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An Address to the Literary and Philosophical Society of South Carolina, August 10, 1814

Stephen Elliott

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AN ADDRESS

TO THE

LITERARY AND PHILOSOPHICAL SOCIETY

OF

SOUTH-CAROLINA;

DELIVERED IN CHARLESTON,

ON WEDNESDAY,

THE 10th AUGUST, 1814.

By STEPHEN ELLIOTT, PRESIDENT of the SOCIETY, and MEMBER of the AMERICAN ACADEMY of ARTS and SCIENCES.

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1814.

AN ADDRESS, &c.

GENTLEMEN,

IN obedience to the appointment of the Society, I riſe to addreſs you; and little as I may have merited the honor you have conferred upon me, I ſhould feel ſtill more unworthy if I permitted the calls of buſineſs, or private avocations, to excuſe me from the performance of any duty you may impoſe upon me, however imperfectly the execution may anſwer your expectations, or my own wiſhes.

In aſſociating to proſecute and encourage Literary and Philoſophical purſuits, you have given a teſtimony of your reſpect for ſcience, and of your deſire to render an important ſervice to your country; of your wiſh to promote reſearches which give dignity to individual reputation, and are eminently calculated to advance public welfare, to multiply national reſources, and to elevate national character. In the proſecution of this deſign let us add zeal to knowledge, and perſeverance to enterprize.

In the early dawn of ſcience in modern Europe, Literary and Scientific Societies began to flouriſh, and with the encreaſing day they have continued to multiply. Men of ſcience have every where been eager to encourage their formation; nations have ſome times conſidered them an ornament and a benefit. Their uſes are important and diverſified. Not deſigned to form theories, to eſtabliſh or ſupport particular ſyſtems, either in ſcience or in art; it has been their more humble province to collect the ſcattered and fading rays of philoſophic light, to record detached and iſolated facts, to encourage the purſuit and inveſtigation of truth, to give to ſcience popularity, to draw the human mind, if poſſible, from the trivial and often unworthy enquiries of momentary intereſt or paſſion, and to afford the friends and cultivators of Literature and Philoſophy ſome point of union and of concert. It is not eaſy, now, to determine how much theſe aſſociations have aided the improvement of civilized ſociety, or added by their labors and reſearches to the maſs of human knowledge. Their taſk has been to collect the ſtone, the mortar, and the block, with which the future architect may rear his edifice, and like the workmen of the quarry, although their individual labours may be unnoticed or hidden in the finiſhed ſtructure, yet, have they, nevertheleſs, eſſentially contributed to its ſolidity or magnificence.

In Europe, where the purſuit of ſcience has long been a cheriſhed, and a faſhionable occupation, and where the number of literary and ſcientific men has become ſo great as almoſt to croud and joſtle on the road, ſocieties have been formed to promote the ſtudy of each diſtinct branch of knowledge. But with us it has been deemed adviſeable to unite in one Society all who ſhould be willing to aſſociate in our labors; while by arranging our members into different claſſes, and aſſigning to each claſs diſtinct and de-

terminate objects, each individual will find himself co-operating with associates, having common views and occupations.

On this occasion it will not, perhaps, be an inappropriate theme, to recall to your remembrance, and to present to public view, the great objects of our association, and after passing briefly in review the arrangements of the society, after faintly delineating their extent and magnitude, to offer some general observations on their ultimate importance and values. I feel that this sketch will be drawn with a weak and unsteady hand. To few has it been given to view the extended field of science with strong and distinct vision, to pourtray each separate compartment in colours, at once luminous and true; nor will time permit me to do more than merely to point out the extent and importance of our pursuits, their influence on individual character, and on national prosperity.

The objects to which the society has deemed it advisable to direct the attention of its members, have been distributed into the following classes:

I. MATHEMATICS, and MECHANICAL PHILOSOPHY.

The mathematics form one of the great foundations of science in their first elements an attainment of indispensable necessity to society, in their higher branches distinguished for the sublimity of their views, and the extent and utility of their application. This science is peculiarly the science of truth, no doubt hangs upon its processes, no uncertainty attends its result. Whatever relates to number, to proportion, to magnitude, it exclusively comprehends. All the branches of mechanical philosophy, mechanics, optics, hydrodynamics, astronomy, are but illustrations of its principles in the wonderful diversity in which they are applicable to matter when at motion or at rest.

Armed with its intelligence, man reduces to system the extended movements of the universe, reduces to order the erratic marches of the planets, brings to measurement their distances, their magnitude, their density, their velocity; explains their apparent irregularities and eccentricities, calculates and determines the all pervading power of gravitation, numbers the stars in the firmament, and metes out the limits of the constellation.

The mathematics give to geography its precision, and of course all its value; they point out to the mariner his track on the pathless ocean, to the traveller his road through the untrodden wilderness, to the miner his route in his subterranean journey. Many of the arts of civil life, architecture, civil, naval and hydraulic, fortification, surveying, navigation, depend exclusively on their assistance, and most of the machinery that gives to man such stupendous power is formed and guided by their principles. Without their aid, society itself, like some neglected column, or tower, like Palmyra or Babylon, would moulder into ruin.

In the investigation of mathematical and geometrical truths, some of the most profound and sublime efforts of the human intellect have been displayed. Yet, after all that has been accomplished, this science is not exhausted; even in that field which has been explored by the great minds of a Euclid, an Archimedes, a Copernicus, a Kepler, a Leibnitz, a Newton, a Euler, a La Place; there remain many hidden truths. Discoveries still due to genius, merited rewards for labor. And in the application of mathematics to the pursuits, and occupations of man, to mechanics, to machinery, to the arts, the limits are perhaps interminable.

II CHEMISTRY, including ELECTRICITY, GALVANISM and MINERALOGY.

No Science is so intimately connected with the purſuits of man, or mingles ſo extenſively with his occupations, as chemiſtry. It embraces the whole range of created nature, it comprehends, in its reſearches, all ſubſtances animate or inanimate: it explores their elementary principles, it unfolds their combinations, it traces their affinities, it aſcertains the reſult of new aſſociations, new combinations. In every employment we feel its influence, or want its aid. Moſt of our arts and manufactures have their foundations in the principles of chemiſtry, or are guided and enlightened in their progreſs by chemical reſearches. In our food, in our medicine, in our cloaths, in the decorations of our houſes, we trace its operations. The proceſſes of the dyer, the painter, the gilder, the glaſs maker, the potter, the tanner, the diſtiller, the brewer, the baker, are purely chemical, and metallurgy, which extracts the metals from their earths, and ores, and gives to man theſe inſtruments of power, exhibits one of the triumphs of chemiſtry. Gunpowder, which has made ſo great a revolution in military ſcience, and changed the whole artillery of war, is a chemical compound. The power of ſteam is generated, guided and governed by chemical proceſſes, while the application of its gigantic force is left to mechanical arrangement.

Chemiſtry aſcertains the nature and properties of thoſe airs or gaſes, which exiſt in the atmoſphere, and perhaps pervade all nature, it analyſes the compoſition of the atmoſphere and endeavours to elucidate its changes. Hence thoſe modifications of the air, which conſtitute the ſcience of meteorology, the reſult of combinations of the gaſeous fluids, varied probably by electric and magnetic influence, become objects of chemical enquiry.

