progress of the century. The sciences here involved, also, are those relating to inanimate matter. Mathematics, physics, chemistry, mechanics, geology, mineralogy, metallurgy, these in their multitudinous ramifications have, in their applications to the arts, transformed the world. While chance or accident, or a blind empiricism has often led to important discoveries and inventions, the successful development of industries based on these is always a matter of the scientific application of means to ends. As a rule, however, the scientific laws and principles have resulted from long and patient scientific research, on the part of our pure scientists, and the utilization of these industrially has been gradually developed by a class of men whose peculiar business it is to bring the materials and forces of nature into the service of man. These men are known as civil, mechanical, electrical, mining and chemical engineers. The discoveries of our pure scientists, followed up by the inventions of mechanics and engineers have together wrought these wonderful marvels. And as the prevalence of science teaching has brought a progress of science which is ever at a swifter pace, so the now widespread technical instruction in this country in bringing our industrial progress along by leaps and bounds. But the greatest economy of production in any line is only attainable by the most scientific methods. The prevention of wastes, the utilization of by-products, the saving of labor, the increase of the output, the perfection of workmanship, the purity of the product, all these are scientific and engineering questions which find their most successful solution in that country in which are to be found the greatest number of pure and applied scientists. *Scientific and technical education is today the foundation of all material prosperity.*

THE APPLIED SCIENTIST.

And now a word as to the type of man who is our main reliance in this industrial evolution. It is not so much the pure as it is the applied scientist. The discoveries of the pure scientist are common property the world over. We can avail ourselves of a scientific law discovered in Germany as well as though it had been announced from Harvard, or Columbia, or Johns Hopkins. But to utilize these laws and discoveries in actual industries requires an applied scientist to be on the ground. It is the engineer, or applied scientist, therefore, to whom we must turn in the progress of our industries, and hence we will now consider what qualities and accomplishments he must possess, in contradistinction from the pure scientist, in order to fully meet the requirements of the position.

To the applied scientist that only is food, or is prized, which can be shown to be capable of serving useful ends. It is his business to select from the pure scientist's store of universal truth such as he can use for particular purposes.

Our applied scientist must have free and intelligent access to the great storehouse of established truth. He must not only follow the progress of science in one field, but in every field in which he undertakes to practice; he must therefore be a constant student. Our applied scientist must know also how to do things. This is the knowledge the mechanic has. In learning his trade he has learned the fruits of the world's experience in doing things.

Again he must know what needs to be done. To know this he must be a man of affairs. He must be acquainted with the ways of commerce and trade, both at home and abroad. He must foresee the needs of the immediate future. He must know the difficulties and hindrances of present methods before he can provide remedies. He must also be an economist. He must know the cost of things and the wastefulness of present methods before he can determine whether or not it is worth his while to invent new ones. In fact he must know as much as possible about how the world now does its work if he is to facilitate matters. This kind of knowledge also the pure scientist does not possess.

But what else must our applied scientist have and be? He must have largely developed in him *sine qua non* in the profitable solution of all new problems,—invention. This seems to be one of nature's gifts. It can be cultivated, however. It is this faculty which suggests the various possible ways of accomplishing a given thing. From this knowledge of affairs our applied scientist sees what needs to be done. His invention suggests a hundred ways to do it. It unconsciously runs to and fro throughout his mental storehouse of acquired facts, both of science and method, and brings to his attention all the possible ways of accomplishing the results.

Thus we see our applied scientist is at once a student of science, a mechanic, man of affairs, and an inventor combined in one. Nothing short of this will fill the bill. Being a scientist only, he knows not what to do or how to do it. Being a mechanic only, he knows particular ways of doing a given series of things, and he is sure to give you of his little store, whether it serves the purpose or not. Being an executive man he sees what ought to be remedied, but he knows not what to put in its place or how to accomplish any desired end. He probably gets a "practical man" to come and do something but the chances are very much against this something being the best thing, or the thing which should have been done. Being an inventor, without the knowledge of either the scientist or the business man, is indeed a misfortune.

To fit a man for this high calling our technical schools are established. They put a young man in the way of becoming what we have here described. He there learns the elements of a series of sciences and their applications which it is absolutely necessary for him to know. If he precedes or accompanies this training with a considerable amount of laboratory and shop practice, such as is now given in all our leading technical schools, and if he also spends his vacation at such work, he learns something of the practical applications of scientific knowledge and the mechanic's art. Supplementing this with a knowledge of the business world and of men, cultivating a pleasing address but schooling himself to the strictist honesty of motive and act, both with himself and towards others, he becomes favorably known. If in addition to these he remains a constant student, and possesses a sufficient amount of invention, he should ultimately become the Applied Scientist *par excellence;* such a man could safely be consulted in the solution of new problems, and this is the special field of the applied scientist.

THE ACHIEVEMENTS OF PURE AND APPLIED SCIENCES.

When we ponder on these marvellous achievements of one short century, mostly by a crude empiricism in applying the discoveries of science, what may we not hope for from the endless future with an intelligent direction given to the labors of those who seek to garner the fruits of all science and not to know the law but to control its operation, to harness the very laws of nature to the car of human progress?

THE BLESSINGS OF MATERIAL WEALTH.

