This Week's Citation Classic

Weibull W. A statistical distribution function of wide applicability.
J. Appl. Mech. **18**:293-7, 1951.
[Royal Institute of Technology, Stockholm, Sweden]

The paper discusses the applicability of statistics to a wide field of problems. A specific three parametric distribution function is proposed (later on called the Weibull distribution). Five examples are given concerning yield strength, size distribution, and fatigue life. [The *Science Citation Index®* (*SCI®*) and the *Social Sciences Citation Index®*(*SSCI™*) indicate that this paper has been cited over 280 times since 1961.]

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"The author of the above mentioned paper died in 1979 at the age of 92. In spite of his age, his mind was as clear as a crystal to the very end. I am one of his nine children. I worked closely together with him since 1968.

"His invention of the Weibull distribution was published for the first time in 1939,[1] with the title 'A statistical theory of the strength of material.' It was written in order to explain the —at that time —well known but unexplained facts that the relative strength of a specimen decreases with increasing dimensions and that its bending strength is larger than its tensile strength.

"This theory was based on the assumption that the strength is a stochastic quantity, which has to be specified by a distribution function including one or more parameters.

"It was also supposed that this function is a characteristic of the material and that the above mentioned size effects should be reflected by changes in the values of the parameters of the given function.

"Due to the fact that World War II was going on, the communications with scientists in other countries were very bad. When the war was over he tried to publish an article in a well-known British journal. At this time, the distribution function proposed by Gauss was dominating and was distinguishingly called the normal distribution. By some statisticians it was even believed to be the only possible one. The article was refused with the comment that it was interesting but of no practical importance. That was just the same article as the highly cited one published in 1951.

"At that time he was a professor in applied physics at the Royal Institute of Technology, Stockholm. He also worked as a scientific advisor to AB Bofors, Sweden.

"After becoming a professor emeritus in 1953 until his death in 1979 he wrote many reports which provide valuable information on the analysis of probability distributions and related topics. In this period he, among others, served as a consultant to the US Air Force for about 12 years.

"Because of his work in this field he got two medals: the ASME Medal in 1972 in New York and the great gold medal of the Royal Swedish Institute for Engineering Research in 1978 in Stockholm. When the Swedish King Carl XVI Gustaf presented the latter medal my father mentioned to the King that he 71 years earlier stood in front of the King's grandfather's grandfather, Oskar II, and received from him his officers commission. 'That was fantastic,' the King answered.

"His last published report was about references on the Weibull distribution.[2] It contains 1,019 references about very many topics.

"The reason for the article having been cited so much depends, in my judgment, on the fact that the distribution function is useful in so many different applications."

1. **Weibull W.** A statistical theory of the strength of material.
    Proc. Roy. Swedish Inst. Eng. Res. **151:1,** 1939.
2..................... *References on the Weibull distribution.*
    Stockholm: Försvarets Teletekniska Laboratorium, August 1977, FTL A-report A20:23.