clo) engaged in the following degrees of exercise. It is assumed, for purposes of analysis, that 24 per cent. of the total energy production is lost by evaporation, and that, as before, the optimal skin temperature for comfort in exercise is 92° (33° C). Neither of these assumptions are likely to be precisely true. The optimal temperatures are given in Table II.

TABLE II

OPTIMAL TEMPERATURES FOR COMFORT WITH EXERCISE IN NORMAL CLOTHING

Place	Resting sitting M = 1	Slow level walking M = 2	Normal level walking M = 3	Fast level walking M = 4
Normal indoors.	70.0° F	58.4° F	43.0° F	28.5° F
Drafty indoors..	74.8°	59.6°	45.6°	30.0°
Normal outdoors	76.0°	61.5°	47.0°	33.0°
Windy outdoors	77.6°	63.2°	48.8°	35.0°

It may be deduced from Table II that if the external temperature is much above that indicated, normal equilibrium can only be attained by increasing the evaporative heat loss through sweating. The amount of such increase can be approximately estimated. For instance, if an individual is walking fast indoors (producing 4 mets) at a temperature of 58.4° F, at which only 2 mets can be dissipated with comfort, the additional 2 mets must be lost by evaporation. (For more precise predictions, the changes in insulation of the ambient air with activity would have to be considered.)

Also the ideal amount of clothing, in clos, necessary for comfort for various degrees of rest and exercise in different outdoor environmental temperatures may be predicted as shown in Table III.

The net efficiency of the human body in performing external work does not exceed 20 per cent., *i.e.,* in doing ½ met of external work the extra heat production will be at least 2½ mets, and the total will rise to at least 3½ mets. In many cases the efficiency is far less, as in level walking where the heat production rises to several mets without the accomplishment of any external work. Using the figure of 20 per cent., the maximum clothing that could be worn in comfort in a given task may be calculated. For example, a mountaineer weighing 160 pounds, surface area 1.9 square meters, climbing at the rate of 1,250 feet per hour, would accomplish a mean rate of work of 0.75 mets. The minimal total metabolism would be 4.75 mets, and the heat to be lost 4.0 mets. Since fast level walking has been assumed as equivalent to 4 mets, it may be seen from Table III that at an external temperature of 30° F without wind, the maximal clothing he could wear for comfort would be about 1 clo.

TABLE III

IDEAL CLOTHING FOR COMFORT

Environmental temperature	Resting sitting	Slow level walking	Normal level walking	Fast level walking
70° F—Normal outdoors	1.5	.7	.4	.3
50° F— " "	3.1	1.5	.9	.7
30° F— " "	4.7	2.3	1.5	1.1
0° F— " "	7.2	3.5	2.3	1.7

The advantage of using the practical units, *met* and *clo,* instead of the classical metric and British units is that they describe energy and insulation values in terms of familiar concepts. One *clo* approximately is the value of the insulation of one's everyday clothing (and incidentally of a heavy top coat alone). The additional insulation conferred by top coats, etc., may be expressed in these units. One met unit varies in absolute amount with the size of the individual. For a man of average size it is approximately equivalent to the heat generated by a 100-watt lamp. Thus, speaking in units associated with one's normal experience, the engineers, the physicians and the physiologists should be able to use their individual training more effectively in a common effort to solve current problems of heating and ventilation, as well as those of the physiological adjustments associated with the maintenance of heat balance.

OBITUARY

FRANK BURR MALLORY

DR. FRANK BURR MALLORY died at his home in Brookline, Mass., on September 27, at the age of 78. Dr. Mallory was born in Cleveland, Ohio, on November 12, 1862. He graduated from Harvard College in 1886 with the degree of A.B. He received his A.M. and M.D. from Harvard Medical School in 1890. He became associated with Harvard Medical School in 1890, first as assistant in histology, later as assistant in pathology. He was appointed assistant professor of pathology in 1896, associate professor in 1901 and professor in 1928. He retired with the title of emeritus professor in 1932. He joined the pathological staff of the Boston City Hospital in 1891 and was made pathologist in 1908. In 1932, at the age of 70, he retired, becoming consulting pathologist.