While material progress and pros-

perity are not the highest good, they bring the conditions which make the higher life possible. You cannot develop a man spiritually until he is supplied with the comforts of life and has leisure in which to cultivate the spiritual graces. Let us also not be afraid of too much material prosperity. We are learning the generous uses of wealth. Wealth is more and more being turned into channels of popular scientific and industrial education, and this education in turn leads legitimately to greater wealth and also to a greater interest in the high things of this life and to lessening interest in the selfish, and sensuous, and fashionable, and frivolous, and idle amusements of life. *In fact, this education in the physical realities of life is the only form of education which will surely win the interest of the man of business and of affairs as against the counter attractions of money-making and money-spending.* When the passion for yachting and horse-racing has been supplanted by a passion for developing the resources of nature, and for discovering new truth and applying it to the ever increasing needs of modern society; when the love of personal display and the desire to excel one's neighbors in a vulgar show of wealth has been supplanted by a love of the true and beautiful in nature, which leads of necessity to a higher appreciation of the true and beautiful in life; when, in short, the lower, narrower, and more selfish interests of the wealthy class have been replaced by those higher and more altruistic interests which come only with a broader education along lines which appeal to their natures and their tastes, then and then only, will wealth become a fruitful means to righteous ends. In such hands there cannot be too much wealth. In that day it may be hoped there will be no idle rich, and that wealth will be used and not abused.

THE LIFE OF SERVICE.

The following was addressed directly to the graduating class:

Finally, to clearness of mental vision, to moral uprightness, and to material prosperity, we must add a spirit of self-education to such public and private service as we find ourselves able to perform. Verily, he that would save his life will lose it, and he that would lose his life in the larger life of his family, his community, his state, or his nation, will find it returning to him an hundred fold. Honesty is no more the best policy than is that of disinterested service. Even as a means of self-advancement there is no ladder by which one may climb so fast or so high, and certainly which is so absolutely safe and sure, as that of service to others. Society pays its debts, but it is slow to advance a loan. Make society your debtor, but without claim for reward, and every man and woman becomes your friend and well wisher. This service to society must be sincere and disinterested, however. We must lend our services, "hoping for nothing again." If our service is but a piece of shrewd speculation on our part, if we expect to return and claim our own with usury, it is hypocritical and is soon recognized as such. Such service is barren of benefit either to the server or to the served. A disinterested service, however, is always rewarded, though sometimes the debt has long to run. This is the kind of service on which the nation must rely. This alone is patriotism. We must support the government by every means in our power, without hope of reward. Not "What is there in it for me?" but "What is there in me for it?" should be our query. Without such citizens no nation can long survive.

Even in the matter of paid service one must always do *more* than his duty if he looks for rapid advancement. The rate of advancement is directly measured by the service rendered your employer over and above what you are paid for. The young man who is constantly balancing his wages against the labor performed fails of promotion and soon joins the ranks of the discontented.

And now you will all ever continue, I am sure, to be students as well as workers, and the greatest good fortune I can wish is that you may all lead lives of great service to your families, to your communities, to your state and to your nation, because therein only lies the road to happiness.

My thesis is, therefore, that we have fallen on critical times, and there is need of the clearest heads and of the stoutest hearts. The world is moving at a rapidly accelerated speed. A nation's life today is not assured by its rate of progress. Our past achievements have been more providential than personal. Our future as a nation will depend more on our wisdom, on our moral uprightness, on our scientific competency, and on our disinterested service than it has in the past. To this high service, therefore, are we called. With a clarified vision to distinguish the true from the false; with a singleness of purpose in seeking the true and the good; with a wide dissemination of a knowledge of what to do and how to do it; and with a self-dedication to the service of society and hence of the state, we may all become, in our several fields of labor, national benefactors.

Power.

We are continually pointing with pride to the achievements of our inventive genius as shown in our labor saving machinery, and indeed the man who causes one day's labor to produce twice as much of the comforts of life as it formerly did is no less a public benefactor than one who causes two blades of grass to grow where one grew before. But there is one field in which the inventor, the scientist, and the engineer have contributed much toward the material prosperity of the world and without which our labor saving machinery would be comparatively worthless, I refer to the harnessing of the forces of nature to do man's work. Imagine how our scale of living would have to come down if we had no power but our own muscles with which to provide for our wants.

Probably the first force, besides his own muscles, that man made use of was the muscular force of animals, and this is one of the most important of our prime movers to this day, in spite of engines and railways and automobiles. Then, as he acquired more skill in the making of machinery, he began to use the forces of wind and water. But wind cannot be depended upon, and water-power cannot always be had where it is wanted, so these sources of power are limited in their application.

It is the heat engine that is doing the work of the world to-day. Not only the steam engine, the air engine, and the gas engine, but in fact our horses and our own bodies are heat engines and the most efficient heat engines we have, so far as the relation of the quantity of work done by a given amount of fuel is concerned. If hay and oats cost no more per ton than coal we might perhaps be running our factories by horse power.

A century ago the steam engine had just begun its work and the industrial progress of the century has been largely due to the development of the type of heat steam engine. It has been adapted to almost every kind of work, and its efficiency increased until now some of our best power plants use less than a pound and a quarter of coal per hour for each horse power.

But even now we are using only about fourteen per cent of the energy contained in the coal. This fact leads many to think that there is a wonderful chance yet for improving the efficiency of the steam engine, but our study of thermodynamics shows us that the efficiency of a heat engine is limited by the change of temperature of the working fluid that an engine that would have an efficiency of one hundred per cent would have to convert all the heat of the working substance into work, which would mean that the steam or other working substance, would have to leave the engine at the temperature of 460° below zero. If we could heat the steam to the temperature of red hot iron we could not expect to obtain more than 40 per cent of the energy of the coal even with the steam exhausting into a condenser at a pressure of only 1-5 of one atmosphere. It is easy enough to convert other forms of energy into heat, but not so easy to convert heat into mechanical energy.

