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UNITED STATES OF AMERICA.

OUR AGE,

AND ITS

Contributions to Agriculture:

AN ADDRESS,

DELIVERED SEPTEMBER 16TH, 1859,

BY JAMES W. WALL, ESQ.

At the New Jersey Agricultural State Fair,

HELD AT ELIZABETHPORT.

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“Agricola incurvo terram dimovit aratro:
Hinc anni labor; hinc patriam parvósque nepotes,
Sustinet; hinc armenta boum, meritosque juvencos.
Nec requies, quin aut pomis exuberet annus,
Aut fœtu pecorum, aut Cerealis mergite culmi;
Proventûque oneret sulcos atque horrea vincat.”

Georgics, Lib. 2d, p. 113.

“The husbandman cleaves the earth with the crooked plough; hence the labor of the year; hence he sustains the country and his little offspring; hence his herds of kine and deserving steers. Nor is there any intermission, but the year either abounds with apples, or with the breed of the flocks, or with bundles of the stalks of Ceres; loads the furrows with increase, or overstocks the barns.”

Mr. President and Gentlemen of the State
Agricultural Society,

FARMERS OF NEW JERSEY:

The duty devolving upon me to-day, through the indulgent partiality of your Association, is one, that had I consulted my calmer judgment, and relied less upon my impulses, perhaps I should have declined. Inexperienced as I am in all the more practical workings of the gentle art of the husbandman, it certainly does appear the most startling presumption for me to stand up in the midst of those whose lives have been devoted to its culture, or whose tastes have been directed to its study and encouragement, for the purpose of intruding my crude thoughts upon a subject, with which experience and cultivation have so familiarized them.

But in accepting this invitation, I did so, fully conscious of my own deficiencies, but animated by generous impulses, which made me feel that I should be false to my Jersey lineage, false to the examples that have gone before me, and forgetful of the teachings of one, whose loyal heart was always full of love for New Jersey, did I refuse to lend my aid, feeble as it might be, to an Association that has done so much, and is destined to do still more, for the best interests of this my native State.

Had this Association accomplished nothing, save the simple institution of this annual agricultural State

festival, it would have deserved the highest honors and the most lasting remembrance. But when to this we add, the devotion and energy manifested by those who originated, or have since enrolled themselves in it, the incalculable benefits that through such devotion and energy have sprung from its organization, the encouragement it has given to agriculture throughout the State, the stimulus to exertion it has created, the generous rivalry it has awakened; then and not till then are we able to realize fully the immense advantages conferred upon the State by its organization.

In view of all these things, how is it? and why is it? that our legislation has done so little to foster an Association whose sole object is the benefit of the State; and all of whose energies have been most perseveringly expended in advancing and encouraging her best interests, and providing for her future welfare and prosperity. Not thus did the Roman state reward the efforts of those whose labors to improve her agricultural resources she thought worthy of the laurel crown, and of the thanks of a Roman Senate. Not thus did a Roman magistracy acknowledge the interests of the state in this gentle art, when yearly her high official functionaries went in solemn procession to the temples of the gods, and sometimes to the fields, to offer up prayers for the safety of the crop, or of the cattle, and for success in every agricultural undertaking. I would, as a Jerseyman, that this question had not to be asked; but the answer is an easy one, and I give it to you in all frankness. It is because you, the independent yeomanry of the State, who own and till its broad and fertile acres, have shut your eyes to the immense influence which your intelligence, your numbers, your social position,

and your important interests would enable you to wield in the political affairs of the State, if you would only determine to exercise it in a proper manner.

The legislation of the past has done nothing, literally nothing, for the agricultural interests of New Jersey. That omission has mainly grown out of the indifference and neglect of the very class most injured by it. (The past you cannot redeem, but the future is with *you*), the men of the plough, the men of toil, the cultivators of the soil you own. You can, with the awakened power which has so long slumbered within you, mould and shape, and direct the future legislation of the State as you choose. The hammer of Odin is in your hands: and as the stroke of that of the Teutonic mythology is said to have produced convulsions upon the earth's surface, so political power in your hands, if wielded in a high and holy purpose, shall shake terribly that old system of inert and useless legislation, which has so long cursed the State.

You have committed to your care the most important interests—interests which only need judicious and fostering protection at the hands of the State, to develop rich sources of wealth, that will add materially to our present and all future prosperity. It has been your fault heretofore, and it will be much more your fault hereafter, if you neglect to place high-minded, intelligent men from your own ranks in our legislative halls, who will look somewhat more after your own interests, and consequently the real interests of the State, which are always advanced, when that art is encouraged, of which you are the living masters.

Send hereafter to your legislative halls, men who affiliate with you, men who drive the plough, and wield

the scythe, and delve the earth ; men who have an interest in the soil they till ; upon whose clear common sense intelligence you can confide ; whose patriotism has been tested, and whose honesty you know.

United in action as in purpose, you have it in your power to send men to our legislative halls who will, by wholesome legislation, build up the agricultural interests of your State, open up once more its soil to geological research ; who will establish agricultural schools, endowed with State patronage ; and promote by all honorable and judicious means the cultivation of those sciences which have already done so much for agriculture, by the continued expansion of its field of operations, and the wondrous increase of its means of usefulness.

