

The Ideas of Frederick W. Taylor: An Evaluation¹

EDWIN A. LOCKE
University of Maryland

The ideas and techniques of Frederick W. Taylor are examined with respect to their validity and their acceptance in modern management. With respect to the principle of scientific decision making and techniques such as time study, standardization, goal setting, money as a motivator, scientific selection, and rest pauses, Taylor's views were fundamentally correct and have been generally accepted. Most of the major criticisms that have been made of Taylor are unjustified. Taylor's genius has not been appreciated by many contemporary writers.

Few management theorists have been more persistently criticized than has Frederick W. Taylor, the founder of scientific management, despite his being widely recognized as a key figure in the history of management thought (Wren, 1979). Taylor and scientific management frequently were attacked in his own lifetime, prompting, among other responses, Gilbreth's *Primer* (Gilbreth, 1914/1973), and the criticisms have continued to this day.

The present author agrees with Drucker (1976), although not with all of his specific points, that Taylor has never been fully understood or appreciated by his critics. Many criticisms either have been invalid or have involved peripheral issues, and his major ideas and contributions often have gone unacknowledged.

Wren (1979) did a superb job of showing how Taylor's major ideas permeated the field of management both in the United States and abroad. However, Wren was not concerned primarily with

evaluating all of Taylor's techniques or the criticisms of his ideas. Boddewyn (1961), Drucker (1976), and Fry (1976) have made spirited defenses of Taylor, but more by way of broad overviews than in systematic detail. The present paper summarizes Taylor's major ideas and techniques and considers both their validity and their degree of acceptance in contemporary management. In addition, the major criticisms made of Taylor are systematically evaluated.

Taylor's Philosophy of Management

An essential element of Taylor's philosophy of management, as the name of the movement implies, was a scientific approach to managerial decision making (Taylor, 1912/1970b; Sheldon, 1924/1976). The name was intended to contrast his approach with the unscientific approaches that characterized traditional management practices. By scientific, Taylor meant: based on proven fact (e.g., research and experimentation) rather than on tradition, rule of thumb, guesswork, precedent, personal opinion, or hearsay (Taylor, 1911/1967).

There can be no doubt that this element of Taylor's philosophy is accepted in modern management. This is not to say that all contemporary managers are fully rational decision makers. Clearly this is not the case. However, most would sub-

¹This paper is based on the Annual Frederick J. Gaudet Memorial Lecture given at the Stevens Institute of Technology, Hoboken, N. J., on April 17, 1980. The author is greatly indebted to J. Myron Johnson of the Stevens Institute and Daniel Wren of the University of Oklahoma for their helpful comments on an earlier draft of this paper, as well as to Marvin Levine for his helpful input on the issue of labor management relations. The preparation of this paper was supported in part by Contract N00014-79-C-0680 between the University of Maryland and the Office of Naval Research.

scribe to the principle of scientific decision making and many actually practice it, at least with respect to some of their decisions. In most business schools there now is a specialized field called management science (which includes operations research), but the scientific approach is reflected in other areas of business as well (e.g., cost accounting). [See Kendall, (1924/1976) for a discussion of Taylor's early influence.] Taylor's goal was to forge a "mental revolution" in management, and in this aim he clearly succeeded. Drucker wrote that "Taylor was the first man in history who actually studied work seriously" (1976, p. 26).

A second element of Taylor's philosophy of management, and the other key aspect of the mental revolution that he advocated, concerned the relationship between management and labor. At the turn of the century, management-labor strife was widespread, violence was not uncommon, and a number of radical labor groups were advocating the violent overthrow of the capitalist system. Many believed that labor-management conflict was virtually inevitable.

Taylor argued that this view was false, that, at root, the interests of both parties were the same. Both would benefit, he argued, from higher production, lower costs, and higher wages, provided that management approached its job scientifically. Taylor believed that there would be no conflict over how to divide the pie as long as the pie were large enough (Taylor, 1912/1970b).

In logic, one cannot argue with Taylor's fundamental premise of a community of interest between management and labor. There were virtually no strikes in plants in which he applied scientific management (Taylor, 1911/1967; 1912/1970a). Wren (1979) argues that during the 1920s Taylor's hopes for union cooperation in introducing scientific management and in reducing waste were realized to a considerable extent in two industries. Unfortunately this attitude of cooperation ended in the 1930s when unions turned their attention to the passage of prolabor legislation.

In general, management-labor relations now are far more amicable than they were at the turn of the century, but all conflict has not been eliminated. One reason for this is that no matter how big the pie is, there still can be disagreements over how to divide it up. Taylor did not anticipate that as the pie got bigger, aspirations would rise accordingly.

Time and Motion Study

Before Taylor, there was no objective method for determining how fast a job should be done. Most managers simply used past experience as a guide. Taylor's solution was to break down the work task into its constituent elements or motions; to eliminate wasted motions so the work would be done in the "one best way" (Taylor, 1912/1970a, p. 85)—a principle even more strongly emphasized by Frank Gilbreth (1923/1970); and to time the remaining motions in order to arrive at an expected rate of production (a proper day's work).

