

entitled to be called a science, and for this he is entitled to be called the father of the science of management, although not of management as an executive function. The term Scientific Management implies a certain condescension toward the then existing stage of the art of management which I do not believe was intended by Taylor. His criticism was principally directed at the absence of scientifically determined facts as a basis for management.

When we speak of Darwin as the father of evolution, of Pasteur as the father of modern bacteriology, of Fulton as the father of steam navigation, or of Newton as the father of the law of gravity, we do not imply that they were the first to conceive of these discoveries, or that the last word was said by them. But we do give them credit for being the first to deal with these subjects in a manner sufficiently comprehensive, logical and practical to bring them to the attention of the world. This is the least that can be said of Taylor. In proof of this, I shall cite his "four principles" and show that, although they were developed largely with reference to production, they are fundamental to management in its larger aspects, as is proven by their having been generally adopted by industry at large.

Before referring specifically to the principles, it should be observed that Taylor not only formulated definite principles, but he developed a technique and actually drew all of the necessary forms and standardized the paper work required for their application. More than this, he gave an actual demonstration of all that he advocated in a going, competitive business. Had he done less than this, he would not have received either the recognition or the criticism which has been lavished upon him. The recognition is, I believe, due to the effectiveness of his principles and formulae, and the criticism to an assumption, unwarranted by the facts, that he considered them to constitute the sum and substance of management.

Taylor's first principle was the gathering together of all of the traditional knowledge which in the past has been possessed by the workers, and the classifying, tabulating and reducing of this knowledge to rules, laws and formulae. With reference to production this included roughly: 1, standardization and classification of stores; 2, maximum and minimum requirements of stores; 3, standardization and classification of tools and machinery; 4, product specifications; 5, job analysis and standard route charts; 6, worked material classifications; 7, forms and records.

This, as with all of his principles, is clearly limited to the facts of management and not the executive function. Its soundness is testified to by its counterpart presented by the services performed by the research and statistical department, now quite general in all phases of management.

A second step in his first principle was the development of a science for each phase of man's work, to take the place of the traditional rule-of-thumb method. With reference to production, this included roughly: 1, time study of unit operations; 2, standardization of operations; 3, operation instructions; 4, balance of stores. This has its counterpart in the statistical charts and formulae now almost universally used as an aid to executive judgments.

His second principle was the scientific selection, teaching, development and training of employees. With reference to production, this includes roughly: 1, standards for selection of employees; 2, schools for instruction; 3, standards and records for judging qualifications and efforts; 4, training of foremen, gang bosses, instructors and inspectors. While no reliable tests for the selection of executives have as yet been developed, there is hardly any university of standing that does not include a school of business administration in which it undertakes to prepare young men for the executive function. Is not this a general recognition of his principle with respect to the higher executive function?

His third principle was the cooperation with employees so as to insure all of the work being done in accordance with the principles of the science developed. Notice the use of the words, "the science developed." With reference to production, this includes roughly: 1, informing and educating owner, manager, foremen and employees with reference to plans and methods; 2, central planning and control; 3, comparison of work performed and time consumed with standard, and a bonus reward for satisfactory results achieved. The general application of this principle to the administrative function is easily recognized in the growing use of budgets and accounting methods to see that budgets are conformed to.

His fourth principle was the equal division of work and responsibility between management and labor. With reference to production, this includes roughly: 1, assumption by the management of full authority and responsibility for ways, means and records; 2, relieving workers of all clerical work; 3, determination of sequence and routing of work; 4, supplying workers

with proper stores; 5, supplying them with proper tools. This is the forecast of the elaborate organization plans and charts and schedules defining duties and responsibilities, now generally in use in large concerns.

In his application of the scientific procedure to problems of management, Taylor not only gave us a practical beginning but he blazed the way for much that is to come. In this connection I do not feel that any discussion of the evolution and present state of management can be complete without reference to what I believe to be the next step—the inclusion in both the science and the art of management of the use of what has been recently developed in the closely related science of psychology. I do not mean by this what is commonly known by the word psychology, in the sense of the static process of introspection that was taught when most of us went to school, but rather, the fundamental principles of what is sometimes called "the new psychology," with principal reference to what it has to teach us regarding man, the principal factor in both the executive function and the science of management.

Mechanical engineering reached its present high state of development largely through intensive investigation of the materials with which it deals. It did not hesitate to use physics, metallurgy, and other sciences for this purpose. The management engineer has attempted to go forward on the information accumulated by the mechanical engineers, seemingly overlooking the fact that his principal material is man himself, concerning whom he has almost no knowledge.

Can you imagine a mechanical engineer working without a knowledge of physics? With all of his mechanisms, he would be in a pretty plight without a knowledge of the laws of the physical world with which he deals. Why then should we expect more of the management engineer with all of his methods, systems and controls, until he acquires a knowledge of the laws governing the behavior of man, the principal material with which he deals?

The hopeful tendency of today for management as an executive function, and the new and ever increasing opportunity for management as a science to be practiced by those adequately informed and trained for their task is, as I see it, in the rapid development of psychology as a science, and the beginning of its recognition by executives as a controlling factor in management. The growing tendency to consider man's probable behavior on the basis of experience, in place of reasoning according to prescribed rules for

behavior, the increasing tendency toward the decentralization of authority, the substitution of clearly defined responsibilities for duties, the keeping of accounts in terms of cost and revenue growing out of responsibilities in place of arbitrary accounting terms—these are all evidences of progress in the right direction.

Whereas we formerly railed at what we chose to call unreasonableness and inconsistency in others, we are now coming to recognize, all unwittingly, but through a better understanding of the dynamics of man, that this unreasonableness and inconsistency is a natural result of differences in nature, environment, and opportunity, and can be adjusted only through changes in environment, opportunity and our own attitude, and that it cannot be adjusted through reasoning or punishment.

Most of us were brought up under the theological traditions of man's essential goodness or badness—the idea that, freed from external influences, man would be good or bad as the case may be. It was thought that he could be reasoned into gratitude, generosity or honesty, even in the face of all opposing influences, and great stress was laid upon the effectiveness of the spoken word. This tradition has done much to befog our understanding of his probable reaction to any given set of circumstances. In our dealings with each other, we have depended upon *reason*, very much as though it were a *law* controlling human action.

Modern Biology and psychology teach that man is primarily emotional, that he is descended from primitive forms of life, and that his reactions are still influenced and modified by primitive emotions, such as fear, rage, hunger, and desire for comfort. They argue that because he was in a primitive state for millions of years, and has been a reasoning being for only a few thousand years, the first and most powerful influence upon him must necessarily be the old habit reaction of quick emotional response to the primitive fear, rage or love which each situation however subtly may suggest. Only secondarily and after control of his emotional reaction does he become subject to reason and the spoken word.

While these views regarding man's origin and his present state are by no means generally accepted as yet, they have shaken the foundations of the earlier beliefs. Executives are unconsciously beginning to study the probable reactions of those they direct, regardless of the reasonableness of such reaction. Whereas executives used to spend days over the