It is for you to bring back the political contests of New Jersey to the old, high and honorable standard, when

“Worth made the man,
And want of it, the fellow.”

You can, if you choose, lift them up from their fallen state, and place them on their former high vantage ground. Your very position makes you conservative. If you have not large possessions to guard, you have the will and the capacity to accumulate, in a country where a pair of hands has been the basis of many a fortune. Your inheritance is not a life of toil and a pauper's obsequies ; but the fruits of industry protected by freedom. You are the “*land-wehre*,” the potentialities of the State, whose labor “places a roof over your heads, a chicken in your pot, and yearly adds a field to your farms.” Your associations have removed you from the contaminating political atmosphere of cities ; and you

will bring back again to our political contests what they so much need, honesty of purpose, integrity of motive, and freedom of action. According to the ancient mythology, "Labor stood still, when Pluto broke out of hell."

"Turbatur Lipare, stupuit fornace relictæ
Mulciber, et trepidus dejecit fulmina Cyclops."

We desire that honest labor in our day, whenever the Pluto of political corruption and degeneracy breaks loose upon the political world, shall not imitate its prototype of the ancient, by standing still; but will scourge back to its den, so infamous, yet so potential a divinity.

Farmers of New Jersey! the future is in your hands. Will you so impress your influence upon it, that the Broad Seal of your State,—which emblemizes, with its horse head, its triad of ploughs, its cornucopia full to the overflow, and Liberty watching over all, the completeness of State and agricultural interests,—shall hereafter stand forth in broader and fuller relief? Let it be to you on your banner, like the far-famed cross upon that of Constantine—having under it as he did, the motto, "In hoc signo vinces,"—"in this sign shall ye conquer."

"*Liberty and Prosperity!*" this is the legend, as we read it in the scroll upon which the shield of your Broad Seal rests. These should be your watchwords. "*Liberty!*" The liberty achieved for you on your world-renowned battle fields by Jersey farmers, and the sons of farmers, who literally left their ploughs in the furrow to hasten to the field. "*Prosperity!*" The prosperity that follows the iron coulter of your ploughs, with which "you tickle the Jersey soil until it laughs with an abundant harvest." "*Prosperity!*" The prosperity of the noble art you cultivate, that spreads the

great and bountiful table, upon which so many of your brethren in our own and sister States depend for their daily food; and that ever, with inexhaustible supply, keeps feeding all the other branches of industry.

Farmers of New Jersey! Once more have you gathered from every section of the State, to keep your annual agricultural festival and jubilee.

Greece, for a thousand years, summoned to her Olympian festivals, beneath the graceful porticos and shady groves of Elis, the men from every portion of the world who bore the Grecian name. They gathered there, from every kingdom under heaven,—from the islands of the sea, and from the colonies that her hands had planted,—to greet once more their ancient mother, and meet like loving children round the family altar, to kindle afresh the noblest feelings of the soul. The Grecian Olympiad was a common bond of alliance and reunion. While ostensibly it seemed but an exhibition for the display of physical vigor, in the numerous games that pleased the public eye and nerved and stimulated the youthful ambition to excel, it had really a much more elevated object. It was, in fact, the grand central point, where philosophers, sophists, statesmen, poets, and husbandmen assembled, that they might compare observations, and devise the ways and means of facilitating intercourse, and of diffusing useful knowledge; while one or more delivered discourses upon the progress of civilization and humanity.

So here, New Jersey assembles at this, her annual agricultural Olympiad, all who wear the Jersey name. You have come up to-day from the ocean seaboard, from the rich alluvial districts of Old Cumberland and Salem, from Burlington, Monmouth, and Mercer. The

men of Sussex, of Warren, of Hunterdon, of Passaic, of Essex, and of Union, are here. You have brought with you the rich products of your fields, the ingenious specimens of the skill and industry of the loved ones of your own homes and firesides, your choicest cattle and the fairest of your flocks; together with those numerous agricultural implements that modern ingenuity has devised for easing the yoke of labor. You have come from your rural homes to this great festival, to exchange greetings with your brethren, to talk over the results of the last year's farming, to compare notes about this or that mode of culture, to examine critically this or that improved stock; and to admire on every side the astonishing products which a generous soil, aided by experience and culture, has poured out in such rich abundance.

And as, at the Grecian Olympiad, it was ever the custom to discourse upon the progress of civilization and humanity, so permit me, on this occasion, to take it as the theme of my discourse, so that in all things we may be said to imitate that ancient and most excellent festival.

Each succeeding age and generation leaves behind it some peculiar characteristic, which stands out in bold relief upon its annals, and is associated forever with it in the memory of posterity. One age is signalized for the invention of gunpowder, another for that of printing. One is rendered memorable by the revival of letters, another by the reformation of religion. One epoch is made illustrious by the discoveries of a Newton, another by the conquests of a Napoleon. If we were asked by what characteristic the present age will be marked in the records of its successors, we should

answer,—by the wonders that have been wrought in the subjugation of the material world to the uses and purposes of humanity, and its wonderful intellectual advancement.