Time study now is used routinely in industrialized countries. However, there has been no final solution to the problem of (partially) subjective elements in time study (e.g., fatigue allowances); nor has worker resistance to time study disappeared, although it should be noted that resistance is most likely when there is a lack of trust in management (Bartlem & Locke, 1981). Such lack of trust often is earned by practices such as rate-cutting—something that Taylor explicitly warned against.

Standardized Tools and Procedures

Before scientific management, every workman had his own private tool box. This resulted in great inefficiencies because the proper tools were not always used or even owned. Taylor pushed strongly for standardization in the design and use of tools. The tools and procedures were standardized in accordance with what designs that experiments had shown to be most effective in a given context (e.g., the best size and shape for coal shovels).

Like time study, the principle of standardization is now well accepted. Combined with the principle of designing tools to fit people, the technique of standardization has evolved into the science of human engineering. Standardization also has been extended beyond the sphere of tool use to include other types of organizational procedures, especially in large firms.

The Task

Taylor advocated that each worker be assigned a specific amount of work, of a certain quality, each day based on the results of time study. This assigned quota he called a "task" (Taylor, 1911/1967,

p. 120). The term task (which was not original to Taylor) is roughly equivalent to the term goal. Thus, the use of tasks was a forerunner of modern day goal-setting. It is worth noting that Wren's (1979) discussion of scientific management at DuPont and General Motors implies that there is an historical connection between it and the technique of management by objectives (MBO). Pierre DuPont adapted Taylor's cost control ideas in order to develop measures of organizational performance (such as "return on investment") for the DuPont Powder Company. One of his employees, Donaldson Brown, further developed the return on investment concept so that it could be used to compare the efficiency of various departments *within* DuPont. When Pierre DuPont became head of General Motors, he hired Brown and Alfred P. Sloan, who institutionalized Brown's ideas at General Motors. Thus, although the technique of MBO may have been an outgrowth of scientific management, it developed more directly from the concepts of feedback, performance measurement, and cost accounting than from the task concept. Taylor had introduced an interlocking cost and accounting system as early as 1893 (Copley, 1923, Vol. 1).

Drucker acknowledges that Sloan was one of the earliest users of the MBO technique, but the term evidently was coined by Drucker (1954) himself, based not just on his studies at GM but on his work at General Electric with Harold Smiddy (Greenwood, 1980). At GE, the technique of MBO came to mean objectives set jointly by the manager and his superior rather than simply assigned objectives and/or work measurement.

Another term used widely today is organizational behavior modification (OB Mod); most OB Mod studies merely involve goal-setting with feedback, described in behavioristic terminology (Locke, 1977). Virtually every contemporary theory of or approach to motivation now acknowledges the importance of goal setting either explicitly or implicitly (Locke, 1978).

The main effect of the post-Taylor research has been to support the validity of his practices. For example, it has been learned that specific challenging goals lead to better performance than do specific, easy goals or vague goals such as "do your best" or "no" goals (Locke, 1968; Locke, Shaw, Saari, & Latham, 1981). Taylor anticipated these results. The tasks his workers were assigned were, in fact,

both specific (quantitative) and challenging; they were set by time study to be reachable only by a trained, "first class" workman (Taylor, 1903/1970). Remarkably, Alfred P. Sloan himself said: "The guiding principle was to make our standards difficult to achieve, but possible to attain, which I believe is the most effective way of capitalizing on the initiative, resourcefulness, and capabilities of operating personnel" (Odiorne, 1978, p. 15).

Further, it now seems clear that feedback (knowledge of one's progress in relation to the task or goal) is essential for goal setting to work (Locke et al., 1981), just as it is essential to have goals if feedback is to work (Locke et al., 1968). Again Taylor anticipated these findings. His workers were given feedback at least daily indicating whether or not they had attained their assigned task (Taylor, 1911/1967). A precursor of evaluative feedback for workers, developed a century before Taylor, was Robert Owen's "silent monitor" technique, described by Wren (1979, p. 72).

The Money Bonus

Taylor claimed that money was what the worker wanted most, and he argued that the worker should be paid from 30 percent to 100 percent higher wages in return for learning to do his job according to scientific management principles, that is, for "*carrying out orders*" (Boddewyn, 1961, p. 105), and for regularly attaining the assigned task.

Although money has been attacked frequently by social scientists from the time of the Hawthorne studies to the present, on the grounds that it is an inadequate motivator, Taylor's claim—that money is what the worker wants most—was not entirely misguided. A plethora of new incentive schemes have developed since Taylor's time, and new ones are still being tried (Latham & Dossett, 1978), not only for workers but for managers as well. Most labor-management conflicts still involve the issue of wages or issues related to wages, such as seniority, rate setting, layoffs, and fringe benefits. New analyses of the Hawthorne studies indicate that their disparagement of money as a motivator was wrong (Carey, 1967; Franke & Kaul, 1978; Sykes, 1965; Lawler, 1975), and recent books and articles again are advocating the use of money to motivate workers (Lawler, 1971; Locke, 1975; Vough, 1975).

