The Power of Example

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Taylor and the Science of Handling Pig Iron

The legacy of the American engineer Frederick Winslow Taylor is a varied one. He lived from 1856 to 1915. Since his death, assessments of his work have ranged from praise as one of the major innovators in the world of work to neo-Marxist criticism of Taylorism as one of the worst examples of the constant efforts of capitalism to exploit the working class for its own ends. A good example of this may be found in a book that influenced the debate on working life in the nineteen-seventies and eighties – Harry Braverman's *Labor and Monopoly Capital: The Degradation of Work in the Twentieth Century*. When Braverman presents Taylor's message, it may sound like this: 'Like a rider who uses reins, bridle, spurs, carrot, whip and training from birth to impose his will, the capitalist strives, through management, to *control*.' In his book on 'the epistemology of labour', the philosopher Bengt Molander follows Braverman in his account of Taylor and Taylorism, but he does not focus primarily on power and control. The main emphasis is on the nature of practical knowledge. In Molander's hands, Taylor is allotted the role of an effective contrast to the current efforts to renew working life through 'co-reflection' and 'co-determination', as he chooses to express it.

Notwithstanding this critical attitude there are good summaries of some of the fundamental ideas in Taylor's *The Principles of Scientific Management* (1911) and *Shop Management* (1903) in Braverman and Molander. Put briefly, Taylor's conception of scientific management is based on three principles: (1) it is the task of management to compare, systematise and analyse the experience of the workers and to establish standards for the day-to-day work on this basis; (2) wherever possible, all thought relating to the work should be moved from the shop floor to a central planning department; (3) one must ensure that the first two principles are applied consistently. Molander see this as an expression of the excessive weight the tradition of Western epistemology gives to theoretical knowledge and the corresponding downplaying of the intrinsic value of practical knowledge.

If you go back to Taylor's own writings, it becomes clear that he was a more subtle, and far more humane, author than the figure Braverman presents for critical consideration. However, it is not my task here to contribute to the restoration of Frederick Taylor's lost honour. What invokes my hermeneutic interest is what Frederick Winslow Taylor may have meant by *scientific* when he wrote about the principles of scientific management.

Molander is very brief on this point. In one place he writes that power is manifest in a more subtle way in Taylor: it appears in the guise of the scientific way of organising and directing production. As do many others, Molander assumes that in English *scientific* means the same as *naturvetenskaplig* (of the natural sciences) in Swedish, *naturwissenschaftlich* in German, and so. *Science* is the natural sciences and nothing else. But it is not as simple as that. When the philosopher Adam Ferguson published his *Principles of Moral and Political Science* in 1792, he cannot have meant that ethics and political science are natural

sciences, any more than a much later successor to occupy the chair in Edinburgh, J. Seth, may have been referring to the natural sciences when he wrote *A Study of Ethical Principles* (the 18th edition was published in 1928) in which he claimed that ethics is a *science*. It is more probable that these authors used the term *science* in the same way as Adam Smith and Immanuel Kant did when they referred to ethics as a science (respectively, *science* and *Wissenschaft*).

Thus the question is what concept of science Taylor applied – the classic concept to be found in the authors mentioned above, or the modern concept that evolved in the 19th and 20th centuries. Where, for example, in the spectrum between the classic and the modern concepts of science can we place Taylor's *The Principles of Scientific Management*? Here, the classic concept of science means the ideas about the scientific method that dominated in the Western cultural tradition from Plato and Aristotle up to and including Kant, and that have appeared here and there far more recently (for example in the above-mentioned Scottish philosopher Seth, who was a contemporary of Taylor). A science in the classical sense is a collection of statements about some field that meets three requirements: the statements are about unchangeable things; they are necessarily true; and some of the statements are so self-evident that they need no proof and can serve as starting-points for the deduction of all other true statements about the field in point. It is such necessarily true fundamental statements that are known as *principles* in the tradition which goes back to Plato and Aristotle. A classic example of a science in this sense is the geometry of Euclid. In his *Elements* he showed how all known necessarily true statements about triangles, rectangles, rhombi, circles and the like can be proved by applying a few self-evident statements (one such statement is 'The shortest distance between two points is a straight line').