Dr. Mallory received the honorary degree of Sc.D. from Tufts College in 1928 and from Boston University in 1932. He was awarded the Kober medal in 1935 by the Association of American Physicians for outstanding service in pathology. In the same year he received the gold-headed cane from the American Association of Pathologists and Bacteriologists. This cane was presented to the association by Dr. Harold

C. Ernst to be awarded for special merit. The previous recipients of this honor were Dr. William H. Welch and Dr. Theobald Smith.

Dr. Mallory served as treasurer of the American Association of Pathologists and Bacteriologists from 1911 to 1940. He also was a past president of this organization. In 1923 he became editor-in-chief of the *Journal of Medical Research* and in 1925, when that journal became the *American Journal of Pathology,* he continued to serve in the same capacity until 1940. Dr. Mallory was a member of numerous American scientific societies. He was also a corresponding member of the Royal Medical Society of Budapest, a member of the Deutsche Pathologische Gesellschaft and an honorary member of the Pathological Society of Great Britain and Ireland.

In 1897, he published, with Dr. J. Homer Wright, "Pathological Technique." This went through eight editions, a final revision appearing in 1938. Dr. Mallory's "Principles of Pathologic Histology" was published in 1914.

Among Dr. Mallory's numerous contributions to the literature may be mentioned his studies on the classifications of tumors, technical methods, cirrhosis of the liver and infectious diseases. He early evinced a keen interest in staining methods and his third paper, published in 1895, while working with Ziegler in Freiburg, was the first of a long series of papers dealing with technical methods. In addition to developing new stains, he always stressed the importance of precision in histopathological procedures and insisted on the maintenance of high standards in his laboratory. Through the use of his methods, he contributed much of prime importance to the classification of tumors based on morphological characteristics. He was an exceedingly keen observer and his diagnostic ability was such that he was regarded by many as the court of last appeal in difficult or unusual cases.

Dr. Mallory's earlier papers were illustrated by drawings, but in 1901 he began using microphotographs. He was greatly interested in this branch of photography and developed it to a high degree of perfection. He was extremely critical of his own work and would discard everything that did not satisfy his ideals. As an editor he also demanded from contributors that their illustrations be of high quality. As a result the journals he edited were noted for the excellence of their illustrations.

In the fiftieth anniversary year book of his college class, he wrote, "I can say that I have been able to work all my life at just what I wanted to, to make a modest but sufficient income for a comfortable living and to take a lot of pleasure out of my existence." That statement well expressed his attitude towards his work. He was devoted to his laboratory and everything connected with it. He was endowed with a divine enthusiasm which was unaffected by age or infirmity. After his retirement as pathologist in 1932, he continued to come to the laboratory just as regularly as before. He was one of the first to arrive in the morning and always came in on Sunday mornings. He was actively engaged in experimental work up to the time last February when he was compelled by his physical condition to leave the laboratory.

One of his great services to medicine was the training of young men in pathology. The number of graduates who were trained under him was approximately 125. Many of them are preeminent not only in pathology but also in clinical medicine as well. He took a great interest in the members of his staff, and their contact with him was close. He strove ceaselessly to instill in them his high ideals and to imbue them with his intense interest in pathology in all its various aspects. As a result of their service under him, his graduates received a thorough grounding both in morphology and in the application of technical procedures. There was always a demand for Mallory-trained men throughout the country both by medical schools and by hospitals.

Dr. Mallory was very fond of the outdoors. He early developed an interest in botany which he maintained throughout his life. He was a tennis enthusiast and played up until a few years ago. In this game, as in his laboratory life, he insisted upon the importance of proper technic. When he witnessed a match between experts, he was as much, if not more, interested in the form of the contestants as in the match itself. Canoeing also was a favorite pastime with him, and for many years he spent Saturday afternoons on the Charles River. Throughout his life, he was a great walker and when increasing age interfered with his other activities, he continued this form of exercise up until a few months of his death.

The death of Dr. Mallory has meant not only a great loss to scientific medicine but an equally great loss to all those who were fortunate enough to know him as a man.

F. PARKER, JR.

BOSTON CITY HOSPITAL

RECENT DEATHS

DR. ERNEST EVERETT JUST, for twenty-six years head of the department of zoology at Howard University, a member of the faculty for thirty-four years, died on October 27 at the age of fifty-eight years.

JOSEPH S. STANLEY-BROWN, from 1892 to 1932 editor of the *Proceedings* of the American Geological Society, died on November 2 at the age of eighty-three years.