No one can contemplate our unexampled progress in this direction during the present century, without feeling that a new epoch has commenced in the history of our race. The divine powers of the human mind are extending their grasp, and rising to a state of higher activity; fields of knowledge undreamt of in the earlier ages of the world are successfully cultivated; the farthest regions of space are explored, and the secrets of their starry depths unfolded to men. The hidden forces of Nature, the laws by which her phenomena are governed in their endless variety and succession, the economy of being, the structure and properties of matter, the relations of things and ideas, the very mind itself,—all are undergoing a rigorous process of scientific investigation, from which discoveries result that would be deemed miraculous, did not their number and frequency almost exhaust our faculty of wonder.

The great characteristic of this general mind movement is its practical tendency. The age of the ancient schoolmen is over, and the public of our day expects from its thinkers and experimentalists not clever paradoxes, not ingenious puzzles carried on through an endless chain of infinite questions and incomprehensible distinctions, but the best, the surest, and the shortest method of grappling with obstinate realities. The public mind demands from its experimentalists, discoveries of the means by which the powers of Nature may be brought to subdue one another, for the service of man in his ceaseless struggles with her material elements.

Learning and skill are esteemed only in proportion as they conduce to the well-being of society; and their value is measured by the extent of their application to the practical affairs of every-day life. Philosophers have ceased to speculate, in retirement, upon unsubstantial, air-drawn theories. Science is no longer an abstraction, floating dreamily above the heads of the multitude. It has descended to earth; it walks with men; it penetrates the bowels of the earth; it enters our workshops; it analyzes the soil upon our farms, and the constituents of the atmosphere above them; it traces the organic elements that enter into the composition of our plants, and makes manifest how those elements are held together by a kind of balance of opposite attractions, which remain united only when that balance is retained. It speeds along with the iron courser of the rail; it tramples on the billows; it defies the tempest; it gives to man the sunbeam for a pencil, and the lightning for a messenger. It lends to man's feeble arm an irresistible might, before which mountains crumble into dust, the barriers of kingdoms are removed, estuaries and straits spanned by substantial roadways, while the unstable waters, no less than the firm land, are made subject to his dominion. The talismans of Arabian fable never endowed their possessors with such power as that which science, in our age, has bestowed upon man. It has placed at his command agents whose indefatigable energy, and adaptation to all human wants and purposes, cast into the shade the Genii of the Ring and of the Lamp.

What is there in the recorded dreams of fancy, more wonderful than the force and power of steam agency, as now developed in its various applications? How

stupendous in its power, and yet how manageable ! A child may direct it ; it would crush an army. A single touch puts in motion the ship that can bear upon its deck the population of a city, or beneath can stow away the freightage of a nation's wealth. The rushing train, entrusted with a thousand lives, is checked by the motion of a single arm. The complicated machinery that whirls, and groans, and labors through the town-like factory, may be set in motion or arrested by a touch. In one place you see it wielding a ponderous Nasmyth hammer of many tons weight, while forging the immense anchors that are to hold the huge leviathans navigating our seas ; in another, polishing, beyond the skill of human handiwork, the delicate hair spring that is to trace and record the noiseless progress of time. Here it is employed upon massive blocks of iron, which it rolls out, cuts up, and moulds, as the potter does his clay ; and here it is spinning threads so fine that they almost elude the sight, while it is weaving them into textures that look like wreaths of morning mist. Unaffected by time, place, or climate, incapable of fatigue, there stands this universal servant of man, ready to relieve him from all drudgery, and to assist his limited ability in carrying out the intentions of his will. It matters not how difficult or varied the services required, or where they are to be performed. In the depths of the earth or on the mountain top, in the open field or in the crowded city, in the frozen north or at the burning tropics ; whether requiring the most gigantic strength or the nicest care, this wondrous agent is suited to them all. It enables man, who is slow and weak compared with other terrestrial creatures, to pass from place to place with all the speed of

the eagle, carrying burdens in his flight that would crush the strongest elephant into a shapeless mass. By its means the force and dexterity of a million fingers are subjected to the control of one mind, and imbued with its intelligence. Under the transforming touch of this wonder-working power, the rudest substances are made to assume shapes of beauty and utility. It gives instruments to the philosopher, tools to the artisan, and labor-saving machinery to the mechanic and agriculturist. The frail vesture of the cotton seed, that once rested unnoticed where it fell, becomes clothing for nations; and when it has answered all possible purposes, and been reduced to the state of filthy rags, which even the poorest beggar would reject, even this refuse-like matter is taken up, and by a magical process transmuted into fair pages, that are impressed with imperishable thoughts almost with the rapidity of thought itself—then distributed throughout the world. These are a few of the astounding results achieved in our day by the power of steam,—a power which remained latent so many ages in the impalpable vapor that has played before the eyes of man since the creation, but which it was reserved for our age to evoke, control, and subjugate. Science has taught us the spell by which the spirit of the mist has been conjured from its dark abode, to administer to our behests. In the glowing words of our own Webster,—“It now seems to say to men, at least to artisans—leave off your manual labor, bestow but your skill and reason to the direction of my power, and I will bear the toil, with no muscle to grow weary, with no nerve to relax, no breast to feel faintness.”

