Walter A. Shewhart, 1891–1967

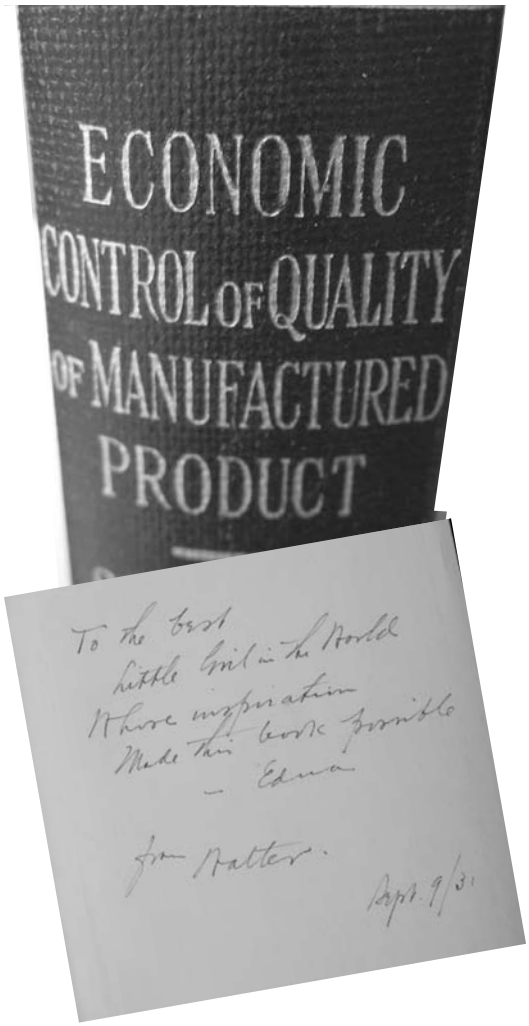
In 1967, W. Edwards Deming wrote a personal biography on Walter Shewhart for The American Statistician. *The following is taken from that article.*

I write as one outside the Bell System who had the privilege of working intimately with [Walter] Shewhart over a period of years. This could happen only because he was always glad to help anyone. Actually, he never thought of himself as helping anyone; he was simply glad to talk and absorb thoughts from anyone [who] was genuinely struggling to improve his understanding of the statistical method—interchanging ideas was his way to put it. And, to Shewhart, it was the statistical method in the singular, not in the plural. Statistical methods are necessary, but they are the tools and passwords by which the statistician works and communicates in applying the statistical method.

It was Shewhart who emphasized the theory of probability as the tool of the statistician. It is his knowledge and use of the theory of probability that distinguishes the statistician from the expert in chemistry, agriculture, bacteriology, medicine, production,

Photos provided by Shewhart's great-grandson, Darin Sekulic, and granddaughter, Joanne Sekulic

"It is his knowledge and use of the theory of probability that distinguishes the statistician from the expert in chemistry, agriculture, bacteriology, medicine, production, consumer research, engineering, or anything else."



Shewhart's monumental book, *Economic Control of Quality of Manufactured Product* , and the inscription he wrote in the book he gave his wife: "To the best little girl in the world, whose inspiration made this book possible 9/31"

consumer research, engineering, or anything else. Otherwise, the statistician would be merely another chemist, another agricultural scientist, or something else.

Quality control meant to him [the] use of statistical methods all the way from raw material to consumer and back again—through redesign of product, reworking of specifications of raw materials—in a continuous cycle as results come in from consumer research and from other tests.

He was quick to see that quality must mean not necessarily high quality, but dependable and economic quality, which in turn meant quality suited to the purpose. But what quality is suited to the purpose? Statistical methods for discovery of what product is needed, what quality is needed, and for learning how a product performs in service and in the laboratory are thus necessary ingredients of the statistical control of quality.

The world knows him for the Shewhart control charts, and the world lives better for them. They are, however, only one of his statistical contributions. He leaves a rich legacy that will take years to absorb. For example, his Rules 1 and 2 on the presentation of data:

Rule 1. Original data should be presented in a way that will preserve the evidence in the original data for all the predictions assumed to be useful.

Rule 2. Any summary of a distribution of numbers should not give an objective degree of belief in any one of the inferences or predictions to be made there, for that would cause human action significantly different from what this action would be if the original distribution had been taken as a basis for evidence.