Electricity, from this influence on the atmoſphere, from the impoſſibility of reducing its laws to mathematical calculation, and from its general effects on chemical analyſis and combination, has been referred to this claſs. With it has alſo neceſſarily been connected galvaniſm. This wonderful modification of electricity, whoſe very exiſtence is a late diſcovery, and whoſe prodigious effects have been but recently made known, has now become one of the moſt powerful re-agents of chemiſtry. No diſcovery in very recent days has opened ſo new and extenſive a field of experiment, as the voltaic, or galvanic battery, nor one which has excited more general or anxious enquiry. It had long been doubted whether the earths and alkalis, as known to us, were ſimple elementary ſubſtances. While ſome were thought to have affinities to the acids, others were ſuppoſed to conſiſt either of elements ſtill more ſimple and which had not yet been detected, or to be the oxyds of unknown metals. Galvaniſm has partly realiſed theſe conjectures. It has already proved that the alkalis are metalic oxyds. It now promiſes to decompoſe many of the earths to render more accurate the knowledge we poſſeſs of elementary ſubſtances, perhaps to diſcover new elements. With every increaſe of agents, ſcience will poſſeſs new powers, and may exhibit new combinations, new actions, new reſults.

Mineralogy has alſo been referred to chemiſtry, becauſe, in the laſt reſort the compoſition and value of all foſſils muſt be determined by chemical analyſis. This ſcience, for a long time neglected and abandoned to ignorance and prejudice, has within a ſhort time obtained the popularity and attention it ſo juſtly merits. While chemiſtry has been engaged in analyſing and aſcertaining the component ſubſtances of different minerals, men of ſyſtem have endeavoured to arrange them in

natural aſſociations and to diſcriminate them by fixed and certain characters. The ſyſtems before the age of Linnæus ſcarcely merit attention, and his arrangement of the mineral kingdom though exhibiting ſome marks of his profound and diſcriminating mind, never acquired the celebrity, which his ſyſtems of the vegetable and animal kingdoms have ſo juſtly obtained. Yet he merits praiſe for having directed the attention of mineralogiſts to the cryſtalliſation of minerals. Bergman and Wallerius added ſomething to the ſcience; and Cronſtedt had the merit of firſt exhibiting a ſyſtem, formed on uniform, if not truly correct principles. His claſſification of minerals is ſtrictly chemical, and although ſuperſeded or neglected in the extenſive diſcoveries of later years, is ſtill entitled to attentive conſideration. Two more recent ſyſtems now occupy and divide public opinion.

Undoubtedly one of the moſt ingenious and profound ſyſtems, which has ever been offered to the attention of the world, is the mineralogy of the Abbe Hauy. Availing himſelf of the lights which had been thrown on the ſcience of cryſtallography by Linnæus, by Bergman, but principally by Romé de Liſle, he has formed a theory more accurate and more extenſively applicable to cryſtalliſed mineral ſubſtances than any of his predeceſſors. Aſcertaining by the mechanical diviſion of different cryſtals, that each diſtinct ſpecies is compoſed of homogeneous particles, or as he terms them, integral mollecules, he endeavoured by a profound combination of mechanical and mathematical ſkill, to diſcover the primitive form of each ſpecies, whether that form reſembled the integral mollecule, or, whether by a combination of thoſe mollecules it aſſumed a new figure, and then determined by mathematical calculation the ratio of increment or of decrement, by which theſe primitive forms could be made to aſſume each variety of cryſtalliſed figure, which in fact it did exhibit, or could poſſibly exhibit. Adopting then the integral mollecule, or primitive form, as the type of each ſpecies, he arranged around the primitive ſpecies, each modification of the cryſtal, as diſtinct varieties. As every ſtep in this proceſs was determined by mathematical principles, no theory, as far as it extends, can be more completely ſcientific. It has, however, ſome defects: in the firſt place, of ſeveral ſpecies unqueſtionably diſtinct, the integral mollecule, and primitive form, appear to be the ſame, or if nature has really made a diſtinction, it is too minute for human inveſtigation. (1) This ſhakes the very foundation of the ſyſtem, which is predicated on the idea that each diſtinct ſpecies of mineral has a primitive form, peculiar to itſelf. In the ſecond place a great proportion of foſſil ſubſtances are preſented to us in rude amorphous maſſes or fragments, exhibiting no trace of cryſtalliſation. As it is impoſſible therefore to detect, of ſuch ſubſtances, the integral mollecules, they cannot be arranged under the ſyſtem of Hauy. It may alſo be doubted, ſingular as the objection may appear, whether this ſyſtem is not too ſcientific to become a popular one. For it not only required profound mathematical knowledge, a knowledge very diſtinct from mineralogy to diſcover the principles of this theory, but it will require much, even to underſtand it, at leaſt ſufficiently to aſcertain new ſpecies, or to refer new varieties to their proper ſtation around ſome known primitive form. It has, however, rendered more extenſive and more accurate our knowledge of cryſtallography, and has enlarged the bounds of ſcience.

Widely different is the ſyſtem of Werner. Founded entirely on external characters, on colour, figure, luſtre, tranſparency, fracture, weight, and modes of cryſtallization, it is avowedly popular and practical, being eſtabliſhed on thoſe qualities moſt obvious to the ſenſes, moſt eaſily retained by the memory. Its leading principle is to aſſociate

in natural groups, or families, ſuch minerals as nature appears by their external characters to have allied, unmindful of their component ſubſtances, as determined by chemical analyſis. It would indeed appear that ſome of the pupils of Werner, perhaps Werner himſelf, doubt the accuracy of thoſe analyſes which ſeparate ſubſtances that ſeem to be naturally allied. While this ſyſtem is liable to the objection of departing widely from chemical arrangement, of aſſociating in ſome inſtances foſſils whoſe component parts are materially diſſimilar, and of ſeparating others that appear in the hands of the chemiſt to be nearly allied, it has the merit of being ſtrictly mineralogical. Its deſcriptions and characters are drawn from the obvious features of minerals themſelves, and not from the collateral lights of chemiſtry and the mathematics. It uſes theſe ſciences, but they do not conſtitute its foundation: and it is but juſtice to remark, that the ſchool of Werner is ſaid to have produced the beſt practical mineralogiſts in Europe.

After all, however, theſe ſyſtems are but conjectural and tentative: and as we are ſtill obliged to refer every new ſubſtance to the laboratory of the chemiſt, before we can know its conſtituent parts, or its value in the arts, or in commerce, Mineralogy, however we may arrange our cabinets, or marſhal our ſpecimens, muſt remain a branch of this "Univerſal ſcience."