In the 1800s there were major changes in the concept of science, first in the German-speaking region, and then in Scandinavia and elsewhere. *Wissenschaft* and its synonyms (*vetenskap*, *wetenschap*, *na'uka*, and so on) came to represent all possible kinds of method-driven research relating to natural phenomena and cultural circumstances. The new kind of linguistics that emerged in the 1800s (comparative Indo-European language studies, the Young Grammarian school and other varieties of research in the history of language) with their requirements of precision and historical accuracy appeared at the time to be a perfect example of the scientific method. But as time passed it was the experimental and mathematically-oriented natural sciences that took the lead in the world of science. At least, that is how it looked in the perspective of the logical positivists in the 20th century. Positivistic thinking may indeed be one of the reasons why the term *science* in English, notwithstanding the broad spectrum of its use, tends to lean towards the natural sciences. Above all, the tendency to use the word *science* for the natural sciences only, thus excluding the humanities from the world of science, seems to be the result of the ways in which *The British Association for the Advancement of Science* has delimited its field of interest. (More on that in the chapter *In the Light of History* above.)

Taylor spent some decades of his life studying and refining methods of work in steel factories and suchlike forms of labour. When he wrote the essay *The Principles of Scientific Management* towards the end of his career, it may have been that he was alluding more or less deliberately to the classical scientific tradition. In the English speaking area there are titles such as *Essays on the Principles of Morality and Natural Religion* (Henry Home, Lord Kames, 1751), *The Principles of Moral and Political Philosophy* (William Paley, 1785) and, not least, *An Introduction to the Principles of Morals and Legislation*

(Jeremy Bentham, 1789). Jeremy Bentham, the main founder of utilitarianism, proposed that moral science must necessarily be based on a principle that neither can nor need be proved, namely the principle of utility. This, the most fundamental of all moral statements, Bentham expressed thus:

> By the principle of utility is meant that principle which approves or disapproves of every action whatsoever, according to the tendency which it appears to have to augment or diminish the happiness of the party whose interest is in question; or, what is the same thing in other words, to promote or to oppose that happiness. I say of every action whatsoever; and therefore not only of every action of a private individual, but of every measure of government.

The theory that the moral value of actions derives exclusively from the well-being or happiness that, in the long term, they are likely to create for all parties involved is the core of the utilitarian tradition which, in various forms, informed much of both moral philosophy and the social sciences in the 19th and 20th centuries.

If you look at the first chapter of *The Principles of Scientific Management* with Bentham et consortes in mind, you cannot avoid becoming aware that, in their formulations, Taylor and Bentham are children of the same spirit. The most fundamental principle in Taylor's teachings on scientific management is set out as follows at the beginning of Chapter 1:

> The principal object of management should be to secure the maximum prosperity for the employer, coupled with the maximum prosperity for each employé.
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> The words "maximum prosperity" are used, in their broad sense, to mean not only large dividends for the company or owner, but the development of every branch of the business to its highest state of excellence, so that the prosperity may be permanent.

Like Bentham, Taylor is concerned with the maximisation of the long term happiness or utility for all parties involved. In industrial organisation it was important to him to have the parties involved realise that in a long term perspective their interests coincide. The very foundation of scientific management, writes Taylor, is the firm conviction that the true interests of the two are one and the same; that prosperity for the employer cannot exist through a long term of years unless it is accompanied by prosperity for the employee, and vice versa. On this basis he proposed that maximum prosperity can only be attained as a result of maximum productivity, which in its turn can only be achieved by training and developing the natural abilities of each individual.

Taylor's theory of scientific organisation is an application of the general utilitarian doctrine of prosperity to a particular area of activity. And in the same way as in Bentham's moral science, Taylor refers to the fundamental principles of scientific management as *self-evident*, as statements that one realises must be valid if one has understood them properly. 'It would seem to be so self-evident that maximum prosperity for the employer, coupled with maximum prosperity for the employé, ought to be the two principal objectives of management, that even to state this fact should be unnecessary', he writes on the first page of Chapter 1. And on the next couple of pages he says that it should also be 'perfectly clear' that the greatest prosperity for the workman, coupled with the greatest prosperity for the employer, can be brought about only when the work of the establishment is done with the smallest combined expenditure of human effort, plus nature's resources, plus the cost for the use of capital in the shape of machines, buildings, etc., and that the fundamental principles 'appear to be so self-evident that many men may think it almost childish to state them.' Without attributing to Taylor any profound knowledge

of the area of the philosophy of science, it seems reasonable to say that what he tried to arrive at were basic principles of the kind upon which, in the classical ideal of science, all science must build.

Throughout, he was at pains to identify two levels in scientific management – the general, self-evident principles on the one hand, and the application of the general principles in particular cases on the other. What different individuals think is the best way to apply the general principles must not be confused with the principles themselves.

