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# RALEIGH STAR, And North Carolina Gazette.

"NORTH CAROLINA—Powerful in moral, in intellectual, and in physical resources—the land of our sires, and the home of our affections."  
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The Ruling Passion.—A London paper says, "Daniel Goode, who was educated, was fond of horses, and considered a good judge of them. A captain of the navy, with whom Goode formerly lived, obtained permission to see him in Newgate one day.—On finding himself in his cell, the 'bonhomme' of the sailor prevailed and said—'Well, Goode, there is no use now in alluding to your unhappy situation. Have you any idea which horse will win the Derby?' Goode's reply was—'Ah, sir! I wish they would let me see the Derby run before they hang me! I could then die happy.'

LECTURE,  
READ TO THE RALEIGH MECHANICS' ASSOCIATION,  
ON THEIR 4TH ANNIVERSARY, July 12, 1842.  
BY WM. W. HOLDEN, ESQ.

GENTLEMEN:  
The age is eminently practical and energetic. In every department of knowledge, and in all the avenues which lead to wealth and happiness and honor, the lights of experience are pouring in upon the darkness of conjecture; falsehood is bowing beneath the sceptre and the diadem of truth; and men are beginning to understand, more fully and properly, their responsibilities, absolute and relative, and to appreciate the powers, the hopes and the destinies of the race. At no period, perhaps, in the history of the world, have the sciences been so intensely studied and so widely disseminated as they are at present. And if what we have been accustomed to denominate antiquity be nothing more than the infancy of mankind, then indeed do we live in the vigor and in the fullness of time, when law and order and civilization, refined and purified by the fires of a generous freedom, and mellowed by the hand of Christianity, throw their broad shields at once over the richest and the poorest, giving no greater protection to the prince, amid the pomp and the garniture of distinction, than they do to the mechanic and the artisan, amid their perplexities, their toils and their labours. The sceptre of those who were once mighty to oppress the nations has been broken like an untempered spear; and the systems of the dark ages, which rose slowly, but effectually, in the midst of blood, and carnage and disorder, have been torn and scattered to the winds of desolation. The feudal system—where is it? Ask the occupants of the tottering thrones of Europe, and the reluctant answer shall come forth, that the revival and extension of learning in the fifteenth century, the invention of printing, the transcendent eloquence of Martin Luther, and the progress of liberal opinions, roused mankind to a knowledge of their rights; and that sturdy esquire and baron bold, the stateliness and the grandeur of feudal ceremonial, and the excitement and renown of tilt and tournament, repose in death amid the chambers of the mighty past.

Under the influence of that spirit of liberty which overthrew the feudal system, and exploded the doctrine of the divine right of Kings, the arts and the sciences have received, within the last century, the most powerful and happy impulses. In the science of law and government alone, the world has had many and great exponents and champions of Justice and of Truth. The names of Pitt, Washington, Jefferson, Hamilton and Marshall among the dead, and of Brougham, Kent, Clay, Webster, Calhoun and Van Buren among the living, will long have a place in the affections and memories of men. The principles for which they struggled—principles which consecrate the dead and render the living dear unto us—are the great lights towards which all civilized nations are approaching, and demanding, with a voice "louder than the deep in storms," the same rights and privileges which belong to the land of Washington and Henry. And the voice of the down-trodden shall be respected. The fires of freedom, which are now glowing in their bosoms, shall ere long burst up through the shadows of regal thrones, and flash in triumph to the day.