Many attempts have been made to produce a more efficient engine by using some other fluid instead of water but the laws of the conversion of heat energy into mechanical energy are independent of the special properties of any substance. Hot air engines have been used to some extent, but their efficiency is low largely on account of the difficulty in transmitting heat to and from the working substance. This difficulty is overcome in gas and oil engines by mixing the fuel with the air and thus generating the heat in the working substance itself. The gas engine can work through a greater range of temperatures and hence has a greater thermal efficiency than the steam engine, but it uses a fuel that is more expensive in most localities. It has its advantages and its disadvantages as campared with the steam engine. Largely on account of the small amount of attention required, it is used quite extensively for small powers, especially where the load is nearly constant and the service intermittent. It is also finding a new field of operations in utilizing the waste gases of blast furnaces, which are peculiarly adapted to this type of engine.

When the gas engine first made its appearance, again when the electric motor came into use, and still later when Tripler began to make liquid air by the barrelful, we were informed that the steam engine would soon be a thing of the past to be seen only in our museums, but it is still doing business and promises to stay with us for some time to come. Its only real rivals are the gas engine and the turbine. The gas engine is finding its own sphere of usefulness in those places for which it is best adapted but it will have to be greatly improved before it can take the place of the steam engine. The turbine with the aid of the electric motor has taken the place of the steam engine in some places within convenient distance from our waterfalls. But electricity, as used for power, is in no sense a prime mover but simply a means of *transmitting* power. Instead of competing with the steam engine electricity has furnished it with a new field of labor, and the requirements of this class of service have led to some marked improvements in the engine.

Liquid air is no more a prime mover than electricity, for we cannot produce it without absorbing power and the law of the conservation of energy holds here as well as elsewhere. It may become useful as a means of *storing* power however.

We have no reason to expect that any of our sources of power will go out of use, at least for a good many years yet. Horses, steam and gas engines, water wheels and electric motors all have their uses and their limitations. The mechanical disadvantages of the reciprocating engine have led many a man to spend much time and labor trying to devise a satisfactory rotary engine.

One of the problems of the twentieth century will be to find a source of energy adequate to meet the demands of what will be more than ever an age of power. Our supply of fuel is limited and we cannot expect our coal fields to supply us with power for many centuries more if the present rate of use and increase keeps up. Will men then learn to live without the aid of power, will they use coal more economically or will other forces be utilized? One improvement which seems quite possible is the more economical conversion of heat into other forms of energy. In the electric light we get about one-half of one per cent. of the energy of the coal consumed. The man who will produce electricity from coal economically will be given a chief place among our inventors, and the man who can imitate the firefily and glowworm in producing light without heat will not be far behind.

Another field for the inventor is found in the storage of power. The storage battery is about the only means now available. It is used to some extent where the power available or required varies greatly, but it is too heavy to be shipped from place to place.

Liquid air contains nine times as much energy as can be packed into a storage battery of equal weight. It may possibly enable us to bottle up the energy of Niagara and ship it hundreds of miles to points far beyond the reach of electrical transmission.

But a pound of petroleum contains forty times as much energy as one pound of liquid air and it can be shipped and stored without loss. If we could manufacture a similar substance out of cheap materials we might be able to store up the energy of the winds and our water power and use it wherever and whenever we want it. We are already using a similar method of producing light. We light our bicycle lamps and some of our buildings with the

energy of the St. Mary's River, through the medium of calcium carbide and acetylene gas.

There is a vast amount of water power yet to be utilized and, as coal becomes more expensive, factories may be driven to those localities where it can be obtained. The five million horse power at Niagara could run a monstrous manufacturing city and it would not be a smoky city either.

Another great source of power that is used but little is the direct heat of the sun. Solar motors have been experimented with to some extent but they can hardly be considered a commercial success as yet.

The solar motor may not be used very extensively for many years to come, but there are localities where steam power is prohibited on account of the cost of hauling the coal, and where the sun shines most of the time in which it should prove valuable. It may be the means of reclaiming many acres of desert land and thus make two blades of grass grow where nothing grew before.

Solar motors, wind mills, and water wheels utilize forces that promise to last as long as the sun shines, so we have not much reason to fear that the progress of the world will cease because of the exhaustion of what are now our chief sources of power.

W. W. WELLS.

Technical Science in its Relation to the Home.

During the youthful period of human development the knowledge obtained was through empiricism, the result of casual observation. Every science had its birth in empiricism, and this empiricism will continue to occupy a portion of scientific work as long as there is opportunity to acquire knowledge. It keeps alive the spirit of speculation, yet the number of demonstrated facts has become so great that speculation is kept in the background in the minds of scientists, and is used only as a stimulus to research.

The struggle of the sciences for their present position has been long and, in a sense, bitter, but evolved from the widely separated and imperfect theories of the past, there is in reach of the present seeker after truth, an abundance of classified knowledge.

In the home has been the same progression. The homemaker is no longer satisfied with the traditional methods of an empirical nature, but seeks to understand the principles involved in her sphere of activity, and to place her duties on a scientific basis. By assuming this attitude, she relegates tradition, empiricism and superstition to the rubbish garret, and endeavors to subject scientific laws and facts to her use. She thus makes a higher standard of learning for herself, magnifies her position to its true proportions, and rules over her province resourceful in thought and action and highly technical in its character.

Many educators have seen the necessity of a systematic course of training, which will prepare women to deal with the household problems brought about by this change in their relation to the home, and have, through their influence, introduced courses of study in the various schools to meet the demand in this work. From many sources knowledge is accumulating and it is of such a character as to be necessary to every woman who would make her home the laboratory in which her mental and physical life is developed. She surely should possess a scientific knowledge of the body and those factors which influence it in health and disease. When there is an attempt made to understand the significance of this, there becomes involved many scientific subjects of diverse complexions. It especially designates Physics, Anatomy, Physiology, Chemistry, Sanitation, Bacteriology and Dietetics. These, therefore, are fundamental to a comprehensive view of the duties found in the house. They are the substance of the art of living. Can anything be further from the truth than to mention this work as a fad? Truly, ignorance alone must be responsible for misnomers of this class. If based upon scientific research conducted as thoroughly and carefully as in problems of other sciences, this will not be a fad but a permanently established educational movement.