According to Taylor's diagnosis, the fact that so many people have failed to realize the truth of the basic principles of the maximisation of prosperity may be attributed to a combination of flawed thinking, poor organisation and inefficient work methods. Firstly, there is a widespread misconception among employees that higher productivity per individual causes higher unemployment. Secondly, defective management has the effect that each workman has to 'soldier, or work slowly' in order to protect his own interests. And thirdly, almost all work operations are based on rules of thumb. There are no comparative studies of the long term effectiveness of different methods. What Taylor is best known for is his work on the replacement of inefficient rules based on limited knowledge with *scientific* methods. Our next question, then, is what is meant by the term *scientific* at the level of methods of work.

In his case studies he concentrated on the performance of hard physical labour in the Bethlehem Steel Company and similar places of work. He observed that people suited to the work – physically strong adult men – performed their tasks in different ways when they were handling pig iron, for example. If the worker used the wrong tempo or the wrong movements, he could tire very quickly. With his knowledge of human physiology in his head and a stopwatch in his hand,

Taylor undertook long series of comparative ergonomic studies which were intended to produce recommendations on the best way to perform that kind of work without the workmen's bodies being worn out prematurely. He refers to these studies as *the science of handling pig iron.* He calls his comparisons of the long-term performance of different workmen *experiments.* And he describes the purpose of these systematic observations as uncovering the *laws* which govern the work that was observed. The laws should preferably be quantitative. On the basis of his studies of the work of handling pig iron he devised the law that when pig iron is being handled (each pig weighing 92 pounds), a first-class workman (i.e. a workman suited to this physical labour) can only be under load 43 per cent of the day. He must be entirely free from load during 57 per cent of the day. How he arrived at these particular figures, however, is not quite clear from *The Principles of Scientific Management.* One may suspect that they are a way of conferring a more scientific nimbus upon an everyday generalisation – 'When it comes to the transport of heavy iron pigs, the workers should normally rest for a little more than half the work period'.

It is evident that the science of handling pig iron is a product of the new scientific approach of the 19th century – science as systematic, empirical research based on systematic observations and, if possible, experiments as well, with the overarching task of formulating the laws that apply to that research area. The new conception of what science is was well-known in Taylor's time, not least because of the rapid development of the experimental natural sciences in the 19th century. If one may use the phrase, it was in the air.

One conclusion of this brief discussion of the content of *The Principles of Scientific Management* is that here we have to do with science in two rather different senses: first, general principles that are self-evident and from which more specific state-

ments may be deduced; and second, systematic research work of the kind that, at the time, was the aim in both the human and the natural sciences. The first kind falls into the classical tradition which goes back to Plato and Aristotle. The second kind reflects the modern conception of science that emerged in the course of the 19th century.

Another conclusion is that what Taylor was interested in is a special kind of work. His research focused on more or less heavy physical work that may be improved by means of ergonomic studies, technical improvements and organisational changes. It is a far cry from that kind of work science to our current efforts to preserve and advance the practical experience-based knowledge to be found in various professions. The one cannot replace the other, but it was clearly high time that researchers such as Bo Göranzon, Ingela Josefson, Ruth Olsen and some others finally put research on practical knowledge on the agenda.

References

Frederick Winslow Taylor, *The Principles of Scientific Management* (1911) is a well-written essay of barely 80 pages. It is readily available in paperback published by Dover Publications (1998). Also available on the internet: http://melbecon.unimelb.edu.au/het/taylor/sciman.htm

Harry Braverman's *Labor and Monopoly Capital: The Degradation of Work in the Twentieth Century* was first published in New York and London in 1974. The quotation on the first page of this chapter is from p. 68.

Bengt Molander's little book on the epistemology of labour, *Arbetets kunskapsteori,* was published by Dialoger, Stockholm 1997. The brief comment on the meaning of 'scientific' can be found on p. 24.

The transition from the classical to the modern concept of science is the main theme in the four previous chapters in *The Power of Example.*

The relationship between Kant's science of ethics and the utilitarian tradition is the theme in Tore Nordenstam, 'Kant and the Utilitarians', published in the journal *Ethical Perspectives*, Vol. 8, No. 1, April 2001 (pp. 29–36). Also on the internet: http://www.ethical-perspectives.be/viewpic.php?LAN=E&TABLE=EP&ID=107

Bo Göranzon, Ingela Josefson and Ruth Olsen are three of the key figures in research on practical knowledge in Scandinavia. Bo Göranzon is attached to the unit *Skills and Technology* at the Royal Technical Institute in Stockholm (KTH). Ingela Josefson is attached to the *Centre for Studies in Practical Knowledge* at Södertörn University. Ruth Olsen is attached to the *Centre for Practical Knowledge*, Bodø Regional University.

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