The benefits which have been conferred upon mankind by the votaries of art and science, are almost incalculable. They have not only gratified his physical wants, but opened new fields—boundless and ever-during fields—over which his mental faculties may linger, and perpetually gather the elements of freshness and delight. They have done more than this; they have changed his ideas of human greatness. Fortified by the principles of a sound and practical philosophy, and sensible of his tremendous responsibilities as a citizen of two worlds, the possessor of high intelligence now weighs every thing in the scales of justice and of virtue, and estimates human greatness, not by the number of cities the aspirant for renown may have demolished, nor yet by the gore he may have spilt, but by the amount of permanent and substantial benefit he may have contributed to confer upon mankind. Thus estimated, how little is Napoleon, and how great are Watt and Fulton! How does he sink in the comparison! When the former had triumphed at Arcola, and planted his eagles upon the battlements of imperial Rome; when thrones after thrones had crumbled and gone down beneath the lightnings of his eye; when his battle-thunders, rolling from the Pyramids to the shores of the Baltic, had laid almost all Europe prostrate at his feet; and when, with the iron crown of Charlemagne upon his brow, he was revelling, in anticipation, amid all the pomp and splendor and majesty of universal empire, the astonished spectator might have fancied, that, as he was the controller of the destinies of nations, so he was also their greatest benefactor, and that he was not more the favorite of fortune in his contentions for dominion, than in the extraordinary facility with which he bent learning and art and science to the performance of his will. Yet what European—what American thought—when gazing upon the wonderful achievements of the child of destiny, that long before this prodigy of valour saw the light, there had been approximating to perfection an invention which was to be rendered of more practical importance to the world than all the chieftains that ever rose, or reigned, or fell! Napoleon perished in the midst of the splendid visions of his high ambition, leaving no enduring memorial of his affection for mankind; but Watt and Fulton have wrought a benefit, which will raise emotions of admiration and gratitude in the human bosom, wheresoever their names shall be uttered throughout all coming time.

As late as the seventeenth century but little progress had been made in practical philosophy. The doctrines of Aristotle had obtained absolute sway for two thousand years, and were every where regarded, up to that period, with profound respect. They taught men to believe in matter, form and privation as the origin of all things; that the heavens were self-existent and incorruptible; and that all the stars were whirled round the earth in solid orbs. This system of philosophy was purely abstract; and the disciples of Aristotle, in extending and refining it, plunged into deeper and stronger meshes of doubt and difficulty than any in which he had been entangled. But doubt is the parent of knowledge. As the years rolled onward, mighty champions sprang upon the theatre of the world, to contend for the prevalence of truth and rational philosophy. The revival of learning, the power of the press, and the reformation, diffused living and broad streams of light upon the minds of men; and the improvements of Gilbert, Kepler and Galileo, were but prelude to the important and useful discoveries of Bacon, who, rising in the seventeenth century above all the great teachers of mankind, established a system of philosophy purely experimental—a system which has superseded all the sense-

less jargon and wild conjectures of the dark ages of the world. The result of Bacon's discoveries has been the study of nature in a pure and separate form—a strict and severe combination of experience with calculation and reasoning. There are certain properties assigned by Natural Philosophy to all bodies, and are hence called their essential properties: Impenetrability, Extension, Figure, Divisibility, Inertia and Attraction. When we say a body is impenetrable we mean the property it has of occupying a certain space, so that where one body is another cannot be, without displacing the former. By extension we mean the length and breadth and depth of bodies. The limits of this extension constitute figure, and this figure or shape is necessarily either symmetrical or irregular. Divisibility is nothing more than the susceptibility of bodies to be separated into an indefinite number of parts. Divide a grain of sand, for example, and although you reduce it to its finest particles, yet not one of the particles will be lost, but will exist in a separate state. Inertia expresses the resistance which inactive matter makes to a change of state. The last property common to all bodies is attraction. It is well known that all bodies consist of infinitely small particles, and that these particles possess the power of attracting each other. This is called the attraction of cohesion, because the particles adhere or stick together; and without this power all solid bodies would fall to atoms. But there is another property which pervades all bodies called caloric or heat, and this, by forcing them asunder, acts against the attraction of cohesion, and the mutual action of these powers, preserves their particles in proper counterpoise. The attraction of gravitation is but a modification of the attraction of cohesion; the latter acts upon particles and at small distances; the former on the largest bodies and throughout the planetary system. And here we behold Newton in all his glory, looking out, apparently without induction or analysis, upon the deep mysteries of worlds, and pouring day over the whole Universe of God! It is said that when this great man was drawing to a close the demonstration of the truth that gravity is the cause which keeps the heavenly bodies in their orbits, he was so overpowered with the magnitude and importance of the discovery, that he desired a friend to complete what the intensity of his own feelings did not permit him to do.