III. ZOOLOGY AND BOTANY.

Zoology, even if you except from it man, the firſt link in the chain of terreſtrial beings, and the moſt worthy of our inveſtigation, has ſtill many claims to our attention. The relation which the more perfect ſpecies of animals bear in their ſtructure and phyſiology to man, has thrown light upon many of the obſcure functions of the human frame, and renders comparative anatomy an object of intereſting reſearch; while the imperceptible grades by which animals deſcend on the ſcale of being; the variations in their organization; the loſs of ſome functions and powers, the acquiſition of others; their peculiar conformation, whether adapted to fly, to run, to ſwim, to creep; their increaſing ſimplicity of ſtructure, and gradual dimunition of vital power, until the animal, by inſenſible tranſition appears to be loſt in the vegetable, open a field, and afford objects for obſervation no leſs amuſing than inſtructive: Neither in an œconomical view is this ſtudy leſs important. The multiplied relations of man to the animal kingdom, his extenſive dependance on it for food, for clothing, for ſervice, for health, even for amuſement, would ſeem to require from him a well directed attention to their organization, their habits, and œconomy. How valuable to man would be the domeſtication of other animals, that in new capacities ,or with different powers, ſhould render him as much ſervice as the horſe, the ox, or the ſheep. From the other orders of the animal kingdom (beſides the mammalia) we derive now many articles that ſupply the wants and add to the conveniences of civilized life, and an encreaſed knowledge of their hiſtory and habits would enlarge the amount of their preſent ſervices, and diminiſh many of the evils we ſuffer from them; even Entomology, the moſt neglected and depreciated branch of natural hiſtory, preſents many views of peculiar intereſt to man. To ſay nothing of the ſilk worm, an inſect ſo important to luxury, and ſuch a ſource of wealth to many countries; of the various ſpecies of lytta, ſo valuable as veſicatories to medicine; of the cochineal and lac inſects, (coccus cacti et lacca) ſo prized for their coſtly and brilliant dyes; of the bee, ſo intereſting from its induſtry and wonderful œconomy, as

well as from its productions; inſects, from their numbers, their diverſity of habits and of food, their ſize, are almoſt perpetual objects of amuſement, or annoyance, of profit, or of injury. Their annoyance, and their injuries, we feel more ſenſibly than their benefits perhaps they are more real, they are certainly more obvious. For, although we are fortunately exempt from the deſolating march of the locuſt, we ſuffer from the ravages of other inſects. The injury which the cotton has ſuſtained from the larva of a moth, is well known; the tobacco requires much care to protect it from the larva of a ſphinx; and every ſpecies of grain is liable to attacks from inſects at ſome period of its growth. In our gardens they are more deſtructive than in our fields, and in our orchards ſtill more pernicious than in our gardens; and perhaps I may, with accuracy, aſſert, that if we could prevent the depredations of one inſect, the curculio, (2) which, in its larva ſtate, preys upon our drupaceous fruit, the peach, the nectarine, the plumb, the cherry, in all of their varieties, we need envy no country its orchards, but might exhibit on our tables, at little or no coſt, as great a variety, and as finely flavored fruit as any climate with which we are acquainted. It is only by a thorough acquaintance with the natural hiſtory of inſects, that we can hope effectually to leſſen their numbers, or to reſtrain their ravages; and although we ſhould not be able, altogether, to prevent their injuries, for they ſometimes ſeem to walk abroad as one of the ſcourges of Providence; yet it is only from enlightened efforts that we have a right to expect an alleviation. Induſtry, with knowledge, will diminiſh many of the evils which ignorance and indolence muſt certainly aggravate.

From the vegetable kingdom, it is probable, that every ſpecies of organized animated being, either immediately or mediately derive their ſubſiſtence. In the terreſtrial animals this fact is obvious, for the carnivorous ultimately depend on the graminivorous or granivorous for food. And among the inhabitants of the ocean, the same analogy probably prevails, and the minute inſects, which, in the firſt degree ſupport the ſuperior tribes, draw their nouriſhment from the aquatic plants which border every river, or the marine algæ which so abundantly inhabit many parts of the ocean. From the vegetable kingdom are derived nearly all of thoſe articles, which are employed to palliate or cure the diſeaſes, and to alleviate the ſufferings to which the human frame is liable. What volumes have been written on the dietetic and medicinal virtues of plants, and although much that has been written might without injury be conſigned to oblivion, much remains to be written before a correct or complete knowledge of their qualities can be obtained. Improvement in this has kept pace with improvement in other departments of ſcience, ſince experiment, and an enquiry into facts, have ſuperſeded idle ſpeculations, and fantaſtic theories. From the vegetable kingdom we derive much of our clothing, many of our dyes, and many of the materials of our manufactures. Can a knowledge of ſubſtances, ſo intimately connected with our wants and infirmities be unintereſting and uſeleſs? Can a knowledge of ſubſtances occupying ſo large a ſpace in the works of creation be unworthy our attainment? It is not a mere terminology that we ſhould purſue in this ſcience. The ſtructure, habits, and affinities of plants ſhould be objects of our reſearch. Agriculture and gardening are but branches of philoſophic botany, and all rational expectation of improvement in theſe moſt important departments muſt be founded on a ſubſtantial and accurate knowledge of the principles of vegetation, of the phyſiology of plants, and of the cauſes which, in different climates, or in different ſoils, promote or retard their growth, and their productiveneſs.

Syſtematic botany gives order to our knowledge, enables us to aſcertain and arrange the different ſpecies of plants, which actually exiſt on the earth, to know with certainty thoſe, which in different, or diſtant countries, have been found uſeful to man, and brings to view, although as yet imperfectly, the great natural aſſociations which exiſt in the vegetable kingdom.

To the moſt common obſerver, the affinities in certain families of plants muſt be obvious. The Gramineæ, the Cyperaceæ, the Cruciatæ, the Labiatæ, the Leguminoſæ, the Umbelliferæ, the different diviſions of the Linnæan Syngeneſiæ, the Apocyneæ, the Orchideæ, and many others, have reſemblances, ſo ſtriking, that they have always attracted the attention of the moſt ſuperficial inveſtigators of nature. In many plants, however, theſe affinities, or connecting links, become remote or uncertain. Some of the ableſt botaniſts, in the world, are now endeavoring to complete the knowledge, and eſtabliſh the ſyſtem of Natural Orders. Should they ſucceed in this great enterprize, ſhould they be able to diſtribute, by characters, which however ſlight, ſhall be certain, however obſcure, ſhall be permanent, all the vegetable kingdom into families, having one common ſtructure, one common habit, and which, even, when ſcattered over diſtant climes, ſhall poſſeſs common qualities, adapted to ſimilar uſes: ſcience, will then, have rendered to man one of the moſt important ſervices, which perhaps, ſcience can beſtow. Yet, it is much to be apprehended from the difficulty, which has attended this enquiry, from the exceptions which ſeem to ariſe, even among ſpecies of the ſame genus, that this reſult is unattainable; that nature never permits us to generalize, but at the expence of truth. That all real knowledge is a knowledge of individuals, acquired by patient reſearch, and repeated experiment, although in theſe reſearches, we may be undoubtedly aided, by the knowledge of kindred ſpecies, which we already have obtained.