That a more perfect idea may be obtained concerning science in the home specific treatment of some subjects may lend aid.

Home sanitation is vital in its consequences and therefore deserves careful attention from those who may be held responsible. The work carried on by Sanitary Associations, Boards of Health and people in authority has succeeded in arousing the interest of homekeepers respecting the hygienic condition of their homes. It is in the house and by the homekeeper that the work must be done. The man of the house comes and goes and his work is elsewhere. The home is the woman's domain and when danger threatens she is there to carry the burdens. In one way every woman should be a Florence Nightingale. She proved what foes light, pure air and good food are to disease, and so opened the eyes of the military authorities to the needs of the army that to-day the death-rate of the English army is only one-tenth of what it then was. In demonstrating this she not only showed the effect of sanitation upon the army but upon the home where its importance cannot be overlooked.

Epidemics are no longer, as formerly, considered a punishment sent down from heaven. They are indeed a punishment but for the sin only of ignorance. Pasteur proved that the feasibility of arresting disease is no longer an ideal. Millions of people have been saved from death and poor health by the progress of science armed with the knowledge of tuberculosis, the cause which produces it, its nature, its development, the dissemination of the contagion and the means by which it may be held in check, the American home is no longer blindly submitting to the onsets of this foe but is successfully striving to leave no loopholes for an attack, since the home is doubtless responsible for the progress of all contagious diseases.

Again we find a pertinent illustration in the scientific development of cooking. This branch is better established—not because it is more important than sanitation—but because it appeals more forcibly to the daily wants of man.

The homekeeper realizes the importance of having the proper kind of food well cooked and served. She should also know how food contributes to the body; how the food substances are changed on their journey along the alimentary tract; how they are acted upon by the digestive juices and assimilated by the body.

Some conception should be formed of how this food after entering the body is used in constructive work of one kind or another, and in what form eventually it is eliminated. Throughout all of these changes it becomes possible to follow and measure the elements entering into the constitution of the food so accurately that any departure from the normal conditions may at once be noted. A harmony exists which to destroy means to create a discord on functional activity or to produce disease. In the case of nitrogen it is possible to alter its offices in the body by associating with it varying amounts of other food material. In order to manipulate food substances to produce the different and desired effects upon the body, the homekeeper should have a technical knowledge of the subjects involved. Without such a knowledge she becomes helpless in the control of natural forces and operates only in an empirical manner. She is responsible for many things, and in order to accomplish the desired end she must have the information which technical science will give.

Further than this it becomes necessary to acquire a broader knowledge of the sciences, such as Chemistry, Physics, Anatomy, Physiology, Bacteriology and Botany than has been implied in the foregoing illustrations. This paper purposely omits the discussion of other phases than that of the sciences which we believe to be fundamental to the intelligent and harmonious development of the home.

In managing the home, therefore, the home-maker will find much need for thought and study, and will have no cause to complain of the monotony of it all. She will find no time for the agitation of questions which take her out of the feminine boundaries into the masculine fields of labor.

It has been noted in our casual review of this subject that the sciences underlying the home are working their way gradually to that position now occupied by the sciences upon which medicine and agriculture are founded, and, from our discussion of Sanitation and Cooking it will be easily seen how technical science affects the home.

The civilization of a people may be measured by the condition of its women, for with the advancement of our civilization has come the emancipation of our women and their exaltation in the home. The nation depends upon the home, and the home, in turn, depends upon the health and happiness of the people composing it, which cannot be secured unless the home is based upon scientific knowledge. Someone has said: "Scientific housekeeping is neither beneath the attention of the refined, nor beyond the reach of the uncultured. It is the duty of the rich; it is the salvation of the poor."

FLETA PADDOCK.

Justin Smith Morrill.

The close of the Revolutionary war and the opening of the Nineteenth century wrought great changes in all industrial pursuits. The ties to the mother-country which had so long checked the nation's progress, were shaken forever, and new energy, new strength suddenly arose, and entered into every department of human enterprise. And of those pursuits whose advancement was most marked under the new regime, none showed greater changes, or indicated broader avenues for development than agriculture. The rapid acquisition of land to the west and south, with their diversity of climate, their wonderful alluvial soils, their teeming valleys, soon impressed the American farmer that his was a heritage of tremendous resources—his for the taking. Therefore many of the older homesteads were abandoned for the fields of the west, and the advancement of the one section was gained through the retrogression of the other.

Thus husbandry developed, constantly embracing new phases, and expanding beyond the bounds of cooperation and definite control. Other industries were likewise giving greater scope to agricultural science, and were steadily establishing methods which were new in agricultural practice. But with all this advancement, this stupendous expansion of the scope of agriculture, embracing yearly its thousands of acres of virgin soil and primeval wilderness, with the marvelously increasing annual yield, with every apparent avenue for development, there yet remained one factor absent. A plan, a scheme for the establishment of permanent institutions throughout the Union, where agricultural science would be taught, and where investigations might be carried on in the interests of husbandry—this as yet was lacking.

Early in the century, a few attempts had been made toward agricultural education. Here and there agricultural and horticultural societies had been formed, local fairs held, and now and then a publication on agriculture had appeared from the pen of some patriarch of the plow. In one or two states, minor agricultural schools had been established by private enterprise, where the cruder branches were taught, and where for the first time, the chemist's mystic powers were harnessed in the interests of agricultural science. Science, indeed, had found its way into a few of the academies and colleges; manual training had received some attention. But such efforts were spasmodic. They were but the humble beginnings of a greater end.