Of bodies there are therefore the essential properties upon which mechanical power has to act; and of the elementary powers of mechanics there are six, the lever, the pulley, the wheel and axle, the inclined plane, the wedge and the screw. In order to direct and apply these powers, some contrivance or apparatus becomes necessary, and this is called a machine. By a machine motion is applied, for the purpose of changing the direction of the power, rendering a body in motion capable of communicating a motion greater or less than its own to other bodies, or for enabling it to overcome a power greater than its own. And all these contrivances or machines work under gravity, acting on solid bodies, the fall of water, which is but gravity acting on fluids, air, heat and animal strength.

The arts are considered as departments of knowledge which have their origin in human ingenuity, which depend on the active or formative processes of the human mind, and which, without these would not have existed. In common parlance, we apply the name of sciences to those departments of knowledge which are more speculative or abstract in their nature, and which are conversant with truths that exist at the time we contemplate them.

An eminent writer (Lord Brougham) has said that science means knowledge reduced to a system; that is, arranged in a regular order, so as to be conveniently taught, easily remembered, and readily applied. And the same writer has divided the sciences into three great classes: those which relate to number and quantity, those which relate to matter, and those which relate to mind. The first are called the Mathematics, and teach the properties of numbers and of figures; the second are called Natural Philosophy, and teach the properties of the various bodies which we are acquainted with by means of our senses; and the third are called Intellectual or Moral Philosophy, and teach the nature of the mind, or in other words, the moral nature of man, both as an individual and as a member of society.

It may be laid down as an indisputable axiom, that every mechanic should be a practical philosopher—that is, he should know enough of nature to enable him not merely to prosecute effectually his peculiar calling, but to invent and improve, and to extend the limits of mechanical knowledge. And it is by no means necessary that a man should do nothing else than study known truths and discover new, in order to merit this high and noble title. The greatest philosophers the world has ever seen were active, working men. They performed their days' work faithfully and skillfully, and amassed, during the evenings, knowledge which enabled them to go on in their vocations with still greater fidelity and skill.

Every young mechanic, especially, should study that science upon the principles of which his trade is based, and by which it is directed. If he be a hatter, a tanner, a dyer, a painter or a bleacher, a knowledge of chemistry will aid him to an indefinite extent. And the principle holds with regard to every other trade. If he be a carpenter, for instance, he should study architecture in all its branches, fully and thoroughly. If a mill-wright, the mechanic powers should engage his attention; he should be well acquainted with the peculiar structure of wheels, so as to know how to accommodate them to certain falls of water; and if the machinery is to be propelled by steam, which is but the vapor of water, or by water itself, he should study the science of the motion and force of fluids, in order to render himself capable of applying them to practical purposes.

In this State, particularly, the great mass of the mechanic class pay too little attention to elementary principles. They do their work as their fathers did it before them, without knowing, in a great many cases, the fundamental principles by which they are guided and directed. And often, gentlemen who have no immediate and indispensable connection with the science of mechanics, know more about it than many mechanics, who improve in their trades only in propor-

tion to the acquaintance they form with the elementary principles of mechanical knowledge. Mr. Webster, for example, is not more celebrated in literature and law, than he is for his intimate acquaintance with the science of mechanics. He never constructed a machine, and yet he knows how a machine ought to be constructed. It is related that on a certain occasion a distinguished son of North Carolina, who had, in his youth, been an operative mechanic, and who had, perhaps, built many a saw-mill, visited the great yankee, for the purpose of knowing him personally and of conversing with him face to face. The North Carolinian, sensible of his inferiority to Mr. Webster in law and literature—although he was not, perhaps, his inferior in natural endowments—very naturally conceived the idea of opening the conversation upon some subject in mechanical science, and accordingly directed his attention to machinery in general, and to the conformation of saw-mills in particular. And it is said he subsequently declared, that Mr. Webster told him more about saw-mills in one hour than he had learned in all his life. It is said, moreover, that when the port of Boston was to be gaged, no mechanic could be found who could do it, and that the task devolved upon an eminent Judge of Massachusetts, whose proficiency in mechanical science was proverbial. Indeed, this gentleman knew so much about mechanics, that whenever he had occasion to have his horse shod, his shoes mended, a hat made, or a house constructed, he never failed to inspire the blacksmith, the shoemaker, the hatter, or the carpenter with the conviction, that he, the Judge, was not only a good mechanic, but the very best mechanic in Massachusetts.

