The Fundamental Truth of Scientific Management*

BY HARRINGTON EMERSON

Some truths are so obvious that we cannot see them. As to any accepted belief it is a remarkably good plan to assume that the opposite is correct, and we are very likely to stumble on some fundamental but overlooked truth. Beginners on bicycles make the mistake of supposing that the wheel is to be balanced by turning the handle bars, which they proceed to grip in a desperate fashion, hoping through the movement of the front wheel to balance the body. A rolled hoop will balance itself; so will a free bicycle wheel, and the adept knows that the body sways the wheel, not the wheel the body. Down to the time of Copernicus the world accepted the belief that the earth was the center of the universe, and that moon, sun, and all the stars whirled daily around it. Chanticler, who believed that his crowing made the sun rise, was not more foolish.

One of Poe's celebrated tales is entitled "The Purloined Letter," a letter stolen and hidden so that the most careful search could not find it, although it was in plain sight all the time. For centuries mankind persisted in believing that the world was flat. Our eyes told us that the sun and moon were at least circular. Any child with a cherry could demonstrate that the phases of the moon proved it to be spherical. The disappearance of the hulls of vessels below the horizon proved the curvature of the earth. The limited expanse of the sea seen from a mountain top proved the curvature as did also the curved shadow of the earth on the moon or in an eclipse. Yet humanity persisted in thinking the world flat.

There are other truths just as plain, just as obvious, in the economic realm—and just as much overlooked as the roundness of our world. It is a fundamental truth that progress of any kind, as well as deterioration, is made along lines of lessening resistance. As a river flows from the mountain slope to the sea it takes the course of least resistance, it changes from a turbulent, shallow, foaming stream to a placid, wide, deep, tidal river. This is physical geography. The whole history of evolution

* Address before the Economic Club of New York, Monday, March 27, 1911.
shows that however difficult the first step, more is accomplished with less work, with less effort, in the subsequent steps.

It is on this truth that scientific management rests. Some of my friends, the labor leaders, have come before the public with two ultimata. The managing class shall not manage, and the workers shall not work. This position of theirs rests on four fallacies.

The first is that a partisan has the right not only to plead but also to decide a cause, that Mr. John Mitchell, Mr. Stone, Mr. Gompers, Mr. Morrisey, have not only the right to set forth the claims of labor, but also to define its rights. No pleader, no interested party, whether manager or worker, can fairly and unbiased decide what is right and fair and true. The second fallacy is that the laws of evolution can be stayed, laws that began before humanity was, that will continue to operate after humanity is no more. In the great movement of adjustment of the workers to the world’s work, the three classes, workers, managers, and capitalists have again and again butted their heads against stone walls simply because they did not know what they were about. The third fallacy is that more result necessarily means more work, that the economies proposed by greater efficiency, by more common sense, are only attained by adding to the burden of the worker. The fourth fallacy is that increased efficiency will throw men out of employment.

It is not only workers who disregard fundamental laws. Managers have sinned more in this direction than workers, and they are more responsible. Labor is to-day about sixty per cent efficient, but capital is only thirty per cent efficiency, and workers have a right to demand that economies in the use of capital shall be realized, that capitalistic waste shall be eliminated at least with the same zeal that labor wastes are attacked. The manager who eliminated his three capital wastes, who eliminated the other four wastes, would be so strong that he need fear no combination of workers. He would have done for them most of the things they expected.

I do not in the least blame labor leaders and workers viewing with suspicion any new plan that is presented. Too many lemons have been handed out in the past, although sometimes the handers out really thought them oranges. Skepticism, investigation, experiment, trial, are justified, but not unintelligent opposition.
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One labor leader on the platform with me made a great point of the fact that certain men on guaranteed day rates regularly paid had not earned a bonus. He seemed to think this was a defect of the system, not knowing apparently that no two babies, women, or men are exactly alike. After I had denounced piece rates as objectionable in practice and wrong in principle, another eminent labor leader, who has my highest respect for the great work he has accomplished, declared that an efficiency reward was piece rate in disguise, although every principle underlying the two methods is radically different.

