method has a rationale of its own. In this connection, it may be well to recall that the validity of a proposition about physical phenomena under the mechanistic view at its best depends in the last analysis on verifications that usually involve errors of observations and approximate numerical computations. On account of such errors, we are unable to assert that the very exact proposition of the mechanistic view is literally true. On the other hand, we may be able to verify and assert in certain cases that the proposition in the statistical view is literally true, although it is a proposition about the probable and approximate. It thus seems to be a tenable position that the statistical view should not be regarded in all cases as a last resort.

In conclusion, the plausible inference is that along with our reverence for the mechanistic view and its achievements, it seems appropriate to recognize its limitations, and to develop also an appreciation for the rationale as well as for the convenience of the statistical view. However, it is not my intention to exaggerate the importance of the statistical view. In practice, it is usually the joining of statistical and mechanistic considerations that makes it possible to get workable results out of what appear on the surface to be weak and often meaningless relative frequencies and averages. The extensive analysis of data by improved statistical methods is a great step in advance, but such analysis will remain relatively sterile unless it is supplemented by the formulation of useful or interesting theories.

OBITUARY

STEPHEN MOULTON BABCOCK

WISCONSIN'S Grand Old Man is dead! The news has been flashed around the world that Stephen Moulton Babcock has closed his earthly labors. Working away daily with that patient, purposeful persistence that has characterized his assiduous labors for decades in his efforts to wrest from nature the mystery of the interrelations of energy and matter, to-night the busy mind is stilled. The laboratory that has afforded him the material vehicle through which his imagination played is silent. The pendulum that is so delicately adjusted that the doctor hoped he would be able to measure its variation in temperature as the weight swings to and fro will continue to vibrate until the mechanism runs down, but the hand of the master will no longer record its beat. The book was closed as he would have had it. The chapter was not finished, but a few days ago he added here and there a line, working away with undimmed enthusiasm that has been the marvel of his friends these many years. Rich in years that have been filled to the brim with new ideas that have kept his mind young and elastic, he has labored on and on. The joy of life to him was always the unsated quest.

Science is an exacting goddess. She brooks no rivals. He who would woo her and win must forego many of the allurements that detract the mind that generates new ideas. But to Babcock nothing could swerve him from his steadfact devotion to her cause.

The University of Wisconsin has had its share of really great men. Some have been great in the teaching field; some for their power of lucid statement through the spoken word that burned its way into the minds and hearts of men. Babcock was the scientist—the explorer who loved to push back the boundaries of the unknown. He knew no fatigue if any unsolved problem arose in his pathway. The joy of conquest appealed to him as it does to the finder of some undiscovered bourne, yet he would have hated to have been forced to organize his discoveries and reduce them to formal treatment. One thing he often said he never would do and that was to write a book.

The Spartan spirit of the pioneer marked his own method of research. He would not tolerate an assistant. Time after time Dean Henry, in the early days of the experiment station, would try to help him multiply his fingers through additional help, but it was of no avail. He would rather whittle out a piece of apparatus with his jack-knife (and the writer has seen many a piece so constructed) than to have a finely calibrated mechanically perfect device made for him in the machine shops. He used to say he could think better if he was using his own hands in fashioning the tools he needed.

Babcock lived in the right age to bring out the best that was in him. His pioneer spirit would fain spend but little time in poring over the writings of others to classify knowledge that already existed. He had but little regard for self-constituted authority. If a statement occurred in a book this was almost *prima facie* evidence that it had been borrowed from some other source; far too frequently, books masquerade in borrowed plumage. The laboratory, not the library, was where Babcock sought truth. He knew that nature would not lie, but he was never quite sure that man might not have erred in making the record.

Fortunately for Babcock, he had no graduate school to tie him down to Procrustean limits. I doubt whether he would ever have submitted to the exactions of a seminar. But those of us who have been fortunate enough to work where we caught now and then a glimpse of the movement of his scientific mind have indeed had a rare privilege. It was as if

an angel had touched our lips with a coal from off the altar.