An intimate acquaintance with the laws of nature will show the mechanic how to avoid attempting impossibilities; secure him from important mistakes in attempting what is, in itself, possible, by means either inadequate or opposed to the end in view; enable him to accomplish his ends in the easiest, shortest, most economical and effectual manner; and induce him to attempt, and enable him to accomplish, objects, which, but for such knowledge, he would never have thought of undertaking.

In the first place, if those who have invented contrivances for obtaining perpetual motion, had known how to avoid attempting impossibilities—if they had known that the law of gravity was in their way, their labours and ingenuity might have been directed to practical and important purposes, and some great machine might now have attested the strength and brilliancy of their genius. And how many important mistakes are made, by attempting things which are in themselves possible, by means either too slender, or opposed to the end to be accomplished! The smelting of iron, for example, requires the application of the most violent heat that can be raised, and is commonly performed in tall furnaces, urged by great iron bellows, driven by steam-engines. Instead of employing this power to force air into the furnace, through the intervention of bellows, it was, on one occasion, attempted to employ the steam itself, in, apparently a much less circuitous manner, by directing the current of steam in a violent blast, from the boiler at once into the fire. From one of the known ingredients of steam being a highly inflammable body, and the other that essential part of the air which supports combustion, it was imagined that this would have the effect of increasing the fire to tenfold fury, whereas it simply blew it out; a result which a slight consideration of the laws of chemical combination, and the state in which the ingredient elements exist in steam, would have enabled any one to predict without a trial.

Another illustration, from the same author, to show that every mechanic ought to know his science well, in order to accomplish his ends in the easiest and most effectual manner, may not be inappropriate. In some parts of France, where mill-stones are made, a mass of stone sufficiently large is cut into a cylinder several feet high, and the question then arises how to subdivide this into horizontal pieces, so as to make as many mill-stones. For this purpose horizontal indentations or grooves are chiselled out quite round the cylinder, at distances corresponding to the thickness intended to be given to the mill-stones, into which wedges of dried wood are driven. The wedges are then wetted, or exposed to the night dew, and next morning the different pieces are found separated from each other by the expansion of the wood, consequent on its absorption of moisture; an irresistible natural power thus accomplishing, almost without any trouble, and at no expense, an operation which, from the peculiar hardness and texture of the stone, would otherwise be impracticable but by the most powerful machinery or the most persevering labor.

A knowledge of the sciences ought to be acquired, not only because it gives an individual a great advantage over his neighbors in a pecuniary sense, but because it elevates and enlarges his mind, and makes him more competent to discharge his duties as a member of society. And in this country, almost every mechanic has an opportunity as well of learning the scientific principles of his trade, as of becoming highly useful and honorable in any sphere or profession of life. Here he labors under none of the peculiar and severe restrictions which are imposed upon the mechanics of Europe. No one, I have been informed, however well skilled he may be in his trade, is allowed to set up as a master-workman in Germany, until he has travelled or wandered for the space of three years. For the purpose of enabling the journeyman to wander, without being molested or delayed, the master with whom he has served his apprenticeship, furnishes him with a duly authenticated wandering-book, and he is sent forth to beg for work or starve. During this period of painful and oppressive pilgrimage, he visits at

least seven of the principal cities, where his trade is carried on; and even then, before he is admitted to the privileges of the craft, he is under the necessity of paying a tax to the government, and of producing what is called his master piece, which is often rejected. And in England, until the reign of George the Third, every mechanic was bound to the soil by the operation of certain laws. But in this country every journeyman mechanic has the privilege of aspiring, at any time, not only to the condition of a master-workman, but to the highest honors of the land; and his personal freedom, whilst he works no injury to his fellow-citizens, is as unrestricted as the winds.