But even the subtle influences of caloric, which thus

animates the inert water with Titanic might, fails to excite our astonishment to so high a degree as those marvels recently produced by electrical agency. If the one unites lands and transports material objects, the other seems destined to become the link that shall unite the universal mind—the vital channel of intelligence and thought between all the habitable parts of the earth. As yet, we dare hardly venture to conjecture the diverse forms this mysterious power is destined to assume, or the part it is yet to perform, in the future history of our planet. Some general ideas are all that we can fix upon as the basis of our speculations; and even these are amongst the most astounding facts within the compass of human knowledge. They resemble the operations of a spiritual rather than of a material agency. The Electric Telegraph has now become a familiar object. We look upon it with a careless eye—we pass onward and forget how once we deemed its properties miraculous; yet by it we see realized more than the beautiful fiction of Strada. Not between two minds alone does it establish a responsive sympathy, but it creates a communion of thought between cities and kingdoms. It enables a man to utter his feelings at the very instant they arise in his mind to ears that listen for them thousands of miles away. It darts with lightning speed through realms of space, and as it darts communicates thought from man to man. With the rapidity of the electric flash, it equally speeds the messages of love, or the dread summons which inexorable justice sends after its victim; and when the murderer has fled from the scene of his crime on the wings of steam, that flash along the telegraphic wire has overtaken him by a still speedier

messenger, ranging the officers of justice to seize him thousands of miles from the spot where the bloody deed was done. The enchanted horse of the Arabian magician, or the magic carpet of the German sorcerer, were poor contrivances compared with that agent which momentarily speeds along our telegraphic wires, and by which almost all the difficulties of time and space are overcome.

Look at those wires, as they stretch along by our great railway lines. They appear perfectly quiescent. The weary bird rests upon them, and clasps them in its tiny claws. Yet along that motionless thread, and through that feeble grasp, there may be passing tidings of life or death, of ruin or prosperity,—intelligence of the fall of kings and thrones, of battles lost and won, of events that change the destinies of the world,—plunging whole nations into mourning, or intoxicating them with joy. A thousand fathoms beneath the keel of the war-ship, undisturbed by the tumult of the elements in which she reels and struggles, in the dark and silent abysses of ocean, where uncouth monsters hide, where human vision has never penetrated, and amid scenes that have been secret since the beginning of time—there shall lie the wondrous ligature connecting the minds of nations, conveying manifold contributions to the sum of human wisdom and experience, and from the humanizing operations of which man, shall learn to still his mimic thunders, and aspire after higher and brighter glories than those won by mutual slaughter on such gory fields as Magenta and Solferino. The fire that glides along this ligature shall scorch away the differences of race and nation, and men shall cease to learn war any more. This globe of ours must yet be

transformed by this wondrous agency into one vast human head; these magic wires, like interlacing nerves, universalizing and harmonizing every sensation and every thought.

It was out of the passing whirlwind came the mysterious voice that asked of suffering Job: "Canst thou send lightnings, that they may go and say unto thee, Here we are?" The power denied to the age in which the patriarch lived, has, for some wise purpose of the Infinite, been reserved for the men of this generation, who have not only found out the path of the lightning, and can send it on its human mission, but, Prospero like, have caught, in passing, the Northern Ariels—those merry dancers of the skies—who light their torches in our Northern zone, and compelled even these "tricksy sprites" to do their bidding.

But there is another power at work in our age, that incalculably transcends the power of electricity or of steam—an agency to which they are both ministering servants. It is that of mind itself—the prime mover and director of them all, defining their purposes, and controlling their operations; that restless, indefatigable and inscrutable principle, to which the human frame is but an apparatus of exquisitely adjusted organs; that intellectual power which as it thinks, and feels and wills, impels man to action, directs his movements and registers their results—which pushes its inquiries into every department of creation; and with an insatiable thirst for knowledge, scans the mightiest operations of Nature, and scrutinizes her minutest processes. It surveys the past, anticipates the future, and ever and anon turns in upon itself to observe its own movements, and conduct a marvellous analysis of which it is

itself at once the subject, the instrument and the performer.

In this great mind movement, by which our age is so peculiarly characterised, evinced in the rapid development of the hitherto unknown laws of Nature, and the successful application of those laws, so as to make them contribute to man's comfort and happiness, the Agriculturist has not been forgotten.

Agriculture has become what Cicero vauntingly styled it in his day—"the nearest of all employments to the purely philosophical and scientific kind." It has in our day become a pursuit, which to prosecute to its full capacity, the arts and sciences of modern times must be made to bear upon it, and co-operate with it, so as to add something to its progression, or to apply beneficially the knowledge of its already established principles and practices.

Science in descending from her high places in this age, has taken agricultural labor by the hand, that they may walk together over the earth's surface and through the fields, while they search out "the causes of things."

Geology in this wondrous age, reveals to the intelligent husbandman, that the solid earth whose surface he tills, which bears upon its stalwart breast the Cyclopean masonry of the granite and limestone mountains, was once held in aqueous solution, and its substance as impressible as the sand from which the ocean wave has just retired. She points him to the delicate markings the footprints and impressions of organic animal structures, hardened in the solid rock, as proof of the once soluble condition of the earth. She builds up for him the great globe itself by a regular succession and con-

