Frederick W. Taylor, J. Maunsell White III, and the Matthew Effect

The rest of the story

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When the public sets a war memorial up
Do those who really sweated get the credit?
Oh no! Some general wangles the prestige!
Who, brandishing his one spear among thousands,
Did one man's work, but gets a world of praise.

(Euripides, *c.* 484-406 BC)

There are numerous instances in history where the person contributing the most to an effort does not receive the credit deserved; someone else basks in the limelight. In the words of an unknown philosopher, "the soldiers do the fighting, but the general gets the credit".

Sociologist Robert K. Merton expresses a similar idea known as the "Matthew Effect". Merton coined the name of this effect from the Gospel according to St Matthew: "For unto everyone that hath shall be given, and he shall have abundance; but from him that hath not shall be taken away even that which he hath" (Matthew 35:29). According to Merton, the Matthew Effect consists "in the accruing of greater increments of recognition for particular scientific propositions to scientists of considerable repute and the withholding of such recognition from scientists who have not yet made their mark"[1].

A prime example of the Matthew Effect originated during the era known as Scientific Management (*c.* 1898). The soldier of this period was J. Maunsell White III; the general was the famous "Father of Scientific Management",

Unless otherwise indicated, information cited throughout this article is from a personal interview that Christopher Neck conducted in New Orleans, Louisiana, on 10 November 1987, with John Tobin White, the nephew of J. Maunsell White III. According to Mr White, J. Maunsell White spelled his middle name with two "ls", whereas his grandfather spelled it with one "l". Both spellings appear in the literature.

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Frederick Winslow Taylor. White and Taylor were co-discoverers of the Taylor-White process for treating tool steel. This discovery revolutionized metal-cutting techniques and paved the way for mass production methods[2]. As economic historian Carl N. Degler comments:

> One of the many innovators in this field [the machine-tool industry] was Frederick W. Taylor, who in the 1880s and 1890s invented a whole series of important machine tools, but whose major contribution was the development of techniques for making high-speed machine tools. The higher the operating speed of a machine tool, the greater the amount of work it could perform, but high speeds also heated the tool to the point where it softened and lost its cutting ability. Working with J. Maunsel White at the Bethlehem Steel Company, Taylor in 1898 developed a process whereby the steel tool retained its hardness even when running very fast and hot. Taylor's processes and tools are still standard in the machine shops of the world[3].

The significance of this discovery to Taylor's career is well expressed by biographer Daniel Nelson:

> The discovery of high speed tool steel had a substantial impact on Taylor's career. It increased his stature among engineers, spurred additional inventions, and advanced his metal-cutting investigation. Two other effects were even more important in the long term. The money he received from the sale of the high speed steel patents was the largest single increment to a fortune that provided the financial base for the diffusion of scientific management ... Equally important, the interest that high speed steel generated among engineers and manufacturers projected Taylor into the role of propagandist for his work, anticipating his "second" career (as the Father of Scientific Management)[4, p. 87].

Despite White's contribution, the literature of the Scientific Management era, as well as more contemporary offerings, fails to acknowledge his role in this discovery. Taylor is typically given complete credit for developing high-speed tool steel. Research suggests, however (other protests aside[5, p. 99]), that White played at least an equal role in this important discovery. It would thus appear that the Matthew Effect has struck again.

J. Maunsell White III – "A brilliant mind"

J. Maunsell White III (JMW III) was born on 15 March 1856, on his grandfather's plantation, Deer Range, situated in Plaquemines Parish on the Mississippi River about 40 miles in a southeastern direction below the city of New Orleans, Louisiana. JMW III possessed great intelligence as evidenced in his early years by the fact that he never attended elementary or high school prior to attending college. During his youth, he had a personal tutor on the plantation. JMW III attended Georgetown University where he graduated as class valedictorian.

On completing his degree requirements at Georgetown, he enrolled in the Metallurgy Doctorate Program at the Stevens Institute, graduating with the class of 1879. JMW III's brilliance was not only reflected in his educational background, but also by his photographic memory. It was said that he could recite from memory *Hamlet*, as well as other Shakespearian plays, in their entirety.

J. Mounsell White III

JMW III's contribution to scientific management

After JMW III graduated from Stevens Institute, he went to work for the Bethlehem (PA) Iron & Steel Company. It was at Bethlehem where White and Taylor discovered the Taylor-White process for hardening tool steel. In many ways, Taylor and JMW III were quite opposite, complementing one another in form and character. Whereas Taylor was a true product of old New England, JMW III was unmistakably old New Orleans. As described by Taylor's official biographer Frank B. Copley, JMW III was a "true" son of the "Crescent City" (New Orleans). "A *bon vivant* and a connoisseur in both food and drink, he took life easy, and over his glass loved to exercise his skill as a raconteur"[5, p. 20].