In an accurate and extended view, the ſcience of natural hiſtory, includes almoſt every object of human purſuit; but in its general acceptation it is confined to the three great diviſions of Zoology, Botany, and Mineralogy. Beſides the extenſive relations which this ſcience bears to man, beſides its multiplied uſes, permit me to recommend it to the attention of men of wealth and leiſure, if only on the more humble ground of occupation and amuſement. While it gives employment to the underſtanding, and habits of accurate and attentive obſervation, it does not require the deep and long abſtractions of mathematical enquiries, nor the laborious exertions, or manual dexterity, of chemical experiments. It is every where preſent. It meets you in air, on the earth, or on the water. It can be brought into the cloſet, or ſurround you at the fire ſide. In the examination of natural ſubſtances, you meet with every beauty that ariſes from color, every delight that ſprings from fragrance, every grace that depends on form, mingled with that pleaſure, which is derived from the contemplation of endleſs, inexhauſtible variety. If to the eye of taſte, the lawn, the grove, the ſtream, the mountain, the ocean, the inanimate boſom of nature, afford unſated pleaſure, what muſt be the increaſe, when ſcience gives to every object that ſurrounds you, intelligence and life. When the very earth, on which you tread becomes animate, when every rock, every plant, every inſect, preſents to your view an organization ſo wonderful, ſo varied, ſo complex; an adaptation of means, to ends, ſo ſimple, ſo diverſified, ſo extenſive, ſo perfect, that the wiſdom of man ſhrinks abaſhed at the compariſon. Nor is it to preſent exiſtences that our obſervations are confined. The mind will ſometimes delight to

retrace the march of ages, to review the great formations of the univerſe; to examine of earth the revolutions, the convulſions, that have formed and diſarranged its ſtructure—of its inhabitants, the creation, the diſſolution, the continued reproduction. To admire that harmony, which, while it has taught each being inſtinctively to purſue the primary objects of its creation, has rendered them all ſubſervient to ſecondary purpoſes.

We find every where life, intelligence and order. We feel ourſelves ſurrounded by monuments of immeaſurable power, of incomprehenſible wiſdom, of illimitable goodneſs. We ſurvey and examine them, until knowledge is loſt in aſtoniſhment, until wonder yields to adoration. We exclaim with the pſalmiſt "Great and wonderful are thy works Lord God Almighty, in wiſdom haſt thou made them all."

To facilitate the ſtudy of natural hiſtory, we ſhould endeavor to form a muſeum, where we may collect ſpecimens of all the objects, which nature exhibits to our view. It ſhould be particularly our aim, to elucidate the natural hiſtory of our own country, and to obtain ſpecimens of our native productions. If the funds of our infant ſociety, are too limited for ſuch an eſtabliſhment on an extended ſcale, we may at leaſt lay the foundations, and leave the ſuperſtructure to our ſucceſſors. In many departments of natural hiſtory, as mineralogy, botany, conchology, entomology, the ſpecimens, until our collections become conſiderable, would not occupy much room, and can be preſerved with a little attention. The animals of larger ſize, and of more difficult preſervation, may be added, as means and opportunity permit. How intereſting would it be, to behold, in one aſſemblage, the rich treaſures of nature. To view the quadrupeds, the birds, the fiſh, the inſects, the ſhells, the vegetables, the minerals, of the moſt remote ſhores, the wildeſt deſerts, the moſt inhoſpitable climes; the productions of every land, and every ſea, congregated together; arranged according to natural aſſociations, or artificial characters; or grouped by geographical relations. Than ſuch a collection, we can imagine nothing more delightful to the eye, nothing more gratifying to the underſtanding. With theſe objects, may be connected the works of man; works calculated to illuſtrate the manners, cuſtoms, arts, the wants and improvements of different ages, or to explain the geography, chronology, hiſtory or mythology of ancient and modern days. Coins, medals, cameos, intaglios, ſculpture, ſtatuary, painting, arms, manufactures, will all encreaſe the value of ſuch a collection; and a library adapted to our purſuits, and ſelected and deſigned, to pour the lights of ſcience, over the fabric of nature, would complete the eſtabliſhment.

The ſtudy of natural hiſtory has been, for many years, the occupation of my leiſure moments; it is a merited tribute to ſay, that it has lightened for me many a heavy, and ſmoothed many a rugged hour, that beguiled by its charms, I have found no road rough or difficult, no journey tedious, no country deſolate or barren. In ſolitude never ſolitary, in a deſert never without employment. I have found it a relief from the langor of idleneſs, the preſſure of buſineſs, or from the unavoidable calamities of life.

IV. ANATOMY, SURGERY, PHYSIOLOGY, and MEDICINE.

Of theſe ſciences, Man has always appeared duly to eſtimate the value. The tortures of pain, the apprehenſion of death, have led him, in all ſtages of ſociety, to fly to art for relief, to yield himſelf ſubmiſſively to real or pretended ſkill, and in ages of ignorance, to worſhip, almoſt with Divine honors, the Maſters and principles of the "Healing

Art." Guided by the ſtar of Science, Anatomy and Surgery have progreſſed with rapid ſtep, and have fully partaken of the ſplendor of modern improvement. Whatever the moſt enlightened eye could ſcrutinize and detect, whatever the moſt dexterous arm could execute, may be found in their annals, monuments of their ſkill, and matchleſs excellence. But the progreſs of medicine has been more queſtionable. There appear to be limits which we are not permitted to paſs, ſecrets we are not allowed to explore. The principle of life is ſtill unknown, and that myſterious power, varying with every temperament, modified by every peculiar organization, ſeems to give to diſeaſe, in each individual conſtitution, a diſtinct form. Hence it has been difficult to give to medicine, ſyſtem. To form theories, illuſtrating the cauſes, ſymptoms, and termination of each diſeaſe; when diſeaſe itſelf, affected not only by phyſical, but by moral affociations, exhibits as many anomalous aſpects, as human character, or human feelings. Hence, perhaps, in no purſuit, has ſucceſsful practice depended more on perſonal ſagacity, on the faculty of conſidering diſeaſe, not in the abſtract, but as combined in every caſe with individual conſtitution, temper, and habits. Theory after theory, has been ſwept away. The dogmatics, the empirics, the ecclectics are forgotten; The principles of mechanics and of chemiſtry, the doctrines of vibration, of irritability, of excitability, have all been inſufficient to explain the phenomena of diſeaſe. And medicine ſtill offers a wreath of unfading verdure to him, who ſhall be able to trace the hidden ſprings of life, to mark their developement, their expanſion, their decay; who ſhall explore the latent ſources of diſeaſe, ſhall arrange its affociations, ſhall explain its modifications, ſhall counteract its efforts, and arreſt its progreſs. We mean not, with Lord Bacon, to ſay, that the labors beſtowed on medicine, have been all in circle, rather than in progreſſion. In phyſiology, in the materia medica, in the treatment of many diſeaſes, there has doubtleſs, been great improvement; but the foundations of the ſcience are ſtill unſtable. The ſyſtems that have reduced medicine to one ſingle principle, or practice to one dominant doctrine, have proved but ſplendid quackeries. Of the diſeaſes, which two thouſand years ago, proved the ſcourges of our race, how few have been ſubdued; and of the countleſs generations of man, how few are there, even excluding thoſe that periſh by violence or accident, who die from the natural decay of the organs of life, who, having performed all their functions, and fulfilled all their duties, fall like autumnal leaves in the fulneſs of days, and of maturity.