It was well for the followers of agriculture, that, at this juncture, a man of acute perception should endeavor to crystalize this increasing demand for scientific learning into form and power; well for them that he should turn aside from the heat and fury of the hour, and find his energies needed in tardy labor and struggling industry. In a time when northern homes were giving their bravest and best to battle and sombre southern plains were ghastly with the blood and brains of men; while the industries of a nation lay paralyzed by the mighty conflict in war, it was well that one man should turn his back to ambulance and cannon and seek to better his countrymen through the arts of peace, rather than the ravages of war. That man was Justin Smith Morrill.

In the bill introduced into the National House, July, 1862, Mr. Morrill proposed a system which at last should minister to the needs of the industrial classes. It was a plan at once original, complex, far-reach-

ing, consummate. In the words of the measure, it provides for "the endowment, support and maintenance of one college in each state where the leading object shall be, without excluding other scientific and classical studies, and including military tactics, to teach such branches of learning as are related to agriculture and the mechanic arts, in such manner as the legislature of the states may respectively prescribe, in order to promote the liberal and practical education of the industrial classes in the several pursuits and professions of life." From the first fierce opposition assailed the bill on every hand. Eminent men everywhere condemned it as interfering with states' r i g h t s. Newspapers ridiculed it as a scheme utterly incapable of prosecution. Public sentiment laughed at the man who would teach the farmer's son to apply science to his craft. But the persistence of the modest New Englander would not down. Ceaselessly, patiently, he worked, till his task was done. True public servant, he had an inborn sympathy for all manual art, and continually sought to uplift the standard of the laborer. Profound statesman, he exercised that intuitive foresight which ignores present conditions, and foresees problems which the years still hide.

Thus was established a system for the dissemination of agricultural knowledge; a system whose benefits will never be known, and whose influence will extend to all coming generations; a system which is ever tending to create that better mode of husbandry, where science is correlated with practice, the virtues of the one being combined to enhance the virtues of the other. It is a system which has affected nearly every arable section in our country. It has mutualized the varied commercial interests of the farmer. It has transmuted the abstruse sciences into concrete knowledge pertaining to every branch and phase of husbandry. It has expelled the old and brought in the new, in method and theory, and the old empiric laws have been laid away on the shelves of time together with the crudities of ancient handicraft, or the doctrines of old-time astrology. By its diffusion of knowledge, it has brought happiness and abundance into thousands of homes, where dwell the brawn and sinew of our nation. And lastly, this system has established public institutions throughout our land, whose interests are the interests of applied science; institutions which number as we number our commonwealths, and whose power rests in the united support of millions. All honor to him by whom these institutions were founded. All honor to the name of Morrill! All honor to the agricultural colleges of America! All honor to the sincerity of their purpose and the loftiness of their ideals! May they ever add strength to strength as manual industry develops; and may their numbers increase as the nation extends her borders farther into distant lands.

The New England settlers' home was a primitive one. It was a home bare of ease or luxury; a home whose threshold the stranger seldom crossed, in a region where the straightened ties of denser population had never curtailed the freedom of the savage; a lonely home, encompassed by an almost unbroken wilderness. This has been the home of many of America's patriots, this was the home of Justin Smith Morrill. It was a Christian home, and the simple Christian faith taught there, wrought the solid basis for the higher virtues of his later life. The frugality practiced, the persistence and sturdiness acquired by that frontier life, brought forth the fearless man of action, destined to long service for his country. And it cannot be doubted, that all those qualities of disposition and action which framed the career of Justin Morrill, found their origin in the hardy, rigorous life he followed from youth to manhood, and which were sustained by the spotless purity of his character.

Yet, there was nothing of grandeur or imposing greatness in the character of Justin Morrill; none of the enthralling magnetism of Blaine, none of the wonderful brilliancy of Hamilton. His was the type of modest worth, of quiet, constant devotion to duty. His path was the plain, straight path of public and private virtue. To popular favor, he was oblivious. There was not an element in his nature which betokened anything of self-aggrandizement or seduction to private interest, which have so blighted the careers of some of our greatest statesmen.

But it is vain to speak thus of Justin Morrill. In life, he needed no voice of praise, no robes of honor. And in death he needs no eulogists. He needs no memorial monuments. Forty-seven institutions of learning, the spires of their halls rising to meet the sun, their acres stretching forth to receive its light, constitute monuments to his memory of perpetual power, monuments whose influence will ever extend higher and higher in the estimation of men, till they will eventually wield an influence in every avenue of manual industry. And, throughout America, ten million men, who live by the plow, whether amidst the granite hewn hills of New Hampshire, in tropic glades of Florida, on limitless prairies of the west, or in barbarous archipelagoes beyond Pacific seas, will thank their God, that, in a period when agriculture had reached a critical mark, He should raise up a man with the keenness of vision to foresee the industrial problems of coming generations; that He should create a man to organize and perfect a system for the diffusion of agricultural knowledge and thereby to establish a basis which will insure forever, the stability of America's agriculture, on whose welfare rests the fortune and prosperity of a mighty people. And, through the flight of years, as the posterity of those ten million husbandmen is increased, it may be, to thirty million, may not only they, but may a whole nation, among her many distinguished sons, ever honor and revere the name and memory of Morrill, the Father of Industrial Education in America.

N. A. McCUNE.

Annual Reunion of the Columbian Literary Society.

The Columbian Literary Society held their annual reunion in their society rooms Wednesday evening, June 19. Among the visiting friends besides those from the College and Lansing were Mrs. Shoesmith, Leslie; Mrs. M. E. Townsend, Onondaga; Miss Hayes, the Misses Stillwell, Grand Rapids; Miss Mullen, Bay City; and Mr. F. O. Foster and Miss Maud McLeod, Ionia, who entered with the class of '01.

