My affair with the JAP

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During World War II, the US Army Quartermaster Corps established a Climatic Research Laboratory on the second floor of an old building of the Pacific Mills in Lawrence, MA, on the banks of the Merrimac River. The mission of this organization was to test equipment, particularly clothing, for the use of troops in the field, and the Pacific Mills had been chosen because it housed climatically controlled rooms and treadmills suitable for heavy exercise. These facilities were used to test the effectiveness of clothing under tropical and arctic conditions during work and became a training ground for many physiologists, particularly in respiration and temperature regulation, and for two presidents of the American Physiological Society (APS). After World War II, the laboratory in Lawrence became the US Army Research Institute for Environmental Medicine in Natick, MA.

The unit was staffed largely with administrative officers from the Harvard Business School and with medical officers from Harvard Medical School. The commanding officer was Colonel John Talbott from the Massachusetts General Hospital, who had gone on the Harvard Fatigue Laboratory high-altitude expedition to the Andes in the late 1930s. As a house officer at the Peter Bent Brigham Hospital, I was included in this August assembly. My assignment was to measure the thermal conductivity of clothing. Cuthbert Bazett, then chairman of physiology at Penn, and Richard L. Day, a pediatrician from Columbia, were consultants and had designed plethysmocalorimeters for the foot and hand. These instruments had a copper double shell filled with insulating material, across which the temperature gradient was measured with thermocouples. Heat loss could be calculated from the temperature gradient between the shells, and blood flow could be measured at the same time by classic plethysmography. To test the thermal protection of gloves in the cold, we measured blood flow through and heat loss from the hand and calculated the temperature difference between blood entering and leaving the hand. When I was wearing light underwear and the room temperature was ~14°C, the temperature difference between blood entering and leaving my hand was only 8°C. Because it is reasonable to assume that the venous temperature approximates that of the skin, which was very close to 14°C, the arterial blood entering the hand would have been ~22°C. As a check on this, Colonel Talbott inserted a needle thermocouple, made in Bazett’s laboratory at Penn, into my radial artery and, sure enough, the blood temperature was ~22°C. This indicated that the temperature of the arterial blood flowing into the hand was reduced well below body temperature, and we concluded that the arterial blood was cooled considerably by the venous blood returning from the hand. This may have been the first demonstration of a countercurrent mechanism. When the work was written up, Dr. Bazett said he knew that Wallace Fenn was instigating establishment of a new journal of the APS for the publication of restricted research done in Government laboratories during the war and would like it sent there. It was, and so I found my name as the last one among the authors of the first article in the first issue of the JAP.

During World War II, a great deal of human physiological research done in government laboratories, the Climatic Research Laboratory, and in universities related to the practical needs of the military. Temperature regulation was studied because troops worked under extreme environmental conditions, respiration was investigated because aviators were exposed to high altitude and G stress, and divers/submariners experienced hyperbaric conditions. Muscular exercise, metabolism, and nutrition were of general importance. The JAP was dedicated to encouraging the publication of this work, lest it be lost, as is stated in the Foreword from the Editorial Board in its first issue. In the first volume of JAP, 20% of the articles are on temperature regulation, 29% on respiration, 11% on nutrition and metabolism, and the rest are on exercise, muscle, fluid balance, and other practical problems of human activity. At the time of the Journal’s birth, the term “applied” had a derogatory connotation in the best physiological circles. However, with the appearance of the respiratory papers of Fenn, Rahn, and Otis (6 in volume 1; Refs. 1–6), the famous ideal-air paper of Riley and Cournand (7; see Fig. 1), and the temperature regulatory and metabolism papers by the leaders in the field, this stigma vanished.

The second volume of JAP included postwar research, and a number of papers dealing with the circulatory system appeared. This helped establish the Journal as a respected vehicle for human physiology research. The first issues were printed on 6.5 by 9.5-inch pages, and one volume a year was published. In 1957 publication was expanded to two volumes, and because this could not contain all accepted papers, the
page size was enlarged to 8.5 by 11 inches, beginning with volume 14 in 1959. In 1971, printing was expanded to two volumes per year and has remained thus. That the J AP has been such a success is a tribute to the judgement of the then Board of Publication Trustees. I have been an author of 49 papers in the J AP, so it will always rank high in my regard, not only for the human physiology research it displays but also from sentiment.

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REFERENCES