V. AGRICULTURE, AND RURAL ECONOMY.

To the connexion between agriculture, and the phyſiology and philoſophy of plants, I have already alluded. The fundamental principles of this art are every where the ſame; but we find in the practical details, a thouſand variations. A difference of climate, of temperature, of expoſure; a predominance of heat, of cold, of moiſture, of dryneſs, all tend to produce new modes of culture, to require new objects of cultivation. In all countries the leading features of agriculture, the preparation of the ſoil, the application of manures, the rotation of crops are ſimilar; but in practice we find every plant poſſeſſing a peculiar habit, and requiring an appropriate culture. In a new country, like ours, where in the climate, the ſoil, the articles of cultivation, and more eſpecially in the cultivators themſelves, we differ widely from thoſe nations, from whom we have been

accuſtomed to derive our information, it is peculiarly important to record our own practice and experience. Nor is it ſucceſsful experiment only, that we ought to relate. It is often as uſeful to perpetuate our failures, as our ſucceſſes; to buoy the ſhoals and reefs of an extended coaſt, as to mark the channels. From the want of a written record, much of the knowledge of our fathers, has already been forgotten. And there are many points, belonging not only to the main, but to the collateral branches of this ſubject, on which we want information. The embankment and recovery of our extenſive marſhes; the draining of our deep ſwamps; the converſion of our ſandy pine barrens into paſturage, if not into tillage; the improvement of our preſent modes of culture; the introduction of new objects of cultivation; the rotation of crops moſt ſuitable to our agriculture; the melioration of our ſtock; the permanent encloſure of our lands, the foundation of all good farming; the formation of meadows; and the general improvement of our rural economy, are all objects of important enquiry. The tardineſs with which, in an enlightened age, new modes or articles of cultivation are introduced into different countries, appears, to a reflecting mind, a ſubject of real aſtoniſhment. This ſtate was ſettled an hundred and thirty years, before the cotton plant was cultivated as a crop. We are now wondering at the ſucceſs of the ſugar cane. We raiſe no ſilk, yet ſome recent experiments have left, on my mind, no doubt of the perfect adaptation of our climate to the ſilk worm. (3) Many of the cerealia and leguminous plants of Aſia, Africa, and the ſouth of Europe, have never yet been cultivated on our plantations; many varieties of fruit, even of thoſe raiſed in Europe, are unknown in our gardens. How important would it be to a young country, to have, even at the expence of government, a real experimental farm, where the leading object ſhould be, not ſo much to improve the actual cultivation of the plants, now forming the common crops of the country; this may, perhaps, be ſafely left to individual exertion; as to aſcertain and introduce every plant uſeful for food, for medicine, or in the arts, which could be raiſed in our country in the open air; and to endeavor to naturalize thoſe, which at firſt appear too delicate to ſupport the variations of our climate.

VI. COMMERCE, MANUFACTURES, AND INTERNAL NAVIGATION.

On the importance of theſe ſubjects, it is unneceſſary to dilate. Of Commerce, this bond which connects all nations, this animating principle, which vivifies every region that it touches, which gives plenty to the barren rock, and abundance to the ſandy deſert, I ſhall only remark, that, although its practice and arrangements are always moſt advantageouſly left to the enterprize of the merchant; yet, while from the reſearches, and diſcoveries of ſcience, from the ſkill of the artiſt, and from the labors of the agriculturiſt, commerce derives its materials and powers of action; there are many things in its principles, many in its details, much of its information, and much of its exertion that merit a record.

Manufactures require much attention; and from the ſtate of ſociety in our country, much judgment to ſelect, and promote, thoſe peculiarly adapted to our ſituation. The power and wealth of a great Empire may change, or even reverſe the natural order of manufactures; may nurſe them in hot beds, may furniſh them with artificial warmth, may rear them to premature perfection, may ſupply the calls of luxury, or adminiſter to the ſplendid wants of magnificence, before the neceſſary arts of ſocial life have gain-

ed an eſtabliſhment. But with us, they muſt riſe by their own ſtrength, by their adaptation to our wants and our reſources; to our materials, and to our labor. It is wiſe in every nation to diverſify the purſuits of its citizens, to multiply the links that connect them to each other, to render them as independent, as poſſible, of foreign nations, to enable them to ſupply their mutual wants by mutual exchanges Deplorable would be the ſituation of that country, where the citizens purſuing but a few great objects of culture, or of art, and depending for the ſupply of every other want, on foreign reſources; depending for the exchange of their own induſtry, on foreign commerce; ſhould find theſe channels interſected by war, or internal regulations; they would then have to purchaſe, at exorbitant prices, every article of common neceſſity, and have nothing to offer in exchange, but thoſe productions, of which every neighbour has already a ſuperfluity.

The improvement of our internal navigation is one of thoſe great objects in which every citizen muſt feel ſome intereſt, from which every individual would derive ſome perſonal advantage. By facilitating the intercourſe between the diſtant portions of our country, by leſſening the expence, and riſk of tranſportation, the articles of conſumption, whether of neceſſity, of convenience, or of luxury, which they ſeverally furniſh, will be more eaſily attainable. And many productions which now, from the want of a market, command no price, and obtain no attention, would then become ſources of profit to individuals; and of benefit to the country. The principles on which theſe improvements ought to be conducted; afford at all times a ſubject of important enquiry. The firſt efforts in the progreſs of ſociety, are, of courſe, directed to clear away the obſtructions which naturally, or artificially, occur in the ſtreams which can be rendered navigable. The exertions of improved and opulent communities are employed, to interſect a country, in every poſſible direction, by navigable canals; overcoming, by ſcience and labour, the obſtacles of nature. In theſe enterprizes, ſome of the higheſt and moſt ſurpriſing efforts of human power, and ingenuity, have been diſplayed. To accompliſh theſe objects, man raiſes the valley, levels the hill, diverts the ſtream, perforates the mountain; he leads the river in unaccuſtomed channels, and the bird of the air views the white ſail of commerce, uſurping her accuſtomed haunts. (4)

Few countries are capable of ſuch extenſive improvements in internal navigation, as our own. Forming, from the mountains to the ocean, an almoſt regularly inclined plain, it is in the power of art to divert our ſtreams from their very ſources, to pour them into canals, to diſtribute and direct them at pleaſure, and to ſupply them with water, not only ſufficient for their own conſumption, but to form innumerable mill ſeats, where power can be regulated by ſyſtem, free from the evils, either of want, or ſuperfluity. When compared with rivers, at leaſt above the progreſs of the tides, canals, from their ſecurity from accident, from the directneſs of their courſe, from their exemption from the influence of currents or of winds, and from the certainty with which voyages on them can be made, have great advantages. Hence, they have always been favourite enterpriſes in all countries, where the wealth and population have permitted their eſtabliſhments.