Recently I spoke at the same meeting with scientific managers, and with an eminent labor leader. Said one of the speakers, "Managers are responsible for many of the evils that exist in plants. Conditions are not standardized. If there is to be greater output, and if it is in any part due to the intelligence and labor of the worker, he or she should receive increased reward and proper safeguard should be thrown about health and life. I am willing to suspend judgment and investigate." This was the labor leader, and I asked him for his coöperation and advice as to my work; one of my chief associates asked me for the privilege of seeking out and working with this man.

Said one of the speakers: "Common sense puts responsibility where it belongs, sets no definite tasks, encourages no special stunts, does not reward specifically any special stunts. It is evident that if there are twelve different items of cost and eleven of them can be lessened by scientific management, it must be for the purpose either individually or collectively of increasing human welfare, of paying more to the workers per hour. There is no possible escape from this conclusion. The public may receive all the benefit of waste elimination temporarily, financial backers may appropriate more than a fair return, but the men of all others who deserve immediate recognition are those who direct and do the work, who aid in waste elimination. Therefore, under the efficiency system the public may profit by lower prices, sellers may profit because of greater output and lower overhead charges, investors may receive larger dividends, but first and foremost, the man who has substituted brain activity for muscle activity ought to receive increased pay, and if it is withheld, efficiency is sure to decline because it is common sense as well as ethics that injustice and efficiency are incompatible."
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Said the third speaker: "In England three hundred bricks are considered a day's work for a bricklayer. Mittened apprentice boys have laid this number of bricks in cold weather in forty-five minutes. If for any reason it is desirable that no man shall lay more than three hundred bricks a day, if work must be made to reach around, if it is to cost as much as possible, well and good, let the man lay his three hundred bricks in forty-five minutes and go home, taking full pay and make place for another worker. The man will at least have more leisure, and the walls will go up in one tenth the time."

If the proposed economies of scientific management are attained by adding to the burden of the worker, I would denounce scientific management, as I have denounced long hours for day work, as I have denounced piece rates and other forms of stunt work.

Let us deal with this fallacy first by stating the universal law of efficiency. Every new operation begins with a maximum of effort and a minimum of efficiency. It progresses to pleasurable effort and best efficiency. It is in time forced to still higher efficiency at the expense of greater effort, and then a new method is substituted. Every one of us has experienced this law in his own life, and if we have not recognized it it is because we are perversely blind, not to say stupid.

The baby tries to creep, a new operation for it. It puts forth prodigious effort and is monstrously inefficient. It improves, the effort is lessened, the result is increased until it attains a very respectable and pleasurable crawl. It is inspired to attain higher efficiency, and it puts forth very much greater effort for very little better result; it becomes disgusted, it suddenly changes the method, rises to its feet and walks, aye runs for the joy of the movement. Running is easier than creeping and this law of progress is a universal law.

The man runner, the Indian or Egyptian sais increases his speed to five miles an hour. The prophet Elijah girded up his loins and ran before the chariot of King Ahab to Jezreel. It was hard work, desperately hard work for both the prophet and king's chariot, but the modern man speeds ten to fifteen miles an hour on his bicycle. This is not a killing pace, it is a pleasurable pace, although three times as fast as the extreme speed of continuous running. But this easy pace is not satisfying, so
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the bicycle rider speeds up for a special stunt to twenty miles an hour for five hours. It takes him only one fourth as long as it would to have run the distance. But riding the bicycle at twenty miles an hour for five hours, although the extreme limit for bicycle riding is still not fast enough. Unnecessarily, serving no useful cause, simply because it is in him, he starts a six-day bicycle race, and in that time one man covers 1330 miles. This is not fast enough; it takes too much effort; so he develops the motor car, runs 1565 miles in a single day, six times as much as any bicycle ever did. He is not working as hard as the creeping baby did, and he is going 120 times as fast. He can keep it up one hundred times as long. He is one thousand times as efficient as the creeping baby. Even this is too slow, too limited, so he turns to the aeroplane and expects to speed one hundred miles an hour through the air.