Pay has become a major issue even in the famous

Topeka experiment at General Foods, which was intended to stress job enrichment and participation (Walton, 1977), and it is a key element in the still popular Scanlon Plan (Frost, Wakeley & Ruh, 1974), long considered a human relations/organizational development technique. The pendulum now clearly seems to be swinging back toward Taylor's view (Locke, Feren, McCaleb, Shaw, & Denny, 1980). It is notable that one of the most outspoken contemporary advocates of money as a motivator is, like Taylor, an industrial engineer, Mitchell Fein. Fein has developed a new plant-wide incentive system called "Improshare" (Fein, 1977), which is coming into increasingly wide use.

Individualized Work

Taylor was a staunch advocate of individual as opposed to group tasks, as well as individual rewards, because he believed that group work and rewards undermined individual productivity, due to such phenomena as "systematic soldiering." Taylor wrote, "Personal ambition always has been and will remain a more powerful incentive to exertion than a desire for the general welfare" (1912/1976, p. 17). In this respect, Taylor's views are in clear opposition to the trend of the past four to five decades, which has been toward group tasks.

Nevertheless, Taylor's warnings about the dangers of group work have proven to have some validity. For example, Janis (1972) has demonstrated that groups that become too cohesive are susceptible to groupthink, a cognitive disorder in which rational thinking is sacrificed in the name of unanimity. Latané, Williams and Harkins (1979) have documented a phenomenon called "social loafing," in which people working in a group put out less effort than when working alone even when they claim to be trying their hardest in both cases.

Studies of group decision making indicate that there is no universal superiority of groups over individuals or vice versa. Although a group might outperform the average individual member, the best group member is often superior to the group as a whole (Hall, 1971).

The current view seems to hold that although people may work less hard in groups (as Taylor claimed), the benefits in terms of cooperation, knowledge, and flexibility generally outweigh the costs. Overall, the evidence is not conclusive one way or the other. Most likely the final answer will

depend on the nature of the task and other factors.

Management Responsibility for Training

In line with his emphasis on a scientific approach to management, Taylor argued that employees should not learn their skills haphazardly from more experienced workers, who may not be using the "one best way," but from management experts who are thoroughly familiar with the job. There can be no doubt that most contemporary managers fully accept the notion that training new employees is their responsibility. Furthermore, the objective evaluation of training is becoming increasingly common.

Scientific Selection

Taylor advocated selecting only "first class" (i.e., high aptitude) men for a given job because their productivity would be several times greater than that of the average man. Colleague Sanford E. Thompson's use of a measure of reaction time to select bicycle ball bearing inspectors (Taylor, 1911/1967) was one of the earliest efforts at objective selection.

Thompson's selection testing antedated the pioneering work of Hugo Munsterberg (1913) as well as the more systematic attempts at validation of selection tests conducted by American psychologists for the Army during World War I. Since that time, personnel selection has mushroomed enormously and has become a science in its own right. Wren (1979) notes that Taylor's emphasis on scientific selection was an impetus to the development of the fields of industrial psychology and personnel management.

Shorter Working Hours and Rest Pauses

Taylor's experiments with pig iron handlers and ball bearing inspectors determined that fatigue would be reduced and more work would be accomplished if employees were given shorter working hours and/or rest pauses during the day in proportion to the difficulty of the work. The findings with respect to shorter work week were corroborated by the British experiments during World War I (Vernon, 1921) and are now fully accepted. Similarly, the beneficial effects of periodic rest pauses have been documented in numerous experiments. Ryan (1947) summarizes the evidence on both issues.

Criticisms of Taylor

View of Work Motivation

A number of criticisms have been made of Taylor and his ideas. Taylor is frequently criticized for having an oversimplified view of human motivation. Although he never claimed to have a complete view (Taylor, 1911/1967), he did claim that what the worker wanted most was money. Taylor believed that men would not work or follow directions unless they attained some permanent, personal benefit from it. This assumption is fully in accord with the tenets of expectancy theory (Vroom, 1964).

What is the evidence for the power of money as motivator? The present author and his students recently analyzed all available field studies that examined the effectiveness of four motivational techniques: money, goal setting, participation in decision making, and job enrichment (Locke et al., 1980). It was found that the median performance improvement resulting from individual incentive systems was 30 percent. This figure was far higher than that for any of the other incentives. The median figure for group or plantwide incentive schemes was 18 percent, still higher than for any nonmonetary technique. These findings (which were based mainly on studies of blue collar workers) coincide with the results of numerous recent studies which indicate that extrinsic incentives such as money are more important for blue collar than for white collar employees (Locke, 1976). This should not be taken to imply that money is unimportant to white collar and professional workers.

Taylor's other major motivational technique was goal setting, that is, assigning specific tasks. A critical incident study by White and Locke (in press) found that goal setting and its equivalents (e.g., deadlines, a heavy work load) were associated with high productivity (and absence of goal setting or goal blockage with low productivity) more frequently than were any other factors. In the Locke et al. (1980) analysis referred to above, goal setting was the second most effective motivational technique. The mean improvement in performance in studies in which workers were assigned specific, challenging goals was 16 percent.

If the effects of Taylor's two main motivators, money and goals—or the task and the bonus, as he called them—are combined, there is an expected or potential performance improvement of 46 percent.