VII. HISTORY, GEOGRAPHY, TOPOGRAPHY and ANTIQUITIES.

Hiſtory and Geography now form ſo important and neceſſary a part of liberal educa-

tion, that they want no illuſtration, and require no eulogium. While hiſtory teaches, by experience, the moſt unerring, tho' perhaps the leaſt regarded, of all preceptors, the higheſt and moſt important truths; while ſhe delineates by actions, not by profeſſions or opinions, the unvarying tenor and principles of human conduct; while ſhe raiſes a conſoling or a warning voice, and reflects from the paſt, a gay or a gloomy light, over the proſpects of the future; Chronology and Geography give to her leſſons lucid order and comprehenſive inſtruction. While complete ſyſtems of theſe, or of their kindred branches of Topography and Antiquities, come not within the limits of our aſſociation, there are many ſcattered fragments, many detached facts, many local illuſtrations, that diſtinctly meet our views. Many of the facts attending the early ſettlement of our country, are daily periſhing. Much of the knowledge we now poſſeſs, and are forgetting, will be intereſting to poſterity. Of the location and ancient traditions of the aborigines of this country, we have no accurate memorials. Of their original arts and manufactures, we have few, or no ſpecimens. In the topography of our country we are miſerably deficient, in our geography very incorrect. We have no maps of our country, on which we can place any reliance; no ſurveys, except of our ſea coaſt, which have any pretenſions to accuracy. The illuſtrations, or reſearches of Men of ſcience, on any of theſe ſubjects, we ſhall cheerfully record.

VIII. BELLES LETTRES, LANGUAGES ANCIENT AND MODERN, AND EDUCATION PUBLIC AND PRIVATE.

While the ſeverer ſciences promote the improvement and power of ſociety, Poetry, Oratory and Polite Literature improve and adorn the individual. They form the charm and embelliſhment of ſocial intercourſe, they refine, correct, and poliſh the underſtanding; they add gaiety or energy to thought, brilliancy and life to language; they give to their poſſeſſors that influence in ſociety, which vanity and ambition covet; and in moments of national danger, or national enthuſiaſm, they ſometimes exerciſe, over the moral world, an awful and unbounded power. They form, at once, the fulcrum and lever of Archimedes. But theſe are perſonal talents, and in a great degree unconnected with the ſtate of ſociety, whoſe progreſs they neither accelerate nor retard; for they occaſionally flaſh through the gloomy ſlumber of the intellectual world, and while they leave behind no permanent reflection, dazzle the more from the contraſt of ſurrounding night. In free governments, they will always be ſtudied, Eloquence in particular, the great inſtrument of power, with emulation and zeal. But their principles, their nature, and their objects, deſerve a careful and enlightened inveſtigation.

Language, the peculiar faculty of man, the organ by which he acquires, and by which he communicates all his knowledge, merits diſtinguiſhed attention. It ſhould be cultivated with aſſiduous care, it ſhould be refined and improved with unremitted labor. As all modern languages are compoſed of the wrecks and fragments of other languages, aſſimilated and aggregated in ages of ignorance, they partake of the rudeneſs and imperfection of their native materials, and cannot be faſhioned to that ſtandard of excellence, which even our imperfect knowledge could model. Yet, to this point our labors ſhould tend. We ſhould endeavor to render language, ſimple in its principles, varied in its combinations, definite in its meaning, harmonious in its arrangement, energetic in

its ſtructure. It ſhould afford to every expreſſion a diſtinct idea; to every idea an appropriate expreſſion.

Languages are ſaid to be keys of knowledge. An extenſive acquaintance with them renders common what is local, gives to the preſent the improvements of the paſt, unfolds in ſhort, the wiſdom and inſtruction of all ages and nations. Let us obtain them but let us not, however, ſuppoſe that languages themſelves, are the great objects of our purſuit. They are means not ends; they are the caſket, not the jewel; they are the inſtruments of the workman, not the work itſelf. Yet they merit a place in all ſyſtems of education, from their intrinſic uſefulneſs; from the facility with which they can be acquired, at an age in which the memory is more active than the judgment; and from the probability that, in their acquiſition, young perſons will be obliged to ſtudy critically, and profoundly, the beſt models of compoſition which we poſſeſs; the fineſt memorials which Genius and Taſte have left of their exiſtence. They deſerve alſo to be ſtudied, becauſe the principles of moſt languages are ſo nearly ſimilar, that the knowledge of one, aids the acquiſition of others; becauſe, it is probable, that no modern tongue can be philoſophically inveſtigated, or thoroughly underſtood, without the lights which other languages will reflect upon it; and becauſe the acquiſition of languages, an acquiſition which may be obtained, at an age when the underſtanding is incapable of high exertions, affords ſo many gratifications in future life, that no one who poſſeſſes the advantage appears ever to regret the time or labor which was beſtowed on its attainment.

In a Republic, Education ſhould become a national concern. In no other form of government is it ſo important that inſtruction ſhould be univerſally diffuſed. That it ſhould, enlighten the deceptive miſts, and overwhelming ſhadows of ignorance, that it ſhould correct the falſe views, and oblique paths of prejudice, that it ſhould remove the errors of ſuperſtition, and above all, that it ſhould teach the inſeparable connexion of liberty and virtue. Education ſhould be early, that its impreſſions may be permanent; it ſhould be profound, that its impreſſions may be true; it ſhould embrace the improvements of each paſſing hour, that we may keep pace with our rivals in peace or war; it ſhould be national, that our firſt feelings and ſenſations may be, the love of our country.

A complete ſyſtem of national education, is one of the great deſiderata of our age.

IX. FINE ARTS.

The fine arts, Painting, Engraving, Sculpture, Architecture, Muſic, multiply the pleaſures and enjoyments of life, and give to ſociety ſome of its choiceſt embelliſhments. But it is not for amuſement, ſolely, that they ſhould be cultivated. They are capable of nobler exertions; they ſhould be directed to better purpoſes. Painting and ſculpture addreſs themſelves, directly and powerfully to the ſenſes; they can appeal to the ſtrongeſt impulſes of the heart. Speaking a univerſal language, alike intelligible to ignorance and wiſdom, their influence is extenſive, and their effects important. They ſhould be taught to exhibit examples of virtue—of fortitude—of juſtice. They ſhould riſe above the ſordid or criminal purſuits of man. They ſhould aſſume the tone of a maſter, not proffer the adulation of a ſlave. Their abuſes ſhould be moſt cautiouſly reſtrained, for, when they become the panars of vice, or voluptuouſneſs, they realiſe the fictions of the Upas, and diffuſe, wherever they extend, a peſtilential poiſon

Moſt of the fine arts advance regularly with the progreſs of civilization, others, like

painting, frequently poſſeſs more energy and ſublimity in the infancy of ſociety; at that period when the feelings are but little ſoftened or controlled, by the refinements of ſocial life, in the age of impaſſioned poetry, and amidſt the daily exhibitions of ſublime virtue, and atrocious guilt. As, however, theſe arts are in general, not only the companions of highly refined ſociety, but require the foſtering aid of wealth, to bring them to maturity, we can ſcarcely hope, in our day, and country, to ſee ſpecimens of their high powers. Yet of theſe, as of every other art or ſcience, the fundamental principles may be ſtudied, and ſhould be underſtood. If we cannot enrich the painter, or engraver, or give to the architect an enlarged theatre for his talents, we ſhould endeavor to apply the principles of art to all objects to which they are applicable. To give to our feelings, to our taſte, to our judgments, correctneſs.