The Mexican Aztec dug into the ground with a sharpened stick, cleared away the dirt with his hands, collected some silver ore. The work was very inefficient and very laborious. He invented a pick and shovel, dug down ten feet and pitched out the dirt. He had reached the limit, so he put in a notched tree trunk, filled the dirt into a leather bag and carried it out on his back. More efficient than scratching it away with his hands and feet like a dog, more efficient than pitching it out of the hole like an ant lion, but still most laborious. As the shaft grew deeper, the peon passed the limit of rational, pleasurable, and therefore profitable effort. Up one notched pole above another he would carry one hundred pounds of dirt from a depth of five hundred feet. What was more, if you, a mining expert, wanted to go down into that mine, you were strapped to a chair, he took the chair on his back, and down you went, notch by notch, a striking and visual demonstration of the old-time conceptions of the relation of manager and worker, the former taking all the risks, the latter performing hideously hard work. Probably the acme of human endeavor but not of human efficiency is reached when a 120 pound man carries a 180 pound man 500 feet up on a notched pole. The effort became too great, unendurable, also the risk—managers were occasionally dropped. So the method is changed, a crude windlass is improvised, men turn the handles at the top, they escape the necessity of lifting their own bodies, the effort is cut to one third for the same result. But in time
even this is too much, and so step by step we come to the modern method in which a skip loaded with several tons of ore, a skip on which manager and worker stand side by side, shoots up at the rate of eight hundred feet a minute, and if you don't look out you fly out at the top like a shot from a catapult.

I saw a coal tipple last summer capable of handling 25,000 tons of coal in twenty-four hours, more tons in a day than the peon would handle in his whole working life. The American miner works hard, but his work is child's play compared to the physical strain on the peon in the land of mañana.

Down into the last century galleys were propelled by slaves, chained to their benches and working the long sweeps. There they sat in their filth with a slave driver over them lashing their backs if they flagged. The galley slave was succeeded by the stokers in the ocean steamer, by the oilers and engine wipers. Their work was incomparably easier than that of the galley slaves. At first this new work was very hard and very inefficient. Steamers required ten or twelve pounds of coal per horse power. Steam engines were improved, they needed less coal, the Mauretania uses one and one half pounds. This for a time helped the stoker. But larger engines were designed, larger furnaces built which gave the stoker more work and this work is now approaching the limit and automatic stokers already introduced into so many plants are in view. Ashes, formerly handled by man power and a windlass, are now automatically ejected without human muscular effort.

Mr. Stone, chief of the Locomotive Brotherhood, when speaking from the same platform with me before the Civic Federation, boasted that he had shoveled enough coal into a locomotive to cover two city lots. It is not a performance to be proud of. Had scientific management provided better furnaces and showed him how to fire better he would have shoveled only half the coal; some other fireman could have shoveled the other half; our natural resources would have gone further, and the days of the oil burner or the automatic stoker would have come sooner.

On a fast train and continuous run, the fireman's work is very hard. Mr. Stone rightly surmised that I would be incapable of performing it. But on the Santa Fé railroad running through Arizona I sat up alongside the fireman on a locomotive twice as large as any Mr. Stone ever regularly handled in his fireman
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days, and as the fireman worked three injectors (Mr. Stone's locomotive used to have one), as with thumb and finger he regulated the fuel oil flow into the enormous furnace, he said to me: "As a fireman's job this is a cinch; no work about it at all." Then he reflected that this was perhaps not a prudent remark, so he touched me on the elbow and said: "But think of the added responsibility." He was right, there was added responsibility, but there was less work, and the pay was greater than the pay Mr. Stone received. I could have done it all day long. A twelve-year-old girl could have performed that part of the manual work.

In every department of human labor it is the same. Science has come to take the burden from the back, the sweat from the brow. We hurl back into the teeth of cruel Jehovah his curse. We shall not eat our bread in the sweat of our brows. Our men are no longer men of the hoe, first cousin to the ox, our women no longer wear out their lives grinding corn. Bread is furnished free in even the cheapest restaurants throughout all our land.

Scientific management, itself as yet but a crawling babe, not yet able to walk, has made a beginning, and if it were universally applied there need be no poverty anywhere.

There is no limit yet visible to the powers of man. We have reached out with our eyes until we made the distant stars our playthings. Read what Sir William James has written in his great work "The Powers of Men." "As a rule men habitually use only a small part of the powers which they possess and which they ought to use under appropriate conditions."