After a short but interesting program and a half hour of informal dances the members and guests repaired to the club rooms for their banquet. Everyone enjoyed a bountiful repast after which the following toasts were responded to, "The Past," V. M. Shoesmith; "The Future," D. B. Jewell; "The Seniors," Bert Wermuth; "Our Guests," J. A. Dunford; and "The Columbians," C. P. Reed. The toasts were spicy and enjoyed by all. The remainder of the evening was given up to dancing and playing games.

One of the pleasantest events of the evening in the memories of the Columbians was the presentation to the society of a handsomely designed block and gavel from Mrs. M. E. Townsend, as a memorial token of her son Charles, one of our former most beloved members. Mrs. Townsend feels that the society is very dear to her and the feeling is strongly reciprocated in the hearts of the Columbians. G. S.

Olympic Society Commencement.

The fifteenth annual commencement party of the Olympic Society was held in their rooms last Wednesday night, June 19th. There seemed to be fewer in attendance this year than at former times, though there were all that the rooms could well accommodate. Among the old members who came back were C. A. Jewell, '96, Geo. Campbell, '98, W. C. Brainard and E. R. Russell, '99 and E. A. Bohn, with '01.

After a few selections of music by the Hayes sisters the literary program was rendered. President's Address, G. E. Chadsey; Oration, J. G. Aldrich; Prophecy, S. B. Hartman; Society Paper, G. C. Sevey.

The dance programs were then filled out and the party passed the time very pleasantly till 11 o'clock when they repaired to Club A dining room to sit down to a dainty menu. Mr. E. R. Russell was toastmaster. He was equal to the occasion and his random shots of wit seemed to strike somebody every time. After the banquet the party went back to the rooms and danced till the hours grew large again. G. E. C.

Hesperian Reunion.

On Wednesday evening, the evening of commencement week set apart for society reunions, the Hesperians with their friends, many of whom were from the homes of the graduating members, enjoyed their usual farewell banquet.

At eight o'clock the members commenced gathering in the rooms. The time waiting for all to gather was spent introducing friends and in the enjoyment of greeting one another for the last time for the year.

At about nine o'clock all retired to Club E and partook of the banquet prepared for the occasion. This was followed by toasts, President Bailey acting as toastmaster. The following subjects were responded to: When We Think, Burr Wheeler; Perhaps, G. D. Francisco; Our Problem, R. M. Lickly; What's What, N. D. Fargo; The Tides, N. B. Horton; What's Won, What's Lost, G. C. Humphrey.

After this the party broke up, those caring to dance going to the armory where they enjoyed themselves until the music and the pleasure of the evening had lost its charm. G. C. H.

Feronian Party.

Last Friday, June 14, the Feronians gave their annual formal party in the armory. Over seventy-five couples participated in the grand march, which began promptly at eight o'clock, led by Prof. and Mrs. Vedder. The decorations while simple, were artistic, and showed the touch of the feminine hand. The placing of the music in the center of the floor was commented upon as quite a pleasant change. Programs, which contained but twenty numbers and no extras, were dainty, and society colors, yellow and white were shown in many little ways. New and daintily pretty gowns were much in evidence, and all—especially the boys — declared the occasion a charming success.

G. M. L.

Union Lit. Reunion.

The Union Literary Society celebrated its twenty-fifth anniversary at its commencement reunion. Two of the charter members, William K. Prudden, '78, of Lansing, and Frank W. Hastings, '78, of St. Louis, Mich., attended and took part in the proceedings. After the usual literary program, eleven dances were enjoyed, the music, furnished by an orchestra from Charlotte, being unusually good. The company then adjourned to the dining room in the women's building for the banquet. The decorations here as in the chapter house were simple yet artistic, being confined to palms, asparagus fern and cut flowers. After the delicious menu had been thoroughly discussed the toastmaster, Newell A. McCune, '01, called for the following toasts, prefacing each with appropriate and witty remarks: Twenty-five Years, U. P. Hedrick, '93; The Gentler Element, Thomas Gunson; Our Ideal Athlete, Ellis W. Ranney, '00; Yesterday, To-day, Tomorrow, George D. White, '01; The Great Cold World, Charles A. Gower, '98; The Bicentennial, Dennis W. Smith, '02.

At the conclusion of the banquet dancing was resumed in the chapter house and continued until an early hour.

Among the alumni who returned for the occasion were W. K. Prudden, '78, Lansing, Frank W. Hastings, '78, St. Louis, Mich., Charles A. Gower, '98, Lansing, E. W. Ranney, '00, with his wife (nee Teresa A. Bristol, '99,) Belding, Charles H. Hilton, '00, and wife, Lansing, and Paul Thayer, '00, and wife of Benton Harbor. S. J. K.

Phi Delta Reunion.

A large number of friends and alumni availed themselves of the hospitality of the Phi Delta Society on Wednesday, June 19, the occasion being the annual commencement banquet of the Society. Covers were laid for about 35 guests in the large reception hall, which was artistically decorated with palms and cut flowers. After an enjoyable menu, Herman W. Reynolds very ably introduced the following toasts: "Welcome," Roy L. Himebaugh; "The Thread that Binds," Chas. F. Herrmann; "Reminiscences," Roy C. Bristol; "The Future," J. H. Prost. Besides the above, several short speeches were given by friends whom the guests called upon. At the close of the banquet the entire party adjourned to the Armory, where they joined the Eclectic and Hesperian societies in dancing until an early hour. All agreed that the evening was very pleasantly spent. C. F. H.

Eclectic Society.