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SUCH, Gentlemen, are the objects embraced by our aſſociation, ſuch the field preſented for our reſearches. In this wide range of literature and ſcience, there is no human civilized being, whatever may be his condition, his profeſſion, his avocations, his purſuits, who has not ſome intereſt. Science would give new ſkill and value to the labors of the mechanic, new reſources to the enterpriſe of the man of buſineſs, new dignity to the leiſure of the man of wealth, new enjoyments to the man of pleaſure, new powers to the man of exertion. And yet how many are there, who turning from ſome of the paths of ſcience, with averſion and horror, as too difficult, too laborious to be trodden, and conſidering others as too inſignificant, or too obſcure, to be worth exploring; who finding every uſeful acquirement above, or beneath their capacities; paſs their lives in ignorance or vice, hiding moſt carefully the talent which has been committed to their truſt; neglecting the duties they owe to ſociety, and to their country; and debaſing thoſe faculties, by which alone they are honourably diſtinguiſhed in the works of creation. In created nature, man alone deſerts his high ſtation, man alone betrays his dignity and rank. In the tribes of irrational animals, each individual fills his allotted ſpace, diſtinguiſhed perhaps from his fellows, by trifling grades of ſwiftneſs, or of ſtrength; but between that height to which man may ſoar, and that valley of moral and intellectual degradation to which he may deſcend, immeaſurable is the ſpace.

Yet great as may be the influence of ſcience on perſonal character, its effects on ſociety, are ſtill more powerful and determinate. It was the obſervation of one of the wiſeſt men of modern ages, it was an aphoriſm of Lord Bacon, that knowledge is power. No axiom is more generally true in its individual, none more certainly true in its national application. KNOWLEDGE is POWER. How wonderful the difference between the poor, naked, wandering ſavage, trembling before the elements, whom in terror he adores, depending on his ſolitary, unaided exertions, for food, for arms, for raiment, for ſhelter; and the civilized man, who ſtrong in the ſcience and reſources of ſociety, rides over the ocean, even on the wings of the tempeſt; diſarms the lightning of its power; aſcends the airy canopy of heaven; penetrates into the profound caverns of the earth; arms himſelf with the power of the elements; makes fire, and air, and earth and water, his miniſtering ſervants; and ſtanding, as it were, on the confines of nature, ſeems, as by a magic taliſman, to give energy and life, to the brute elements of matter.

It is not from the ſimple products of the earth, or from the crude materials, with which a country may abound, that her power and reſources muſt ariſe. The moſt pro-

ductive regions, have frequently been the moſt weak, and dependant. The bleſſings of nature, may be blighted, by the ignorance or folly of man. A nation muſt ſeek for wealth and power, by encouraging that active and profound knowledge, which aſcertaining the principles, the proportions, the combinations, the affinities of the mineral; the habits, the productions, the qualities, the uſes of the vegetable; and the manners, the inſtincts, the properties, whether noxious or uſeful, of the animal kingdom, can give to every ſubſtance, which it poſſeſſes, or can obtain, every appropriate uſe; can procure for them their ultimate value; can convert them, at will, into inſtruments of pleaſure, of riches, of grandeur, or of power.

No people have ever yet attained this high point of national improvement, none, perhaps will ever attain it; but exactly in proportion to the progreſs of its improvements, compared to its extent, and local ſituation, will be the relative ſtation, which each country will occupy, in the ſcale of nations. How important then does it become, to give to the purſuits of ſcience, every encouragement which they require, and can receive. That we endeavor to ſtimulate the riſing generation, by example, by commendation, by the proſpect of literary reputation, to labors, and enquiries, which may add ſtill more to national, than to individual benefit. He who makes an important diſcovery in art or ſcience, frequently adds to the wealth, and reputation of his country. He who elevates its literary character, becomes its benefactor.

It is not eaſy to determine how far each ſcience contributes to the general maſs, or to eſtimate its relative value. Forming one RADIANT CIRCLE they mutually ſupport, they mutually enlighten each other. The proud FABRIC of MODERN SCIENCE is compoſed of materials, extracted from every quarry, and has been conſtructed by the labors of hundreds, and of thouſands, co-operating in one common deſign. Every aſcertained fact, every new diſcovery, in any department, adds to the general maſs of knowledge, and enlarges the circle of human obſervation and improvement. No enquiry ſhould be abandoned as abſtruſe and unintereſting, none rejected as obſcure or inſignificant. No tribute ſhould be with-held as too humble or unimportant. The mighty ſtreams that gladden the earth, and diffuſe wealth and enjoyment along their extended borders, are formed by the union of ſmall and unnoticed ſprings. It is not the magnitude of the fountain head, but the number of tributary ſtreams that determine their ſize, and their importance. Some branches of knowledge, from the ſublimity of their views, from the certainty of their reſults, or from their extenſive application to all the occupations of life, may have the higher claims to our notice; but thoſe which only ſerve to poliſh or to decorate, merit alſo attention. We ſhould no more wiſh to deface the Corinthian capital of ſcience, then to ſap its deep foundations.

To you, Gentlemen, who have formed this aſſociation, it will be ſuperfluous to extend theſe reflections. You have borne your teſtimony to the importance of its views, it will remain with you, by exertion, to give reality to expectation. We are component parts of a nation riſing into importance and power. We find ourſelves ſurrounded by rivals, jealous of their rights, powerful in their reſources, ſtrong in arms, yet perhaps depending leſs, on the ſimple operation of phyſical force, than on the combined influence of commerce, arts, and ſcience. To contend with theſe nations ſucceſsfully, we muſt be, in all things, their equals. We muſt give knowledge to enthuſiaſm; means to enterprize, and ſkill to courage. We find our naval and military reputation, riſing with

the dangers and difficulties that ſurround us; the energy of freedom will ultimately ſurmount the errors of negligence or folly. But our literary character is ſtill unknown, or unacknowledged. Amidſt the convulſions of the civilized world, we have beheld nations contending as ſtrenuouſly in letters, as in arms; extending to their citizens, the Laurel and the Bay, with equal enthuſiaſm. Shall we feel no impulſe of national emulation? Shall we not profit by their great examples? Shall we witneſs, in the ſplendid career of ſcience, their ſucceſſes, and their triumphs, and make no effort to give to our country, on the page of literary hiſtory, a "habitation and a name." In the diſtribution of talents to nations and to individuals, nature has been liberal and juſt. If ſhe elevates but few to pre-eminent greatneſs, ſhe condemns but few to inevitable obſcurity; to moſt ſhe gives the power and the opportunity of being uſeful: but while ſhe gives us talents, ſhe leaves their employment to our own diſcretion.

Let, me hope, Gentlemen, that this ſociety, ſmall and humble as may have been its origin, may yet render ſome ſervice to our country. That it may awaken a ſpirit of philoſophic enquiry, that it may recall ſome of our youths from idle and unworthy purſuits, to the labours and pleaſures of literature, that it may give to ſcience ſome popularity. The ſmall ſeed ſcattered in the wilderneſs, may become a tree, under whoſe branches the birds of the air ſhall find food and ſhelter. The nameleſs rivulet may emerge to ſplendor and to uſefulneſs. But to obtain our objects, or juſtify our views, it will be neceſſary that we advance in our career, with a zeal that ſhall not be extinguiſhed, by occaſional failures, and a perſeverance unconquered by temporary diſappointments.

NOTES.

NOTE (1) *Page* 6.

