

## Editorial

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### Commemorating a Classic, and its Creator Walter Bradford Cannon

Some papers are born great, some become great, and some have greatness thrust upon them. We have decided to thrust greatness on a paper published 100 years ago in Volume 1 of the *American Journal of Physiology* (1). Not that the paper is not good, but of far greater interest to us is its author. But first, the paper: it described for the first time the use of X-rays for the study of gastric motility. The study was done on cats who had been given food mixed with the radio-opaque material, bismuth subnitrate. By following the changes in shape of the shadows on a fluorescent screen, Cannon deduced a wealth of information. He described the shape of the stomach, the frequency and nature of contractions, possible function of contractions and the rate and pattern of gastric emptying. By observing that food cornered in the fundus remains undisturbed for quite some time, he concluded that digestion by salivary amylase may continue in the fundus. He confirmed it by measuring the pH of different 'layers' of food in the fundus. The pH was alkaline in the food extracted from a depth of two and half centimetres one and a half hour after ingestion. He also described the differences in handling of foods of different consistencies by the stomach. Further, by observing absence of peristalsis in cats that went into rage during recording (generally, male cats!), he concluded that anger inhibits gastric emptying. Finally, by observing the stomach after giving apomorphine, he threw light on the mechanism of vomiting. All this information was packed in one single paper (1), published 2 years before Cannon received his medical degree from Harvard Medical School.

Born to Sarah and Colbert Cannon in 1871, Walter Cannon inherited an adventurous, inventive and industrious temperament (2). Although his father had little formal education, he desired his children to make up for it. Therefore he surrounded them with a good library. The effort was well spent on Walter Cannon who got admitted to the prestigious Harvard College, completed there in four years twenty-two courses, two of them of research quality. As a result, he graduated *summa cum laude* in 1896 and was also awarded an M.A. degree in 1897. After getting his M.D. degree in 1900 from Harvard Medical School, he opted for a career in Physiology at his alma mater. He was appointed George Higginson Professor of Physiology in 1906, an appointment which he continued upto 1942.

Through the long span of more than forty years which Cannon spent in the Physiological Laboratory at Harvard Medical School, he conducted a variety of studies ranging from digestive functions to effects of emotions on bodily processes, regulation of steady states in the body and the chemical mediation of nerve impulses. The most significant studies were knit into a fascinating story in his classic, *The Wisdom of the Body* (3). In the preface to this book, Cannon honestly states that it was after his group had completed several studies on the autonomic nervous system (ANS) that its regulatory role slowly dawned on them. Once they realized the role of ANS in maintaining steady states, the facts already discovered took on a new significance. Finally Cannon coined the term homeostasis and gave medical science a new way of looking at health and disease. It is now customary to talk of Claude Bernard's concept of constancy of the *milieu interieur* and Walter Cannon's concept of homeostasis in the same breath because these essentially similar concepts were arrived at by the two stalwarts independently. These concepts provide a rational framework for visualizing the function of all cells of any organism - be it a plant or an animal. For a cell to function optimally, it should be provided with suitable conditions. If the conditions deviate beyond certain limits, survival itself may become impossible. The process by which all parts of the body in a complex multicellular organism contribute to preservation of normalcy in health, and its restoration in disease, provides the basis for a spectrum of physiological states rather than clearly demarcated states of health and disease. On the basis of this enlightened view of life processes, Cannon suggested

how a physician could help his patients by assisting the homeostatic mechanisms of the body and reassure them confidently that normalcy would be restored.

Cannon was a man with a wide range of scholarly interests and also enjoyed simple diversions such as working with tools, making kites and little boats and doll houses, modelling clay, canoeing, and tramping in the hills. His autobiographical work *The Way of an Investigator* has some excellent advice for budding scientists. He encourages them by assuring that "phenomena, no matter how mysterious they appear to be, ... will yield their secrets to the persistent, ingenious and cautious efforts of the investigator". He also warns them about the errors to which scientists, being human, are prone, such as untested assumptions, omission of controls, faulty techniques and unwarranted conclusions (2).

When a medical person joins a basic medical science such as physiology or pharmacology, he takes a conscious decision to settle for a career which would be less paying and less glamorous than that of a physician or surgeon. Cannon talks of the compensations which motivate such a decision. The foremost among them is the reward of discovering a new phenomenon. Another is free time for research. No matter how capable a person is, without time he can do no research. Finally, the scientist has the satisfaction of having influenced several generations of students whom an old teacher frequently runs into most unexpectedly. On the day of such an encounter, the teacher's day is made. In short, "though the scientific explorer has no prospect of becoming rich in the worldly

sense, as a result of his labours, he certainly enjoys a rich life" (2). Once Cannon was asked what he would do if he had all the money he wanted. He answered "I *have* all the money I want. My wife gives me ten dollars a month and with that I pay my

carfare, buy my lunches, and get my hair cut" (2). This reply, although amusing, sums up the simple tastes, minimal needs and contented attitude of the man that was Walter Bradford Cannon.

#### REFERENCES

1. Cannon WB. The movements of the stomach studied by means of the Rontgen rays. *Am J Physiol* 1898' 1: 359-382.\*
2. Cannon WB. *The Way of an Investigator*. *A scientist's experiences in medical research*. New York: Hafner, 1945.
3. Cannon WB. *The Wisdom of the Body*. New York: W.W. Norton, 2nd Edition, 1939.

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