Then, there is his Criterion of Meaning:

> Every sentence, in order to have definite scientific meaning, must be practically or at least theoretically verifiable as either true or false upon the basis of experimental measurements, either practically or theoretically obtainable by carrying out a definite and previously specified operation in the future. The meaning of such a sentence is the method of its verification.

The above rules and criterion of meaning were, to him, a necessary ingredient of industrial research for the reason that, as he stated, industrial research is more exacting then pure science. His faith in the power of the statistical method in all human inquiry was unshakable.

He acknowledged an everlasting debt to C. I. Lewis' *Mind and the World Order,* which he recommended to me. I had the usual difficulty with it, and I recall saying to Shewhart at the end of the seventh reading that so far it had meant nothing to me. "Stay with it," he said. "I read it 14 times before it began to mean anything." I wonder how he came upon it in the first place, and how he knew how important it was that he should pursue it.

Although operational definitions, his criterion of meaning, and his rules 1 and 2 for the presentation of data have been known to scientists for several generations, no one to my knowledge has stated them so well as Shewhart. One sees in them C. I. Lewis in the background.

Hypothesis Is Necessary

Some knowledge must be a priori, even if shown later by observation to be untenable. Without theory (hypothesis), data are meaningless or nonexistent. There is thus no true value of anything; true value is undefinable [sic] operationally. There are, however, numerical values that people can use with confidence if they understand their meaning (for the tensile strength of a batch of wire, for example, or for the proportion of the labor force unemployed last month).

There was to Shewhart no such thing as a random sample. There was and is, however, such a thing as a sample selected by a random operation. There may be a concept of randomness, but one cannot communicate

it. What one can communicate is an operational definition of a random operation (for example, proper use of random numbers). Likewise, one can only define yellow, green, tired, unemployed, [or] one inch in terms of an operation. The particular operation will vary with the needs of the subject matter.

There is accordingly no such thing as factual information, distinguished from judgments. Physical measurements are no exception. There are no facts, except as man makes them. Man gets marks on a piece of paper in response to a stimulus. Such marks on paper and tabulations made from them are useful only if the method of investigation is suited to the purpose.

Quality Writing

Although his explanations could be simple and clear in a face-to-face discussion, his greatest papers remain as difficult for the reader as they were for him to write. As he told me once, when he writes, he must make it foolproof. I replied in a particular instance that he had made it so foolproof that no one would understand it.

His book of 1931 will remain a monument, but it was his book *Statistical Method from the Viewpoint of Quality Control,* based on his four lectures given in Washington in 1938, that exposed Shewhart to the statistical world. People then began to understand something about his contributions.

To appreciate a mite of his greatness, one must read not only the two books just mentioned, but his article, "Nature and Origin of Standards of Quality," *Bell System Technical Journal,* xxxvii, 1958. One can only ask why schools of business don't require this article to be read by all professors and students. Why don't people engaged in consumer research and in advertising research read it? Some day, they will.

Although the writing of papers and books was difficult for him, and his efforts often went wide of the mark, one of his great powers lay in his perseverance in communication by letter. He used his power to work through committees. He knew the importance of getting a strong man at the head of a committee, and he was adept at pushing him in the right direction, without himself being visible. He made his points not so much by giving his own point of view, but by asking questions. Establishment of Committee E–11 on statistical methods in the American Society for Testing Materials is an example of this type of accomplishment. The Shewhart statistical series published by Wiley is another example. He sought out the great thinkers and invited them to write. That an author might disagree with Shewhart's point of view made no difference to Shewhart, so long as a book would stimulate people to think.

The Statistician

As a statistician, he was, like so many of the rest of us, self-taught on a good background of physics and mathematics. He respected advanced knowledge of statistical theory and studied daily, but he was not always happy with the way people recommended statistical techniques for use.

As a man, he was gentle, genteel, never ruffled, never off his dignity. He knew disappointment and frustration through the failure of many writers in mathematical statistics to understand his point of view. He also knew success. He was president of the American Statistical Association in 1945 and twice president of the Institute of Mathematical Statistics, in 1937 and 1944. One of the highlights of his life was an invitation from Karl Pearson to give lectures at University College in London in 1932. A visit to Japan later in life, where he saw spectacular results of statistical methods applied in the broad sense of Shewhart, must have been great satisfaction to him. He went to India three times as a guest of P. C. Mahalanobis at the Indian Statistical Institute and received, in 1962, the honorary degree DSc. ■

Shewhart, 1930

William Edwards Deming studied Shewhart's theories on quality control.