On a very curſory review of Hauy's *Traité de Mineralogie*, I noticed the following minerals having the ſame integral mollecule and primitive form:

Magneſie boratée, Soude muriatée, Analcime, Plomb Sulfurée, Cobalt gris, have the cube for their integral mollecule and primitive form.

Chaux fluatée, Ammoniaque Muriatée, Alumine ſulfatée alkaline, Spinelle, Pleonaſte, Diamant, Cuivre oxydé rouge, Fer oxydulé, have a regular tetrahedon for their integral mollecule, and a regular octohedron for their primitive form.

Other coincidences might probably have been diſcovered.

So far, therefore, as this ſyſtem is founded on the idea of each mineral poſſeſſing a peculiar form, it ſeems liable to too many exceptions. No one, however, can be inſenſible to the labors, and ingenuity, with which the reſearches of this celebrated mineralogiſt have been proſecuted; or to the intereſting proofs frequently exhibited of a difference in the component ſubſtances of minerals, being indicated by a ſlight, yet permanent difference in the ſtructure of the cryſtal.

NOTE (2) *Page* 8.

It has always appeared to me that we did not ſufficiently value this, as a fruit bearing country. Our climate not only allows us to raiſe a very great variety of fruit, but thoſe in particular, which grow in the mellow hammock lands of our ſea iſlands, poſſeſs a very high and exquiſite flavor. There is certainly a predominance of moiſture in the latter part of our ſummer, and our orchards ſhould be ſo arranged as to counteract this defect. Moſt of our fruit trees ſhould be planted on the brow, or declivity, of a hill, or in a dry porous ſoil. Grapes ſhould be trained to a conſiderable height from the ground, to avoid the ſteam and moiſture which generally ſucceed our heavy rains in ſummer. I have known every grape in an arbor, which hung within three feet of the ground, periſh; when thoſe which were elevated ſeven or eight feet, came generally to maturity. It is idle in us to follow the practice of a country totally diſſimilar in climate. Moſt of the fruits of warm climates ſucceed with us, the orange, the pomegranate, the fig, and I believe moſt of the tropical fruits could, with a very ſlight ſhelter, be raiſed without the aid of artificial heat. Of the valuable fruit of the temperate climates nearly all proſper. The pear ſucceeds admirably, but many of its fineſt varieties, have not yet been introduced. With the apple we have been leſs ſucceſsful, though ſome good apples have lately been cultivated. But the inſect which depredates on our peaches, plumbs, &c. threatens to deſtroy our fineſt and moſt valuable fruit. It is ſmall, and the egg from which it hatches, is depoſited under the ſkin of the fruit at all ſtages of its growth. It appears to prefer the ſmooth ſkinned fruit, the nectarine and plumb to the peach. I have known the fruit of a nectarine tree totally deſtroyed, before they had attained the ſize of a nutmeg.

I have endeavored to raiſe this inſect, ſeveral times, from its caterpillar ſtate but without ſucceſs. I know not, therefore, to what genus it belongs. I have referred it to the curculio from the information of others. Some times I have ſuſpected it to be the larva of a dipterous inſect. It appears to paſs its chryſalis ſtate in the earth. Hence, paved yards, which afford it no ſhelter, are favorable ſituations for peach trees. Hence, too, the acceſs of hogs to peach orchards is advantageous, as they eat the unripe fruit as it drops, and devour the inſects. Hence, too, poultry are ſerviceable, becauſe, although they cannot deſtroy the inſects in the fruit, they ſcratch up and eat the chryſalides. Smoke appears unfriendly to theſe inſects, and very fine peaches are conſequently raiſed in the central parts of Charleſton, while, in the outſkirts of the city, they are almoſt totally deſtroyed. Whether this inſect was native or imported, is uncertain, and is now immaterial, it is progreſſing ſlowly, but gradually through our country. An old and very reſpectable inhabitant of Beaufort, told me, ſhe remembered when this inſect was only known around Charleſton, and the fruit at Beaufort, and in that neighborhood, were entirely exempt from it. This was probably 50 or 60 years ago. The late Joſ. Turner, collector of the Port of Brunſwick, Georgia, told me, about four years ago, though I ſuſpect incorrectly, that it was not then known on St. Simons, the individual who ſhould diſcover an effectual and eaſy remedy againſt the depredations of this inſect, would merit a very high reward.

Another inſect, very diſtinct from this, and much larger (the larva of a Linnæan ſphinx) has, by ignorance, been ſometimes confounded with it. This caterpillar lives on the root of the peach tree, devouring the liber or inner bark. It injures the tree itſelf, and ſhortens its exiſtence, but does not affect the fruit. Moſt of the

quack remedies againſt the peach inſect, ſuch as opening the roots of the tree in winter, applying to them tar, lime, marſh mud, &c. are directed in fact againſt this inſect, which is not the offending one. So neceſſary is knowledge, in every purſuit. Yet this caterpillar ought certainly to be deſtroyed, as it affects the health and duration of the tree.

NOTE (3) *Page* 12.

Before the revolutionary war, Silk was raiſed in many parts of this country, particularly around Puryſburgh, in this ſtate, and Ebenezer, in Georgia. Its cultivation ſeems to have been ſtopped by that war, and has never ſince revived. A faint impreſſion remains, that our climate was unfavorable to the ſilk worm, that the changes in our ſpring affected it, that the heat and thunder of our early ſummer was injurious to it, and frequently fatal. From the experiments alluded to, which were made by my friend and neighbor Francis Macleod, Eſq. of Ogeechee, Georgia, it was aſcertained, that in very unfavorable ſprings, the ſilk worm can be ſafely hatched in our climate, ſo early as to ſpin its web by the 10th of May. This entirely prevents all injury from heat or thunder. And, although our ſpring is, as may be expected, liable to frequent changes, yet, the viciſſitudes of our climate cannot be as great, nor the changes as ſevere, as in many parts of Italy, which are ſurrounded by the lofty and ice-capped ridges of the Alps and Appenines, where the ſilk worm is nevertheleſs very extenſively raiſed. It is probable, that the raiſing of ſilk, on a large ſcale, would not be as profitable as ſome other articles in common cultivation, yet, to a limited extent, it may merit general attention. To the poorer inhabitants of our country, who have large families, it would certainly afford a valuable reſource. It requires but ſix weeks attention in each year, in which time, the females and children of a family, might raiſe as much ſilk, as will produce, according to their exertions, from twenty to one hundred dollars. Even for clothing it would be valuable, as raw ſilk makes much more durable, and better cloth, than cotton.

NOTE (4) *Page* 13.

In the conſtruction of canals in Great Britain, many aqueducts have been carried over rivers, at ſuch an elevation, as not to obſtruct the navigation of the ſtream. The Duke of Bridgewater's canal paſſes over the Irwell, 39 feet above the ſurface of the water; and at Pont Cyſylty, one of the branches of the Elleſmere canal, paſſes over the river Dee, in an iron aqueduct trough, 125 feet above the river. The hiſtory of canals in Great Britain, affords many other inſtances.

ERRATA.

Page 4, line 7, for values *read* value.

10, line 38, langor *read* languor.

13, line 33, plain *read* plane.

13, line 42, eſtabliſhments *read* eſtabliſhment.

15, line 3 from bottom, for panars *read* pandars.