The figure is very close to the figure of a 40 percent mean performance improvement obtained in studies of individual task and bonus systems (Locke et al., 1980). A survey of 453 companies (Fein, 1973) found that task and bonus systems combined yielded productivity increases even greater than 40 percent. This figure far exceeds the combined effect of two more recently promulgated motivational techniques, job enrichment and participation (Locke, et al., 1980). Although Taylor offered nothing approaching a complete theory of human motivation, one must be impressed by the effectiveness of his techniques and by the little that has been added, at least by way of effective techniques, since his time.

Social Factors

The Hawthorne studies (Roethlisberger & Dickson, 1939/1956) were supposed to represent a great enlightenment. They allegedly "discovered" the influence of human relations or social factors on worker motivation. It has been noted that most of the conclusions that the Hawthorne researchers drew from their own data were probably wrong (Franke & Kaul, 1978). But, beyond this, much of what they said was not even original. Much has been made of the studies in the Bank Wiring Observation room, which found that workers developed informal norms that led to restriction of output. It has been claimed that this discovery refuted Taylor's alleged assumption that workers respond to incentives as isolated individuals. Actually Taylor made no such assumption. In fact, he had identified exactly the same phenomenon as the Hawthorne researchers several decades earlier. He called it "systematic soldiering." (See also comments by Boddewyn, 1961.) Not only did Taylor recognize restriction of output, but one of the chief goals of scientific management was to eliminate it! He viewed soldiering as wasteful and as contrary to the interests of both management and the worker. The main difference between Taylor and Mayo (director of the Hawthorne studies) was that Taylor viewed soldiering as a problem caused by poor management and one that could and should be eliminated by scientific management; Mayo saw it as a reflection of an ineradicable human need.

Nor was Taylor unaware of the effect of social comparisons on worker morale. Discussing the need for the worker to perceive incentive systems as fair,

relative to what other workers were getting, he said, "sentiment plays an important part in all our lives; and sentiment is particularly strong in the workman when he believes a direct injustice is being done him" (Copley, 1923, Vol. 2, p. 133). Taylor also was aware of social factors at a deeper level. Scientific management itself involved a social revolution in that it advocated replacing management-labor conflict with cooperation.

Authoritarianism

Authoritarianism means the belief in obedience to authority simply because it is authority—that is, obedience for the sake of obedience. Such a doctrine clearly was in total contradiction to everything Taylor stood for. First and foremost he stood for obedience to facts—to reason, to proof, to experimental findings. It was not the rule of authority that he advocated but the rule of knowledge. To quote Taylor biographer F. B. Copley, "there is only one master, one boss; namely, knowledge. This, at all events, was the state of things Taylor strove to bring about in industry. He there spent his strength trying to enthrone knowledge as king" (1923, Vol. 1, p. 291).

Taylor did not advocate participation in management matters by his uneducated, manual workers because they did not have the requisite knowledge to do their jobs in the one best way. For example, he shortened the working hours of ball bearing inspectors even when they opposed any such reduction (despite the promise of no loss in pay), because the evidence indicated that their work day was too long (Taylor, 1911/1967). The positive results vindicated his judgement. Similarly, most workers, when they first heard about the task and bonus system, wanted no part of it. But when Taylor (1903/1947) showed them how such a system would actually benefit them (sometimes, to be sure, accompanied by pressures) most embraced it enthusiastically and performed far better as a result. Taylor was not averse to suggestions from the workers. He wrote, "Every encouragement... should be given to him to suggest improvements in methods and in implements" (1911/1967, p. 128). (See also Gilbreth, 1914/1973.) Fisher quotes Copley on this issue as follows: "If you could prove that yours was the best way, then he would adopt your way and feel very much obliged to you. Frequently he took humble doses of his own imperious medicine" (1925/1976, p. 172).

Specialization of Labor

There is little doubt that Taylor emphasized maximum specialization, not only for workers but for foremen (e.g., functional foremanship) and managers as well. His argument was the traditional one, that specialization decreases learning time and increases competence and skill. To evaluate the criticism that Taylor overemphasized specialization one must ask: How much emphasis is overemphasis?

Advocates of job enrichment have argued with some validity that extreme specialization leads to boredom and low morale and lack of work motivation due to underutilized mental capacity. However, it should be noted that Taylor always argued for a matching of men to jobs in accordance with their capacities. People who do jobs that require very little mental capacity should be people who have very little mental capacity (Taylor, 1903/1947). Those with more capacity should have more complex tasks to perform (e.g., by being promoted when they master the simple tasks). See Gilbreth (1914/1973) and Taylor (1912/1970a). In this respect Taylor might very well approve of individualized job enrichment, although, as noted earlier, its effects on performance may be limited. The present author does not agree, however, with Drucker's (1976) claim that Taylor anticipated Herzberg's theory.

There is a potential benefit of job enrichment (e.g., multicrafting and modular working arrangements), however, that Taylor did not foresee. There are fewer and fewer jobs in existence today that stay unchanged for long periods of time. If such jobs exist, they eventually are automated. People are more versatile than machines precisely because of their greater flexibility and adaptability. In times of rapid technological change, such as the present, spending months training a worker for one narrow specialty would not be very cost-efficient. It is more practical to have each worker master several different jobs and to work each day or hour where they are most needed.