tinuity of strata, each presenting its own particular organisms, establishing the important fact that there has been a systematic and progressive succession of life in the ancient world; and preserving as in some curious museum the specimens of organic life, that existed at each period of deposition; manifesting that God's power on the earth has not been limited to the few thousand years of man's existence. Geology counts the age of the earth not by celestial cycles, but by an index found in the solid framework of the globe itself. It points to a long succession of monuments, each of which may have required myriads of years for its elaboration. It arranges them in chronological order, observes in them marks of skill and wisdom, finds within them the vast cemeteries of the successive inhabitants of the earth, tracing the changes backward through successive eras of development, until the time, when "the earth was without form and void, and darkness rested upon the face of the deep." This brilliant science attests that man was the last of created beings in our planet. Through centuries and ages of creative activity, there is not the faintest trace of his presence, his footsteps or his handiwork. In all the pages of this stony volume wherever it has hitherto been opened, there is no record of man. He is as absolute a stranger, as though he were not at this moment and never had been a denizen of this planet. But yet how sublime the thought, that here suggests itself of man's importance, and of a Creator's love, when the truth leaps forth from such scientific revelation, that all this creative energy and intelligence were exerted to prepare a fit habitation for the coming man. The flint of your mountains, the red clay of your seashores, the

marl that fertilizes your fields, and makes them wave with a golden harvest; the rich abounding treasury of your coal fields; are but evidences of a divine forecast, that has thus deposited the remains of animal and vegetable life, which by gradual transformation and decomposition, were to minister for all time, to the wants of the coming ruler, who was "to have dominion over the fish of the sea, over the fowl of the air, and over the cattle, and over all the earth, and over every thing that creepeth upon the face of the earth."

This noble science which thus tells the interesting story of the earth's past career, marking its epochs by revolutions, which have repeatedly submerged, elevated and dislocated its framework, has, in a remarkable degree, in our age made itself subservient to the great art of Agriculture.

It shows this earth with its huge mass resting on its primary strata, where the granite and the gneiss, the limestone and the slate have their beds. It points to the transition period, when tropical vegetation, under the influence of tropical heat, gave birth to the ancient Flora of the earth, rank and luxuriant, whose decay accumulated that vast amount of carbonaceous matter, now ministering so much to the comfort and prosperity of man—those immense coal deposits, out of whose subterranean treasure-house comes the substance that enlivens our hearthstones, prepares our food, furnishes light to our dwellings; and is fast becoming the essential agent of that mighty power of steam, upon which modern locomotion, the increasing value of the products of our farms and manufactories so much depend.

With unerring certainty geology points the agriculturalist to that tertiary formation where the marine

strata are deposited, to which the rivers, lakes, floods and seas of the ancient world contributed. Here you find the grand depositories, where are stored the fat and unctuous marls and green sand, which have proved such efficient fertilizers of the soil in the alluvial districts of New Jersey.

You come to the surface, to the soil you cultivate, and geological science shows you its derivation from the original primary rocks, which by convulsions, changes, and repeated disintegrations, has been the better fitted for the purposes of tillage and cultivation. It teaches the agriculturist how to tell the character of the outer soil from the rocks beneath it. In some places you meet with sand-stone, in other places limestone, in other, slate or hardened clay or rock. Hence your sandy soils, your clay and your calcareous soils: for it is almost certain that the upper soil has been formed from the crumbling or decay of the solid rocks beneath it. Thus, the modern intelligent agriculturist seeking a locality for settlement, by the aid of this useful science is now enabled to say—"By the geological structures of this section of country, here, I shall have the more permanent productive soil; here I am more within the reach of agricultural improvement; here, in addition to the riches of the surface, my descendants may hope to derive the means of wealth from the mineral riches beneath."

But geology is not the only science, that in this remarkable age ministers to the wants and necessities of the agriculturist.

Agricultural chemistry comes in, to teach him the nature of the various elementary constituents of bodies, and the laws which regulate their combination in the

inorganic and non-vital world: while animal and vegetable physiology instructs him in the constituents of organic or vital beings. Chemistry discloses to him the existence of deleterious gasses in the atmosphere, while vegetable physiology most beautifully demonstrates how the leaves of the plants are the lungs by which they breathe, and appropriate the carbonic acid of the atmosphere, which is retained and absorbed by them as part of their structure, while the oxygen so necessary to man's vitality, is excreted into the air by them as useless. So thus by an arrangement, whose wisdom is apparent, the vegetable and animal kingdom are made to contribute mutually to each other's support. Nay, they are essential to each other's existence. Destroy the animal reign, and the vegetable will speedily perish for the want of its proper nutriment. Eradicate the vegetable cover of the earth, and the very air we breath, will lose that element by which life alone continues.

Chemistry reveals how certain elements of the inorganic world contain nitrogen, phosphorus, soda and lime; while vegetable physiology clearly demonstrates how the living organism of the plant, when these substances, in the shape of natural or artificial manures, are brought to its roots, through these vegetable mouths drink in the liquid nourishment that the rains wash down, which by Nature's secret process goes to form stem, leaves and flowers. Vegetable physiology develops for the agriculturist the great truth, that as the blood is to the life of man, so the sap in vegetables is the vital current, the nourishing fluid which, circulating through their veins and arteries, is necessary for the maintenance and increase of their frames; and as this

nourishing fluid is being constantly consumed, and must receive fresh supplies, agricultural chemistry reveals the elements that enter into its formation. It analyzes the sap of the vegetable, and finds it to consist of all the elements, of which the individual plant is composed, while carbon, hydrogen and oxygen materially enter into its formation. Then vegetable physiology most curiously makes manifest how plants derive all these gasses from the atmosphere, their carbon from its carbonic acid, their hydrogen from its moisture, and their nitrogen from the gleaming lightning, that shedding its lurid glare, during the passing thunder shower, gives down this important element, which coming in contact with earth's organic substances, produces that vigor in vegetation, which is the certain accompaniment of the summer shower. So that in fact, the electric magazines of the skies, aided by earth's substances, are continually engaged in the manufacture of those nitrates of potash, of soda, or of lime, that form such important ingredients in your best manures.