Such contacts have meant everything to Wisconsin. For fifty years this spirit has moved among us. The Wisconsin Experiment Station has done a great work, and when all is said and done, the spirit of Babcock has been the pervasive power that has been imminent through it all.

It was Babcock's refusal to adopt the then prevalent notion that a completely balanced ration could be constructed on the basis of chemical analysis that led later here at Wisconsin to the epoch-making discoveries in the field of vitamin research and the rôle of mineral elements in the nutrition of animal life. While Babcock was a chemist, he was no such blind adherent to chemical methods that he lost sight of the fact that life was made up of something which could not be put into a test-tube.

Twenty-five years ago, Hart and his colleagues started their famous single ration diet for cattle, the results of which have made it necessary to rewrite almost wholly the text-books on nutrition, both as to the human as well as the animal. The germ of this suggestion came from Babcock's untrammeled mind. It was here that the torch was passed from the hand of the master to the pupil.

The world at large knows Babcock primarily for the beneficent invention of his famous test for butter fat, whereby the intrinsic value of milk could be easily and accurately determined. This came at a most opportune time and is one of the foundation stones on which the modern science of dairying has been built. Prior to this time, dairying was merely a haphazard art, but with this tool in hand the tremendous advance in the improvement of the special dairy breeds of cattle became possible.

The wide-spread utilization of the Babcock test made such unscrupulous practices as adulteration, watering and skimming the milk no longer profitable, because the test enabled such deceit to be quickly detected. As Governor Hoard once said the Babcock test had made more dairymen honest than had the Bible because of the summary verdict which it rendered.

Babcock's phenomenal grasp of the essentials of any problem to which he directed his attention is well shown by the remarkable contribution which he made in the field of physiology. His studies on "metabolic water," *i.e.*, liquids produced in the bodies of insects living upon perfectly dry matter made a new chapter in the physiology of metabolism. He bred clothes moths and carpet beetles, living on air-dry woolens and found that these animals could produce enough water as a result of their own life processes to bathe their body cells so that their normal functional activity could be carried on. From the standpoint of actual contribution to the advancement of science, Babcock always considered this his most important biological discovery.

It is impossible now to assign a proper value to his researches on the constitution of matter on which he has been laboring for almost two decades. He has been urged to give these results to the scientific world but characteristically he would not do so, because he did not feel that they were wholly complete. For the past twenty years, he has been working in his own way, reducing his ideas so far as he could to an experimental basis. During the past two years he has been very sanguine that he was going to be able to demonstrate in an experimental way some of the principles on which he has spent these years of thought and study. The record has been reduced to written form, and in his will this unpublished manuscript is to be given to the university. It is to be hoped that this work may soon be made available for the study of others.

To the world at large the name of Babcock will long be held in reverence, along with the great men that have left their impress on the minds of men, but the genial and jolly Babcock will always be the memory of those of us who were fortunate enough to have the privilege of actual association with him.

H. L. RUSSELL

ADDRESS GIVEN AT THE FUNERAL SERVICES IN MEMORY OF STEPHEN MOULTON BABCOCK

EXPRESSING the mood of myriads of men and women throughout the world, who have known the boon of his spirit or the beneficence of his science, the University of Wisconsin to-day bares its head and bows its heart before the memory of Stephen Moulton Babcock.

Inventor of a device and a formula that emancipated the dairy farmer from the injustice of the rule of thumb that long prevailed in the market place!

Trail blazer in the crucially important field of vitamin research!

Symbol of the best that the pursuit of science generates in the scholar and gives to the state!

Joyous comrade!

A friend beloved beyond measure!

Inspirer incomparable of the vast army of young scholars serving as acolytes at the altar of science!

Like the great seminal minds of the Renaissance, this grand old doctor of science was himself greater than anything he did, and thus, in death, he gives to us, the legatees of his spirit, a goal towards which to point the education and the science of our time.

This merry man of many years was made of the