With respect to supervision, Taylor's concept of functional foremanship clearly has not been accepted and probably is not very practical.

Men as Machines

The criticism that Taylor's system treated men as machines is related to the previous one. It usually

refers to scientific management's requirement of complete uniformity for a given job with respect to the tools and motions used by the workmen (the one best way). As noted earlier, Taylor was not against the workers making suggestions for improvements, provided they first mastered the best known methods. Taylor's well-chosen example of this principle was that of training a surgeon: "he is quickly given the very best knowledge of his predecessors [then] . . . he is able to use his own originality and ingenuity to make *real additions to the world's knowledge, instead of reinventing things which are old*" (1911/1967, p. 126). The alternative to treating men as machines in the above sense was the prescientific method of management, which allowed men to choose tools and methods based on personal opinions and feelings rather than on knowledge.

It often is forgotten that standardization included the redesign of machines and equipment in order to enable men to become more skilled at the tasks they performed. Taylor applied this principle as much to himself as to others. His unique modifications of the tennis racket and the golf putter for his own use are cases in point. (Both items are on display at the Stevens Institute of Technology.) As noted earlier, he did not force people to fit existing equipment. He, and the Gilbreths, (re-)designed equipment to fit people. It might be more accurate to say that Taylor, rather than treating men as machines, helped to develop the science of integrating men with machines.

Exploitation of the Workers

During Taylor's lifetime, socialist Upton Sinclair and others claimed that Taylor's system was exploitative because, although under scientific management the worker might improve his productivity by around 100 percent, his pay was generally increased by a lesser amount. In fairness, they argued, the pay increase should match the productivity increase.

Taylor easily refuted this argument (Fisher, 1925/1976; Copley, 1923, Vol. 1). He pointed out, for example, that the increase in productivity was not caused by the worker only, but also by management; it was management who discovered the better techniques and designed the new tools, at some cost to themselves. Thus they deserved some of the benefits as well (Taylor, 1911/1967).

Ironically, Lenin, the self-proclaimed enemy of so-called "capitalist exploitation," himself strongly advocated the application of scientific management to Russian industry in order to help build socialism. However, socialist inefficiency, hostility to capitalist ideas, and resistance to change prevented the application of virtually all scientific management techniques in Russia except for the Gantt chart (Wren, 1980). The Soviets, however, may have been influenced by the Polish manager and theorist Karol Adamiecki, who developed his own scientific management theory independently of Taylor (Wesolowski, 1978).

Antiunionism

The criticism that Taylor was antiunion is true in only one sense. Taylor foresaw no need for unions once scientific management was properly established, especially because he saw the interests of management and labor as fundamentally the same (Copley, 1925/1976). It is worth noting in this respect that companies that are known for treating their employees well, such as IBM, do not have unions. The belief that unions were unnecessary under the proper type of management did not indicate lack of concern for employee welfare. The leaders of the scientific management movement, including Taylor, showed great concern about the effects of company policies on employee well-being (Sheldon, 1924/1976). For example, they were constantly preoccupied with eliminating or reducing fatigue. This benevolence, however, did not always characterize the followers of Taylor, who often tried to shortcut the introduction of his methods and engaged in rate-cutting and other deceptive practices.

Dishonesty

The strongest condemnations of Taylor, specifically of Taylor's character, have come in two recent articles (Wrege & Perroni, 1974; Wrege & Stotka, 1978). The first asserts that Taylor lied about the conduct of the famous pig iron handling experiments at Bethlehem Steel, and the second claims that Taylor plagiarized most of his *Principles of Scientific Management* from a colleague, Morris L. Cooke.

As for the pig iron experiments, it seems clear from Wrege and Perroni (1974) that Taylor did stress different things in the three reports that ap-

peared in his writings. However, these descriptions were *not* contradictory to one another; they differed only in terms of emphasis and in the amount of detail presented. This in itself does not constitute dishonesty. Taylor apparently was in error as to certain details (e.g., the amount of tonnage of iron involved), but this could have involved errors of memory rather than deliberate deception. Nor do these details change the thread of his arguments.

Wrege and Perroni also claim that Schmidt (actual name: Henry Knolle) was not selected scientifically for the job of pig iron handling as claimed, but was simply the only worker who stuck with the task from the beginning to the end of the introductory period. This claim would appear to be true unless James Gillespie and Hartley Wolle, who conducted most of the research, omitted pertinent information in their report. However, if one accepts the idea that by a "first class" workman Taylor meant one who was not just capable but also highly motivated, then the choice of Schmidt was not inconsistent with Taylor's philosophy.

In addition, Wrege and Perroni could find no evidence that local papers had opposed Taylor's experiments as he had claimed. However, it is possible that Taylor was referring to some other paper or papers. Wrege and Perroni do not indicate whether the papers they looked at were the only ones published in the Bethlehem area or surrounding areas at that time.

Wrege and Perroni argue further that Taylor never acknowledged that his "laws of heavy laboring" were based on the work of "two extraordinary workers" (1974, p. 21). However in *Principles of Scientific Management*, Taylor clearly states that "a first class laborer, suited to such work as handling pig iron could be under load only 42 percent of the day and must be free from load 58 percent of the day" (1911/1967, p. 60, footnote 1; italics added). In short, these laws were specifically *for* extraordinary workers.