In fact, the science of vegetable physiology may in truth be said to reveal to him who studies it in a proper spirit, the sublime and exalted mission of the whole vegetable economy; which economy, singularly enough, though "of the earth, earthy," symbolizes in the immutable laws of vegetable life the spiritual ordinance of that which is yet to be in the great hereafter. It in truth makes manifest,

"How Creation's soul is thrivance from decay,
And Nature feeds on ruin; the big earth
Summers in rot, and harvests through the frost,
To fructify the world; the mortal now
Is pregnant with the spring-flowers of To-come;
And death is seed-time of Eternity."

It reveals how the immutable law of vegetable nature decrees that death shall proceed out of life, and life out of death; that the living animal shall draw its vitality from the dead plant, and the living plant from the dead animal; that decomposition must be but the commencement of recomposition, and putrefaction the symbol of renewed production. The brave apostle to the Gentiles preaches this beautiful truth in that sublime passage which has so often comforted the stricken mourner, as, weeping over the grave of the beloved, he hears with wildly beating heart that fearful Miserere of the last service of the Church, "Earth to earth, ashes to ashes, dust to dust,"—"But some will say, How are the dead raised up, and with what body do they come? Thou fool! *that which thou sowest is not quickened, except it die!*"

And is not this as well, the universal law that history teaches in the progress of the political world? Has not the dissolution of old forms of government been but a preparation for new phases of humanity? Dynasties may die out, and forms of humanity be changed, but the great law of progress, of reconstruction from decay, still urges humanity on; and the ruin of states and empires becomes like the falling of the leaves in autumn, manuring the soil, and preparing it for the growth of richer vegetation and more abundant harvests.

Nor is this wondrous truth of reconstruction from decay, the only marvel that reveals itself to the earnest student of vegetable physiology. Amongst the wondrous analogies disclosed by it in the animal and vegetable kingdom, none certainly are more astonishing than that curious discovery of sexes in the higher order of plants:

making manifest how, by the impregnation of the germ in the one sex, that germ is converted into a seed; and how that seed, if placed in the ground in a condition where it can have health and support, becomes the perfect plant. How singularly significant, too, the revelation that in the flower of every plant rest these organs of reproduction. So that calm race, the flowers, all loveliness and tranquillity, whose life is beauty, and whose breath is perfume, play no idle part in Nature's workshop; for to them is in reality committed the task of perpetuating not only vegetable but animal life. Upon their active industry depends the life of every bird that soars in air, of the cattle on a thousand hills, of every insect that crawls in the dust, and of the life of man himself. As England's laureate poet asks:

“Who is it that could live an hour,
If Nature put not forth her power,
About the opening of a flower?”

Look, too, at the beautiful revelation vegetable physiology gives us of the superintending love that watches over all things, from the least to the greatest. See how kindly Nature, with a mother's instinctive love and tenderness, surrounds the germ, before it is separated from the parent flower, with nutritive matter—the starch, the gluten, and the albumen—which shall form its future food when the parent flower dies—the carpel splits, and the seed is free. And learn, too, Nature's ingenuity, when you note the little wing-like expansions on the sides of the new-born seed, that it may the more easily waft it to some distant place, where it is to lie, feeding on its own stores, until exposed to warmth and moisture, and the oxygen of the

air, it shall burst its seed coats, and commence its active existence.

But the science of vegetable physiology stands not alone in the valuable contributions it has made to the art of the husbandman. Chemistry has already, as every intelligent farmer knows, advanced, with astonishing rapidity, the agricultural interests of the world.

Chemistry, as a science, is of comparatively late origin; and how few there are, unless their attention is directed to it, who can fully realize the extent to which it has contributed to the comfort, prosperity, and luxury of the world.

When, in the latter part of the last century, the focus of Priestly's burning lens evolved from the common red precipitate of our apothecaries' shops bubbles of gas, identical with that which supports life, who could have supposed, that by freeing one of the metals from its companion element, the composition of many of the most useful ores would have been detected, and a hint furnished which was to bring the whole metallurgic art to a system of rigid and practical economy? Or who could have been presuming enough, when his nostrils first caught the suffocating odors produced by the German chemist's operations on the acid of sea-salt, to have then predicted that this discovery should introduce a total revolution in the manufacture of paper and linen textures, and a vast variety of objects? Or when the chemists of the last century observed the discoloration and degradation which certain metallic salts underwent in the sunlight, who would have ventured on the prediction that the sun itself, in our day, should place a pencil in the hands of Daguerre and Talbot which should make the highest efforts of the

painter's skill, poor in the comparison? Or when the French philosopher, not a half century ago, perceived the disturbance of the magnetic needle, produced by a neighboring galvanic current, who could have conceived that from this circumstance science should conjure up a sprite that would outstrip the fairy Oberon, "in putting a girdle round the earth in forty minutes?"