Says Mr. F. W. Taylor in his great work on Scientific Shop Management: "What the first class man can do, in most cases from two to four times as much as is done on an average, is known to but few and is fully realized by those only who have made a thorough and scientific study of the possibilities of men. It must be distinctly understood that in referring to possibilities the writer does not mean what a first class man can do on a spurt or when over-exerting himself, but what a good man can keep up for a long term without injury to his health, and become happier and thrive under." The first fallacy is that increased result, except for the moment, means increased effort.

The second fallacy is not so cruel, so ignorant, as the first. The greatest disaster that can happen the bread winner of the
family is to be thrown out of work. He can no longer go out 
and fish as the Eskimo do—he can no longer go out and hunt. 
Discharge in time of panic may mean starvation, and the heart 
of even the strongest man quails when he finds himself without 
work and gaunt women and crying children at home. Yet what 
happens under our industrial system without scientific man-
agement? In 1907 I was with the American Locomotive Company, 
counseling as to the introduction of modern methods. Suddenly 
the panic came, and of 25,000 men about 20,000 were let out. 
My job went with the others. The same thing happened at Bald-
win's. There are only two large locomotive building plants in the 
country, and between them they turned adrift nearly 40,000 men. 

One of the principles that scientific management is striving 
for is permanence of employment. On that same platform from 
which I spoke with Mr. Stone and Mr. John Mitchell, I advoc-
cated permanence of employment, even as I denounced piece rates 
as usually installed.

They told me I had no warrant to speak for the worker, yet 
Mr. Stone seized that occasion to praise as perfect, so perfect 
as to be incapable of betterment, the scientific management 
of American railroads. Great as are Mr. John Mitchell and 
Mr. Stone as leaders and as uplifters, they cannot set aside 
truths that apply equally to the microbe of infantile paralysis, 
so minute that it filters through porcelain, and to the stars, so 
remote that we cannot measure their parallax. It was the ap-
lication of the first and the last of the principles of scientific 
management, efficiency reward, that induced a far western road 
last year to pay some of its men over $1,000,000 above current 
rates and to continue an industrial peace of six years' duration.

It remained for Mr. Morrisey to come forward with the fal-
lacy that because the introduction of scientific management will 
mean less effort and less men, therefore it must mean a discharge 
of workers. You will note that Mr. Morrisey dreads it because 
he believes greater efficiency means less labor. They grant that 
greater efficiency does mean less labor, but it does not require 
the discharge of a single worker. We are, in this great country, 
so shy of workers to do the work that offers that we imported 
in the last six years over 4,000,000 foreigners. If we had had 
scientific management we would not have needed all those 
strangers who depress the wage rate. The railroad did not dis-
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place the stagecoach and the canal in a day. For every man in the old occupation there are relatively to-day ten in railroad work. In going into plants to give common sense advice, all we have ever asked of the manager is not to replace men who naturally drop out. Scientific management cannot keep up with these vacancies. In a great New England plant the vice-president said to me, “We love our workmen. We do not want to discharge them.” I agreed with him, but I asked him how many went away every year. He answered, at least ten per cent. Assuming that efficiency could lessen the number of his pay roll ten per cent a year, in three years it would make thirty per cent and no scientific management could keep pace with such reduction.

In this particular plant it was not among the employees that I looked for the chief savings, but along the line of increased efficiency of equipment. In England, in one of the large plants, all small pieces were forged rough and finished by hand. This took an immense amount of time. Hiram Maxim conceived the idea of drop forging those small pieces to size, but immediately the finishers rebelled. They feared it would throw them out of work; so finally the pieces were drop forged one eighth of an inch large and filed down by the finishers. It is because of this kind of Bourbonism—Bourbons never forget and never learn—that Germany and Japan are eating into England’s export trade. England had the trade; she might have kept it if she had been shop efficient.

The savage mother is not afraid to teach her baby all she knows. The fox father teaches his little ones how to hunt. The savage father teaches his boys how to take over his man’s work.

That civilization is rotten before it is ripe in which boys are not allowed to learn their father’s trades, in which efficiency is dreaded because it lessens human toil.