Wrege and Perroni claim that Taylor lied about giving the workers rest pauses, because all of the rest periods referred to involved only the return walk after loading the pig iron rather than an actual seated or motionless rest period. However, if one reads Taylor's *Principles* carefully, one notes that he specifically described his laws of heavy laboring in terms of how much of the time the worker can be "under load" (1911/1967, pp. 60-61, footnote 1).

This implies that the return walk was the part not under load. Furthermore, near the end of footnote 1, Taylor states, "Practically the men were made to take a rest, generally by sitting down, after loading ten to twenty pigs. *This rest was in addition to the time which it took them to walk back from the car to the pile*" (1911/1967, p. 61, italics added). No evidence in Wrege and Perroni's (1974) paper contradicts this assertion; nor do they even mention it.

As to the Wrege and Stotka (1978) claim that Taylor plagiarized most of his *Principles* from a manuscript written by a colleague, Morris Cooke, several facts should be noted. First, Cooke's manuscript was based on a talk written and presented by Taylor himself. Apparently Cooke added to it, but the source of the additional material is not actually known; it could have been from other talks by or discussions with Taylor. Cooke himself gave Taylor credit for this allegedly plagiarized material (Wrege & Stotka, 1978). Fry argues, "It is ludicrous to accuse Taylor of plagiarizing Cooke if in fact Cooke's material was based on Taylor's own talks" (1976, p. 128). Second, Taylor published *Principles* with Cooke's full knowledge and apparent consent. Third, Taylor offered Cooke all the royalties lest his book reduce the sales of a similar book Cooke planned to author himself. All of this is hardly consistent with Wrege and Stotka's implication that Taylor was a dishonest exploiter. Actually, the reasons why Cooke agreed to let Taylor be sole author of the manuscript are not known. At most Taylor can be accused of lack of graciousness due to his failure to acknowledge Cooke's editorial work. It also is puzzling why, if Cooke actually wrote most of *Principles*, Wrege, Perroni, and Stotka did not accuse Cooke as well as Taylor of dishonesty in reporting the pig iron experiments.

Wrege and Perroni (1974) also accuse Taylor of not giving credit to Gillespie and Wolle for their work on the Bethlehem studies. Although Taylor did not acknowledge in print every assistant who ever worked with him, in *Principles* he did acknowledge his indebtedness to many colleagues, including, Barth, Gilbreth, Gantt, and Thompson. He also used the term "we" when describing the Bethlehem experiments. Thus he was clearly not in the habit of taking all credit for himself, as Wrege and Stotka (1978) charge. Again, however, a footnote acknowledging the work of Gillespie and Wolle would have been appropriate.

In the present author's opinion, not only is the evidence that Taylor was dishonest far from conclusive, it is virtually nonexistent. On the grounds of practicality alone, it seems doubtful that Taylor, who worked and performed experiments with so many different people, would deliberately attempt to distort what was done or who did it and thus leave himself open to exposure by any one of them.

Conclusion

With respect to the issues of a scientific approach to management and the techniques of time and motion study, standardization, goal setting plus work measurement and feedback, money as a motivator, management's responsibility for training, scientific selection, the shortened work week, and rest pauses, Taylor's views not only were essentially correct but they have been well accepted by manage-

ment. With respect to the issues of management-labor relations and individualized work, Taylor probably was only partially correct, and he has been only partially accepted. These issues are summarized in Table 1.

With respect to criticisms, the accusations regarding the following points are predominantly or wholly false: Taylor's inadequate model of worker motivation, his ignorance of social factors, his authoritarianism, his treatment of men as machines, his exploitation of workers, his antiunionism, and his personal dishonesty. Several of them verge on the preposterous. The accusation of overspecialization seems partly but not totally justified. See Table 2 for a summary of these points.

Considering that it has been over 65 years since Taylor's death and that a knowledge explosion has taken place during these years, Taylor's track record is remarkable. The point is not, as is often

Table 1
Status of Taylor's Ideas and Techniques in Contemporary Management

	<i>Valid?</i>	<i>Now Accepted?</i>	<i>Manifested in (outgrowths):</i>
<i>Philosophy</i>			
Scientific decision making	Yes	Yes	Management science: operations research, cost accounting, etc. Greater management-labor cooperation (but conflict not eliminated)
Management-labor cooperation	Yes	Partly	
<i>Techniques</i>			
Time and motion study	Yes	Yes	Widespread use; standard times Standardized procedures in many spheres; human engineering
Standardization	Yes	Yes	
Task	Yes	Yes	Goal setting, MBO, feedback Proliferation of reward system, Scanlon Plan, Improshare, need to consider money in job enrichment/OD studies
Bonus	Yes	Increasingly	
Individualized work	Partly	Partly	Recognition of dangers of groups, groupthink, social loafing, contextual theories of group decision making, (but group jobs sometimes more efficient)
Management training	Yes	Yes	Management responsibility for employee training
Scientific selection	Yes	Yes	Development of fields of industrial psychology and personnel management
Shorter hours; rest pauses	Yes	Yes	40 hour (or less) work week; common use of rest pauses