But great indeed as are unquestionably these contributions to the sum total of human comfort and prosperity, we doubt whether in practical every-day usefulness, they have not been equalled by those which chemistry has made to agriculture, and that, too, within a recent period.

It is within the memory of most of us, when the application of this science to agriculture was first efficiently made. Why it was only the other day that Liebig made the first successful attempt to improve agricultural resources, when he suggested, on theoretic grounds alone, the addition of sulphuric acid to bones, as a means of rendering them when used more soluble, so that the spongioles of the thirsty plant might the more easily appropriate the liquid nourishment.

But the intelligent farmer of to-day, who has learned through the developments of this science great and useful truths, truths of which he never dreamed before, is ready to acknowledge his indebtedness. He knows that with a knowledge of geology, vegetable physiology and chemistry, he is much better enabled to realize upon his farm the full advantages of its culture, from his acquaintance with the character of the soil, the organism of plants, and the nature of the food that will best perfect that organism.

The farmer of one idea, the man who, in this age,

despises book-farming, as he contemptuously calls it, is ever like the man with the muck rake in Bunyan, looking downward, and never wishing to extend the range of his vision. He is as one who is content to stick to the old Troy coach in preference to the many more certain and expeditious modes of locomotion. Experience has done much and will do more for the farmer. But experience after all is but the dim glimpse of truth, like the religious faith that men had before a revelation. Experience did much for the age in which old Cato the Censor lived, and in his Agricultural Treatise he very properly enjoined on the young Roman farmer, "Beware of rashly contemning the usages adopted by others." This was good advice in the days of the stern old Roman, and it is good advice now. But he who relies upon experience alone in this age, when the laws of science are unfolding truths that experience never revealed, will find himself going behind, and that pretty rapidly too. Oh, but the world got along very well without *book-farming* many years ago. Yes, and so they did, for a time, without breeches or buttons; and much longer without the printing press or the steam engine.

As Henry Ward Beecher very pertinently says upon this subject: "A farmer never objects to receive political information from newspapers; he is quite willing to learn the state of the markets from newspapers; and as willing to gain religious notions from reading and historical knowledge, and all sorts of information, except that relating to his business. He will go over and hear a neighbor tell how he prepares his wheat lands—how he selects and puts in his seed—how he deals with his grounds in Spring—in harvest—and

after harvest time; but if that neighbor should write it all down carefully, and put it into print, it's all poison! it's *book farming*!"

"Strange, such a difference there should be
'Twixt tweedledum and tweedledee."

Let me enumerate in brief, for time warns me I must not trespass much longer on your attention, the benefits that have resulted to agriculture by the developments of chemistry.

It has taught the agricultural world the value of substances for manures, which heretofore have been deemed worthless. It has shown why plants grow upon a soil that is well manured, because such manure has added to the soil the elements that enter into the structure of plants,—nitrogen, phosphorus, sulphur, potash, soda, and magnesia. It has taught the agriculturist that when the natural manures fail, artificial compounds may be resorted to, giving to the soil and the plant something in which the first was deficient, and the latter was craving for its nourishment. It has taught the characteristic distinction between animal and vegetable manures,—that the former contains a much larger proportion of nitrogen than the latter; and instructs you how to best treat animal manure, so as to hold and preserve that nitrogen, or the volatile ammonia which decay evolves from it, and upon which most of its virtue depends.

Chemical analysis, perhaps, will show you that your soil is deficient in sulphur or in soda. Guided by this, you apply a top dressing of sulphate of soda to your wheat, and the full grain in the ear almost bends to the earth with its weight. You find that the land you are

about to lay down in grass is deficient in nitrogen ; you top dress it with a preparation of nitrate of soda, and a rich, luxuriant crop greets the advent of your sweeping scythe.

The intelligent husbandman who spreads lime upon his land, through the revelations of agricultural chemistry is aware that, by this means, he goes through the very process a chemist resorts to in his laboratory to analyze the soil ; he liberates the silica, the potash, and the phosphates, which enable these substances the better to mingle with the soil, and administer to the demands of vegetation.

And he learns further, that by this liming process, he has furnished no equivalent for that removed by the crops ; and unless he restores to the soil what the lime has evolved, his frequent liming will only burn up and exhaust it. He learns, perhaps what he never dreamed of before, that lime is not in the ordinary sense, a manure, for manuring consists strictly in the restoration of that to the soil in which it is deficient. But lime is a robber, and the farmer who works slovenly and ignorantly, contenting himself with the frequent liming, will find its constant depredations will leave his soil poor indeed.

Already the system of scientific cultivation is being guided and directed materially by the light of chemistry. By taking advantage of varieties produced naturally, by endeavoring to produce others by art, and forming hybrids, an immense number of varieties have been brought into existence, each possessing peculiarities of great interest and importance. On the maritime cliffs of England there existed a little plant with a fusiform root, smooth leaves, and a flower similar to that of the

wild mustard, with a saline taste. By scientific cultivation there have been produced from that insignificant and useless plant, all the brocolis or kales, at least a dozen varieties, all the cabbages that head, all the early savoys, and the whole family of turnips. Now, although it is not fair to suppose that cultivation can ever produce from a single plant so many varieties as have sprung from this *brassica*, much is being done, and much more can be done in this direction. Scientific cultivation, aided by chemistry, is now bending all its energies to produce varieties which shall extract as much as possible from the soil in the shortest possible time ; in other words, varieties richest in nutritive matter, coming speediest to maturity.