The Tics have had the reputation in the past of being royal entertainers and those who were favored with an invitation to their Commencement Banquet and Hop considered themselves fortunate indeed. From 7:30 to 8, members and guests dropped into the cosy rooms and spent the time until nine in friendly chat. President L. H. Taylor voiced the society's welcome in a few well chosen words directing his guests to the dining room of Abbot Hall where creature comforts were in waiting.

There was a bountiful supply of good things and ample justice was done them. Owing to the lateness of the hour, and the hop to follow, the toast list was confined to the numbers on the program responded to by members of the society. Toastmaster M. L. Ireland, with due dignity and grace, announced the following list: "Negatives," by Oliver D. Dales; "Backsights," by J. D. Towar; "Side Shots," by S. W. McClure; "Tracings," by C. P. Reynolds. The last

on the list was very appropriate for the time and place, as marking the severance by so many of the Tic members of their active college and society ties and their going out into the larger society of the world's activity. R. S. Northrop, "Bobby" to his friends, speaking on "Transition," wove in many words of good advice with amusing references to recent and coming events.

At about 11:30 the dining hall was deserted for the College Armory, where, in company with the members and guests of the Hesperian and Phi Delta societies, dancing was indulged in even after the gray shadows stretched over the campus. J. J. F.

Military Inspection.

The annual inspection of the Cadet Corps of the military department of the College was held Wednesday afternoon, June 19, by Capt. William J. Biddle, Jr., of the 14th U. S. Infantry. The ceremonies of battalion review and battalion inspection were followed by battalion drill under Capt. Bailey. A guard-mounting, consisting of details from each of the four companies, preceded battalion parade. At parade the orders relating to the appointment of officers for next year were read. After the parade the officers took charge of their companies and held company drill, after which the inspector observed the drill of the signal squad, and the sophomore class in extended order. After the inspection Capt. Biddle questioned the members of the graduating class about military subjects. He expressed himself as highly pleased, and complimented Maj. Vernou on the work accomplished by the corps. BAYARD LITTELL.

Class Day.

Class day at Grand Ledge was enjoyed by a party of about fifty made up of seniors and their friends. Some few drove over, but the greater number went on the train.

As soon as the resort was reached the party separated into squads of twos and threes and gave themselves up to enjoying the river with its many shady islands and rugged scenery.

At two o'clock the party assembled in the dining room of the Island House to partake of a bountiful dinner. After all had eaten to their satisfaction, President Norton made a short speech, and the party again went out to enjoy the cool shade and the river breezes.

It was a tired but happy crowd that bundled up their hammocks and pillows, and took themselves down to the evening train enroute for the College, and every one felt that the day had been well spent.

J. M. R.

Banquet of the Michigan Agricultural College Association of Washington D. C.

Washington, the seat of our Federal Government, seems also to be an important center for the gathering of those who have received some training at the Michigan Agricultural College. There are now living in this city, or with headquaters here 28 alumni and 14 who have been special students or instructors at the college. Their loyalty to their Alma Mater is indicated by their hearty and unanimous response when a call goes out as for the gathering of the clans. This was well illustrated on the evening of June 5, when 32 of the alumni and their wives and friends met around the festal board and recalled the hopes and joys of their student days, the early struggles and grand achievements of the college, and drank in clear cold water, toasts rich in tender solicitude for the coeds, who so few in the lonesome older days, and ringing with patriotic sentiment for the college which has a warm place in the heart of every one of its loyal students. The pleasure of the evening was much enhanced by the presence of Prof. Eugene Davenport, '78, now Dean of the College of Agriculture in the University of Illinois.

At a brief business meeting called to order by the president, Donald McPherson, '74, just before the banquet proper, the following officers were elected for the ensuing term: president, James H. Tibbitts, '73; 1st vice president, Edward N. Pagelson, '89; 2nd vice president, Coie L. Himebaugh, '87; sec'y, Lyster H. Dewey, '88; treasurer, Miss Mary Lillian Wheeler, '93.

After the numerous courses from little neck clams to ice cream and coffee had been properly disposed of W. A. Taylor, '88, as Toastmaster, called for the following toasts to which there was a hearty response: Our College Presidents, James H. Tibbitts, '73; The Old Faculty, Frank Benton, '79; The Recent Faculty, Guy L. Stewart, '95; Our Coeds, Walter D. Groesbeck, '92; The College Yell, Edward N. Pagelson, '89, (and all present rising); College Societies, Dick J. Crosby, '93; The Present and Future, Lewis S. Munson, '97. After the toasts Prof. Davenport gave a very ineresting talkfull of helpful suggestions on the field of work of our Agricultural Colleges and the lines along which the influence of the Alumni may be extended to benefit our Alma Mater. A telegram of congratulation from President Snyder was received with enthusiasm.

The following were present at the banquet: James H. Tibbitts, '73, Mrs. James H. Tibbitts, Donald McPherson, '74, Eugene Davenport, '78, Frank Benton, '79, Mrs. Frank Benton, '79–'80, Miss Zoe Benton, Coie L. Himebaugh, '87, Miss Nettie B. Browne, Lyster H. Dewey, '88, Mrs. Lyster H. Dewey, '89–'90, Fred H. Hillman, '88, William A. Taylor, '88, Mrs. William A. Taylor, Miss Grace Taylor, Porter Ross Taylor, Edward N. Pagelson, '89, Walter D. Groesbeck, '92, Mrs. Walter D. Groesbeck, William P. Hawley, '92, Dick J. Crosby, '93, Mary Lillian Wheeler, '93, William W. Tracy, '93, Clarence B. Smith, '94, William F. Wight, '94, Huron W. Lawson, '95, Guy L. Stewart, '95, John E. W. Tracy, '96, Sheldon B. Young, '96, Lewis S. Munson, '97, J. B. Stewart, '01, Harry N. Whitely, '98–'00, L. H. D.