Man is a combination of body and soul. All organized beings have in common with him animal powers and propensities; but they are guided by instinct, he by reason; they court the earth, his look is majestic and heavenward. Observe the bee, for example. It possesses instinctive tendencies to roam about the fields, and to exert its energies in labor; and the honey it gathers is not more essential to its subsistence than knowledge is to human enjoyment and happiness. And how skilful a mason is the bee! What human mechanic can rival the order and beauty of its cell—the regularity and texture of its pillars—or the elegance of the golden arches it constructs? And yet it is as perfect when it begins to work as it ever is. But upon man nature has bestowed certain faculties which enable him not only to provide for his physical wants, but to improve and elevate his condition, by intellectual effort and exertion. Art is never perfect; and nature spreads before man the sources of convenience and of power, and invites him to the pursuit of knowledge as an indispensable pre-requisite to happiness. Science opens the great treasury of things to art; and art, in turn, drawing her implements thence, confers upon science the means by which she may explore new fields, and reveal new treasures for the benefit and melioration of mankind. Nor has nature, in requiring of man the exercise of all his faculties, in order to be happy, exhibited a contracted or penurious spirit. She might, indeed, have covered the earth with glorious palaces, made all the hills transparent, and pooled the ocean with forms of living and resplendent beauty; she might have so mingled cold and heat as to have placed him in an atmosphere perpetually pleasant and salubrious, and given him all, and more than all, the enjoyments of life, for which he toils so hard and so incessantly. But she knew that to be happy, he must be industrious; and whilst she withholds from him an innate knowledge of her laws, she gives him powers, which, by active exercise, may yet understand those laws, and wield them to his advantage and felicity.

Perhaps no principle ought to be more indelibly impressed upon the human mind than that which recognizes the true nobility of labor. If order be heaven's first law, *thou shalt labor* was heaven's first great command. Let no man be ashamed of a hard hand or a sun-burnt countenance. Let him rather exult in the conviction that he carries about him daily the incontestable evidences that he lives, not by fraud, chicanery and speculation, but by the sweat of his brow. Labor is honorable because it is ordained of the Creator; it is honorable because by it we provide things honestly in the sight of all men; it is honorable because it is useful; and it is useful because it adds to the common stock of things, and preserves both the body and the mind in healthful exercise. Labor is to this country what *action* was to the great Athenian orator—it is every thing; and no measure should be put down, by the clamours of sectional prejudice, or by any thing else, which promises to protect or encourage or sustain it.

The greatest men the world has ever produced were working-men. Cato, the celebrated Roman Senator, owned a farm and labored with his own hands. And Peter the Great, Napoleon, Sir Walter Scott and Franklin, were all remarkable, in their day, for the steadiness and intensity with which they labored. Peter the great actually served an apprenticeship for the purpose of learning the art of ship-building; and Russia, at this very hour, owes more than half her greatness to the genius and industry of this great monarch. Let the winds carry it; let it be told every where; and let honest laborers, in all coming time, feel proud when they remember, that the founder of St. Petersburg—the descendant of fierce and warlike monarchs—and the grand moving cause of the renown and prosperity of a mighty empire, was once a voluntary, a lowly tenant of the work-shop. Napoleon, out of twenty-four hours labored eighteen; and during his campaigns, his mind was so vigorous and so well trained, that he could write himself and at the same time dictate to seven secretaries with regard to matters of the most momentous character. Sir Walter Scott, when the sun of his fame was shining in meridian splendour, and when "Waverly" was on every lip, was actively engaged both in writing for the public, and in discharging his duties as high sheriff and clerk of a court in Scotland. And Franklin—who has not heard of him? Who does not know that he was a hard-worker? His was a life of toil and difficulty from its commencement almost to its termination; but armed with honesty, integrity and honor, he pressed forward manfully over all impediments, until he discovered the secrets of lightning, and "wrote his name where all men should behold it and where all time should not efface it."

And let it not be supposed that there are no laborers but those who toil with their hands. The labor of the mind is as useful and as much needed, at all times and in all countries, as the labor of the body; and one hour of mental effort exhausts the physical powers more than five hours of unremitting manual labor. And those who do not seem to

\* Bigelow's Technology. \* Mr. Herschell on Natural Philosophy.