Table 2
Validity of Criticisms of Taylor's Ideas

<i>Criticism</i>	<i>Valid?</i>	<i>Relevant facts</i>
Inadequate theory of work motivation	Specious, because no complete theory offered	Money and goals are the most effective motivators
Ignored social factors	No	SM designed specifically to facilitate cooperation and to eliminated negative effects of social factors; awareness of sentiments
Authoritarianism	No	Stressed rule of knowledge (the essence of SM)
Overspecialization	Partly	Specialization maximized expertise; matched men to job requirements (but ignored possible benefits of multicrafting)
Treated man as machines	No	Methods based on knowledge, not feelings
Exploitation of workers	No	Management deserves some of the benefits of increased efficiency based on its contribution
Antiunionism	No	Unions not needed under good management
Dishonesty	No	Accusations based on incomplete or false information

claimed, that he was "right in the context of his time" but is now outdated, but that *most of his insights are still valid today*. The present author agrees with those who consider Taylor a genius (Johnson, 1980). His achievements are all the more admirable because, although Taylor was highly intelligent, his discoveries were not made through sudden, brilliant insights but through sheer hard work. His metal-cutting experiments, for example, spanned a period of 26 years (Taylor, 1912/1970a)!

Drucker (1976) claims that Taylor had as much

impact on the modern world as Karl Marx and Sigmund Freud. This may be true in that Taylor's influence was certainly worldwide and has endured long after his death (Wren, 1979). Of the three, however, the present author considers Taylor's ideas to be by far the most objectively valid. But the historical figure that Taylor most reminds one of is Thomas Edison (Runes, 1948)—in his systematic style of research, his dogged persistence, his emphasis on the useful, his thirst for knowledge, and in his dedication to truth.

References

- Bartlem, C. S., & Locke, E. A. The Coch and French study: A critique and reinterpretation. *Human Relations*, 1981, 34, 555-566.
- Boddewyn, J. Frederick Winslow Taylor revisited. *Academy of Management Journal*, 1961, 4, 100-107
- Carey, A. The Hawthorne studies: A radical criticism. *American Sociological Review*, 1967, 32, 403-416.
- Copley, F. B. *Frederick W. Taylor: Father of scientific management* (2 Vols.). New York: Harper & Row, 1923,
- Copley, F. B. Taylor and trade unions. In D. DelMar & R. D. Collins (Eds.), *Classics in scientific management*. University, Ala.: University of Alabama Press, 1976, 52-56. (Originally published, 1925.)
- Drucker, P. F. *The practice of management*. New York: Harper, 1954.
- Drucker, P. F. The coming rediscovery of scientific management. *Conference Board Record*, 1976, 13 (6), 23-27.
- Fein, M. Work measurement and wage incentives, *Industrial Engineering*, 1973, 5, 49-51.
- Fein, M. An alternative to traditional managing. Unpublished manuscript, 1977.
- Fisher, I. Scientific management made clear. In D. DelMar & R. D. Collins (Eds.), *Classics in scientific management*. University, Ala.: University of Alabama Press, 1976, 154-193. (Originally published, 1925.)
- Franke, R. H., & Kaul, J. D. The Hawthorne experiments: First statistical interpretation. *American Sociological Review*, 1978, 43, 623-643.
- Frost, C. F., Wakeley, J. H., & Ruh, R. A. *The Scanlon plan for organization development: Identity, participation, and equity*. East Lansing: Michigan State University Press, 1974.
- Fry, L. W. The maligned F. W. Taylor: A reply to his many critics. *Academy of Management Review*, 1976, 1 (30), 124-139.
- Gilbreth, F. B. Science in management for the one best way to do work. In H. F. Merrill (Ed.), *Classics in management*. New York: American Management Association, 1970, 217-263. (Originally published, 1923.)
- Gilbreth, F. B. *Primer of scientific management*. Easton, Pa.: Hive Publishing Co., 1973. (Originally published, 1914.)
- Greenwood, R. Management by objectives: As developed by Peter F. Drucker assisted by General Electric's management consultation services. Paper presented at the Academy of Management meetings, 1980, Detroit.
- Hall, J. Decisions, decisions, decisions. *Psychology Today*, 1971, 5 (6), 51ff.
- Janis, I. *Victims of groupthink*. Boston: Houghton Mifflin, 1972.
- Johnson, M. J. Fred Taylor '83: Giant of non-repute. *Stevens Indicator*, 1980, 97 (2), 4-8.
- Kendall, H. P. A decade's development in management trends and results of scientific management. In D. DelMar & R. D. Collins (Eds.), *Classics in scientific management*. University, Ala.: University of Alabama Press, 1976, 118-133. (Originally published, 1924.)
- Latané, B., Williams, K., & Harkins, S. Social loafing. *Psychology Today*, 1979, 13 (4), 104ff.
- Latham, G. P., & Dossett, D. L. Designing incentive plans for unionized employees: A comparison of continuous and variable ratio reinforcement schedules. *Personnel Psychology*, 1978, 31, 47-61.
- Lawler, E. E. *Pay and organizational effectiveness: A psychological view*. New York: McGraw-Hill, 1971.
- Lawler, E. E. Pay, participation and organization change. In E. L. Cass & F. G. Zimmer (Eds.), *Man and work in society*. New York: Van Nostrand Reinhold, 1975, 137-149.
- Locke, E. A. Toward a theory of task motivation and incentives. *Organizational Behavior and Human Performance*, 1968, 3, 157-189.
- Locke, E. A. Personnel attitudes and motivation. *Annual Review of Psychology*, 1975, 26, 457-480.
- Locke, E. A. The nature and causes of job satisfaction. In M. D. Dunnette (Ed.), *Handbook of industrial and organizational psychology*. Chicago: Rand McNally, 1976, 1297-1349.
- Locke, E. A. The myths of behavior mod in organizations. *Academy of Management Review*, 1977, 2, 543-553.