Washington, D. C. June 6, 1901.

C. E. Calkins, '99, of Swartz Creek, spent June 7 and 8 here. He is working hard on his farm.

The following officers have been elected by the Feronian Society for the Fall Term 1901: president, Miss Harriett Farrand; vice-president, Miss Elma Bowerman; secretary, Miss Mary Smith; treasurer, Miss Katherine Gunn; marshals, Misses Mary Ross and Maude Langford.

Old Students.

E. D. Osborne, *sp.* '93–'95 writes to the RECORD that he has just finished a successful year on the road with Swift & Co., South St. Paul, Minn.

Miss Emma Louden, with '01, was married to Mr. E. Harry Post Thursday, June 20, at the home of her parents in Saginaw. Mr. and Mrs. Post will live at 804 Millard street, Saginaw, after July 20.

We are indebted to Mr. D. J. Crosby, '93, for the following: Guy L. Stewart, '95, has been elected State Pathologist of Maryland to succeed Prof. C. O. Townsend who has resigned to enter the division of vegetable pathology, U. S. Department of Agriculture.

Mr. C. C. Pashby, who graduated from our course in Mechanical Engineering with the class of 1894, is now located at 216 Elliott St., Memphis, Tenn. Mr. Pashby was doing very successful work until he was incapacitated for field work by a stroke of paralysis. He has now opened up an office, and solicits the patronage of the profession and others having drafting, mapping, knotty problems, tedious computations and general office work to perform. He guarantees perfect satisfaction. His college friends who know him well feel assured that he will render satisfaction to all those desiring such service. He was a good student, faithful teacher and successful in all his work since leaving College.

Two of Professor Smith's Recent Trips.

A visit to the Pan-American at Buffalo recently revealed the State buildings and State exhibits nearly all complete. The exhibits from the South American Republic are naturally a little slow in their installation. The walks and grounds are approaching completion, twelve hundred men being at work. The show as a whole is very creditable and worthy the study of anyone interested in the progress of agriculture, manufacture and art in the Western Hemisphere. The so-called Court compares very favorably with the one at Chicago in '93.

Takvorian was much in evidence in Buffalo in a new and somewhat gaudy uniform, initiating the rustic and unwary into the mysteries of the great exhibit.

The Upper Peninsula Experiment Station was visited by the Honorable L. Whitney Watkins, of the board and the director on Tuesday, June 11th. A severe freeze on the Saturday night preceding, at which time the thermometer fell to 25 degrees for several hours, had ruined the prospect of a full crop of the small fruits, which had been very promising. The currants were about the size of BB shot and were frozen to a jelly. Strawberries were just going out of blossom, and may yet bear a reasonable crop. Of the 160 acres belonging to the College, something over 20 acres are cleared. Four acres are set out to fruit trees, mainly apple, but with some plums and cherries. The house and barn are completed, and Superintendent Geismar will move in before the first of July. The soil of the station is very fertile and it is a misfortune of the Upper Peninsula that its principal railroads run through vast barren tracts, giving the traveller an entirely erroneous idea of the true agricultural value of that Peninsula as a whole.

It was to be noted that the northern part of the State had not been so continuously deluged as southern Michigan this spring.

C. D. S.

About the Campus.

Eugene Gregory, '78, was on the grounds Thursday.

Miss Catharine Watkins, '98, is visiting Miss Grace Lundy.

Miss Irma Thompson, '00, spent commencement week with Miss O'Connor in Lansing and attended the various functions.

Mr. Burt L. Green, of Alpena, and his wife (formerly Miss Grace A. Melton with '01,) were visitors here during commencement week. They brought their automobile with them.

Mr. Pettit reports finding a mealy-bug on the roots of sugar beet. The insect does not seem to do serious damage; but it is rather an odd place to find a member of the coccidæ or scale insects.

The Themian Society have elected the following officers for next year: President, Miss Nolan; vice-president, Miss Elsie Morrison; secretary, Miss Katherine Slaght; treasurer, Miss Clare Dean; RECORD reporter, Miss Bessie Cordley.

Among the Feronians who returned to College for the commencement festivities were Misses Ella Phelps, Blanche Huhn, Mable Bohn and Gertrude Elliott, with '01. Miss Martha Rich, with '01, spent Sunday here.

LOST—A pair of rimless eyeglasses with gold spring. If the finder will kindly return them to Miss Lundy, or leave them with the librarian, a suitable reward will be given. Lost, also, a small seal purse containing postoffice key and postage stamps, belonging to Miss Lundy.

Progress in Education.

Several brief notes have appeared in the RECORD recently which were intended to impress our young men and women with the fact that there never was such a time as this for acquiring a thorough education, especially in English and the sciences. Here is another note. J. P. Cooke, Professor of Chemistry at Harvard from 1850 to 1894, recognized the fact that science can be taught properly only by experiment, and in 1851 a modest beginning was made by fitting up a laboratory in the cellar of University Hall, where he received voluntary pupils, of whom President Elliot was the first; but it took seven years of hard fighting to introduce this laboratory work as part of the regular college course. In 1858, only 43 years ago, did chemistry at Harvard occupy a respectable place on the first floor of a fine building. The same year witnessed the first class in analytical chemistry at the University of Michigan. In 1863, only five years after, Dr. Kedzie entered upon his long career as chemist of this College with laboratory practice as a prominent feature from the first; and Professor Fiske had preceded Dr. Kedzie in teaching chemistry for six years, i. e., in 1857, antedating Harvard by one year in teaching chemistry as a part of a regular course of study, and still by some, chemistry is spoken of as an old science.

W. J. B.