Formerly, when the supply of manure was limited, the agriculturist had no motive, or scarcely any, of producing such varieties. The varieties he already possessed absorbed from the soil all the nutritive elements of the manure he had to give it, and as fast as he could furnish it. Now, however, artificial manures promise to give an unlimited supply, and the case is different.

Agricultural chemistry has further revealed to you, that the drought, when the earth is parched and vegetation dwarfed and withered by the heat, is only an affliction for the present, a blessing in disguise for the future, That the early and the latter rain may produce at once abundant crops, but dry weather is needed to bring to the surface from the depths of the earth food for the future harvest. That as the drought continues, the water from the sub-soil keeps constantly bringing to the surface the salts of lime, of magnesia, or of potash that it holds in solution. Thus we are

taught to see in the drouth one of Nature's ordinances for keeping up the fertility of the soil.

The management and tilling of the soil has now got to be a branch of practical chemistry, which like the art of dyeing, or of lead smelting, may advance to a certain degree of perfection, without the aid of pure science; but which can only have its processes explained, and be led on to shorter, more simple, more economical, and more perfect processes by the aid of scientific principles.

Nearly a century ago, a Scotch mother, according to Sir Walter Scott, objected to her sons using what she called a new-fangled machine for digh^{ting} the grain from the chaff, thus impiously raising wind by human art, instead of soliciting it by prayers. We wonder what this good old Scottish mother would have thought, if she could have been spared to our times; and her wondering eyes could behold in our age the increasing triumphs of mind over matter, and the subjugation of the physical elements to an intellectual sovereign. Surely, if in any department, man has sought out many inventions, it has been in the department of agriculture. With your patent horse-hoes and patent drills, with your steam ploughs, your centre draft ploughs for sand soils, and for clay soils, with your side-hill and sub-soil ploughs, your reaping, mowing and threshing machines, your revolving wheel and hay rakes, and your patent sowing and planting machines, you have a mass of labor-saving machinery, that must excite the wonder of the farmer who tilled the land a quarter of a century ago.

Such are the wonders of the remarkable age in which we live, such have been the contributions made

by science to Agriculture. Living then in so progressive an age, it is hardly necessary for me to say, that it is the duty of all classes in an agricultural State like New Jersey, to gain by every means within their power the full amount of benefits placed within their reach. We have been heaving, to-day, the log into the deep, and measuring the rapidity of the current, by which the world is borne along. You cannot stop that current if you would, and you ought not if you could. Neither can you stand idly by, trusting to the strength of the ancient moorings, by which your vessel is made fast; for against such a current, the stoutest cables will give way, the strongest vessel drag her anchors, and be lost among the shallows. Your duty, and the duty of all of us, is to strive to turn in the best direction, the current which is carrying us forward, opening for it a free course into regions where it is most needed, rejoicing as we see it fertilizing the material and intellectual waste places.

Farmers of New Jersey! your lines indeed have fallen upon pleasant places; yours is a goodly heritage. Like "the children of the Promise," "you have been brought into a good land, a land of brooks of water, of fountains and depths, that spring out of valleys and hills, a land wherein thou *canst* eat bread without scarceness, thou *canst* not lack any thing in it—a land whose stones are iron, and out of whose hills thou mayest dig brass."

And the same Almighty power which gave you this goodly land to possess it, has blest the fruit of your land, your corn, and your wine, and your oil, and the increase of your kine, and your flocks of sheep.

From your alluvial districts, where kindly Nature

has laid up for you the fertilizing treasures that have so enriched your fields, to the chain of noble highlands that skirt your northern line, rich in their varied mineral deposits—from your seaboard, where the Atlantic dashes with sullen roar, to where the waters of our own Delaware glide murmuringly along—there is no land in all our widespread confederacy that can surpass it, in the value of its fertile acres, the genial nature of its skies, or its abounding capability to meet the great and growing wants of the mighty future that is opening before it.

It is a land with rich and verdant meadows smiling beneath its pleasant skies—with grain-fields ripening for harvests, that fill to the full its groaning wains and bursting granaries—with orchards bending to the earth with their russet brown and golden fruitage—and a soil containing those fertilizing elements that have already made garden-spots of its waste places, and shall yet make its “barrens” to rejoice and blossom like the rose.

It is a land of which I may exclaim, as I glance over it with pride, in the words of the Scottish song, slightly altered :

“The heath waves wild upon her hills;
And foaming frae the fells
Her fountains sing of freedom yet,
As they dance down the dells.
And well I lo’e the land, my lads,
That’s guarded by the sea:
Then *Jersey’s* dales, and *Jersey’s* vales,
And *Jersey’s* hills for me;
We’ll drink a health to *Jersey* yet,
Wi’ all the honors three.”

Such, Jersey Farmers, is the lot of your inheritance,

and I cannot better close than in those eloquent and earnest words of the late Bishop of New Jersey: "It is your heritage, and it is for you to own the fulness of the debt of grateful love by the discharge of your high duties to God, your country, and the generations yet to come, *that it may be to you an heritage for ever.*"

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