The important fact that is too often unacknowledged is that Taylor may have never discovered high-speed tool steel without JMW III's aid. Before receiving JMW III's assistance, Taylor had ruined three Bethlehem Steel lathes in his attempt to test different steel alloys. Just eight days after White joined the experiments (23 October 1898), discovery of the high-speed steel tool techniques, which later produced the Taylor-White process patent, occurred. Nelson describes the events leading to the Taylor-White discovery:

> Taylor began to improve the "smaller engineering elements" of the machine shops in the fall of 1898. His initial effort was to standardize the cutting tool used in the plant. Five years before, at the Cramp Shipyard, he had studied the relationship between different alloy steels and tool performance and had concluded that Midvale "self hardening" chromium alloy steel was superior to other makes. At Bethlehem he resumed these tests in an attempt to determine whether a better steel had appeared in the intervening years. Performing the lathe work himself, he decided by mid-October that the Midvale steel was still preferable to other brands and should be used for all Bethlehem machine work[4, p. 86].

At this point, Taylor appears to have miscalculated his results. As JMW III recalled:

> In order that all of the men in the works most interested in this subject should be of the same opinion regarding the choice of a standard Mr Taylor arranged to have an experiment made in presence of a number of the superintendents and foremen of the works. In this experiment other tools made from Midvale Air-Hardening Tool Steel instead of proving to be better than the other makers of steel were shown to be considerably worse than any of the rest[6].

Nelson summarizes the events that followed:

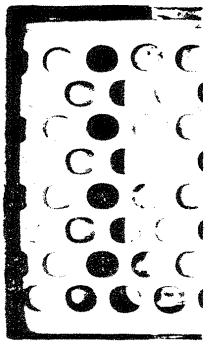
> Taylor was embarrassed and perplexed. To ascertain what he had overlooked, he obtained ... approval for a "carefully tried experiment ... to determine the effect of heating Midvale self-hardening tool steel at different temperatures".
>
> With White's assistance Taylor reheated four Midvale tools that had performed poorly in the earlier tests. He raised the temperature of each tool progressively above the recommended level until he reached the melting point. The effects of these treatments, apparent in tests between October 31 and November 4, were extraordinary. With each increase in temperature, tool performance improved. The third and fourth tools which were heated 300° to 400° higher than recommended, could be operated at "invented" high speed tool steel, perhaps the single most important machine tool innovation of Taylor's lifetime[4, p. 86].

As can be clearly seen from the events described, Taylor's work was unsuccessful until he joined with JMW III. The Taylor-White process may have never occurred without JMW III's insights. As a result, Taylor's Scientific Management movement may have stalled in its tracks because, as Nelson reasons:

> High speed steel and Taylor's other technical innovations were also vital ingredients in the politics of the reorganization process. On the one hand, they enhanced Taylor's reputation and enabled him – at least in 1899 – to initiate his organizational reforms with a minimum of opposition. On the other hand, the technical discoveries underlined the openendedness of the company's commitment to Taylor[4, pp. 88-9].

J. Maunsell-White III who?

As noted, JMW III's significant contribution to the Taylor-White process is often unacknowledged in writings of the Scientific Management era; Taylor is



given sole credit for discovering the tool-steel treating process. This omission is significant because, as described earlier, the discovery may have never occurred without JMW III's contributions.

Writing in their highly regarded volume *Engineering in History*, Kirby *et al.* are typical of those who fail to acknowledge JMW III's efforts. They write:

> Taylor was also active in the development of a tool steel which would cut metal at a far higher speed than anything previously used and therefore increased the productivity of both labour and capital. This steel alloy containing chromium and tungsten had already been developed in England, but in about 1895 Taylor introduced a technique for preparing the steel at what was then the exceedingly high temperature of 1890° F, just under the melting point. This heat treatment produced a cutting tool which became harder the faster it cut. Machine-tool practice was thus revolutionized, and speeds were doubled, tripled, and even quadrupled[7].

Although these authors, and many others, give Taylor sole credit for the metal-cutting discovery, Taylor is not guilty of this omission himself. Taylor readily acknowledged JMW III's contribution by stating:

> It was in the course of making a series of experiments with various air hardening tool steels with a view to adopting a standard for the Bethlehem works that Mr J. Maunsel White, together with the writer, discovered the Taylor-White process of treating tool steel, which marks distinct improvement in the art[8].

One last omission!

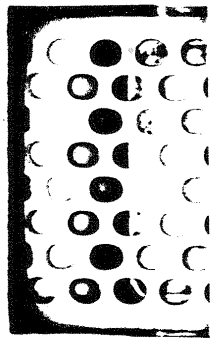
For their discovery of the tool steel treating process, JMW III and Taylor were awarded the Elliott Cresson Medal by the Franklin Institute in 1902. Taylor, however, was the "sole" recipient of an award at the Exposition Universelle Internationale, held in Paris in 1900, "For his high speed cutting tools made by the Taylor-White process"[2].

A closing note

J. Maunsell White III died at the relatively young age of 56 on 22 October 1912. On his death, Sydney White (30 October 1912) wrote a letter to Lester G. French, Editor, the American Society of Mechanical Engineers, describing the life of his devoted brother. Sydney wrote:

> A friend wrote me that the Editor of the *Iron Age* told him not long ago that he did not believe we realized down here [the South] how much Maunsel White had accomplished in his lifetime, nor what an authority he was among steel workers.

Ironically, historians today, some 80 years after J. Maunsell White III's death, still fail to "realize" the contribution he made to metallurgy, as well as to the progress of Frederick W. Taylor's scientific management[9].



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