- Locke, E. A. The ubiquity of the technique of goal setting in theories of and approaches to employee motivation. *Academy of Management Review*, 1978, 3, 594-601.
- Locke, E. A., Cartledge, N., & Koepfel, J. Motivational effects of knowledge of results: A goal-setting phenomenon? *Psychological Bulletin*, 1968, 70, 474-485.
- Locke, E. A., Shaw, K. N., Saari, L. M., & Latham, G. P. Goal setting and task performance: 1969-1980. *Psychological Bulletin*, 1981, 90, 125-152.
- Locke, E. A., Feren, D. B., McCaleb, V. M., Shaw, K. M., & Denny, A. T. The relative effectiveness of four methods of motivating employee performance. In K. Duncan, M. Gruneberg, & D. Wallis (Eds.), *Changes in working life*. Chichester, England: Wiley, 1980, 363-387.
- Munsterberg, H. *Psychology and industrial efficiency*. Boston: Houghton Mifflin, 1913.
- Odiorne, G. S. MBO: A backward glance. *Business Horizons*, October 1978, 14-24.
- Roethlisberger, F. J., & Dickson, W. J. *Management and the worker*. Cambridge, Mass.: Harvard University Press, 1956. (Originally published, 1939.)
- Runes, D. D. (Ed.). *The diary and sundry observations of Thomas Alva Edison*. New York: Philosophical Library, 1948.
- Ryan, T. A. *Work and effort*. New York: Ronald, 1947.
- Sheldon, O. Taylor the creative leader. In D. DelMar & R. D. Collins (Eds.), *Classics in scientific management*. University, Ala.: University of Alabama Press, 1976, 35-51. (Originally published, 1924.)
- Sykes, A. J. M. Economic interest and the Hawthorne researchers. *Human Relations*, 1965, 18, 253-263.
- Taylor, F. W. *Shop management* (published as part of *Scientific management*). New York: Harper, 1947. (Originally published, 1903.)
- Taylor, F. W. *The principles of scientific management*. New York: Norton, 1967. (Originally published, 1911.)
- Taylor, F. W. Time study, piece work, and the first-class man. In H. F. Merrill (Ed.), *Classics in management*. New York: American Management Association, 1970, 57-66. (Originally published, 1903.)
- Taylor, F. W. The principles of scientific management. In H. F. Merrill (Ed.), *Classics in management*. New York: American Management Association, 1970a. (Originally published, 1912.)
- Taylor, F. W. What is scientific management? In H. G. Merrill (Ed.), *Classics in management*. New York: American Management Association, 1970b, 67-71. (Original testimony given, 1912.)
- Taylor, F. W. Profit sharing. In D. DelMar & R. D. Collins (Eds.), *Classics in scientific management*. University, Ala.: University of Alabama Press, 1976, 17-20. (Originally written, 1912.)
- Vernon, H. N. *Industrial fatigue and efficiency*. New York: Dutton, 1921.
- Vough, C. F. *Tapping the human resource*. New York: Wiley, 1964.
- Vroom, V. *Work and motivation*. New York: Wiley, 1969.
- Walton, R. E. Work innovations at Topeka: After six years. *Journal of Applied Behavioral Science*, 1977, 13 (3), 422-433.
- Wesolowski, Z. P. The Polish contribution to the development of scientific management. *Proceedings of the Academy of Management*, 1978.
- White, F., & Locke, E. A. Perceived determinants of high and low productivity in three occupational groups: A critical incident study. *Journal of Management Studies*, in press.
- Wrege, C. D., & Perroni, A. G. Taylor's pig-tale: A historical analysis of Frederick W. Taylor's pig-iron experiments. *Academy of Management Journal*, 1974, 17, 6-27.
- Wrege, C. D., & Stotka, A. M. Cooke creates a classic: The story behind F. W. Taylor's principles of scientific management. *Academy of Management Review*, 1978, 3, 736-749.
- Wren, D. A. *The evolution of management thought* (2nd ed.). New York: Wiley, 1979.
- Wren, D. A. Scientific management in the U.S.S.R., with particular reference to the contribution of Walter N. Polakov. *Academy of Management Review*, 1980, 5, 1-11.

Edwin A. Locke is joint Professor of Business and Management and of Psychology at the University of Maryland, College Park.

Copyright of Academy of Management Review is the property of Academy of Management and its content may not be copied or emailed to multiple sites or posted to a listserv without the copyright holder's express written permission. However, users may print, download, or email articles for individual use.