for either regularly or irregularly appearing action current waves. However, it does not assume that the waves originally produced were made up of the frequencies revealed by the electrical analysis. The method appears to be an improvement over the practice of merely presenting and describing actual pictures of action currents. No physicist would venture to compare or describe waves from their pictures alone. He knows well that two waves may be quite similar pictorially but turn out to be very dissimilar when analyzed.

Although the method is certainly applicable to the study of repeating waves and much of value may be expected from such a study, it is the only means at our command now to evaluate quantitatively non-repeating waves. Inasmuch as records of action currents either of many muscle or of many nerve fibers present irregular waves due to the combined asynchronous activity of many individual units some such method as that of Travis and Hunter is absolutely necessary if we are to have any reliable quantitative treatment of the action currents. Even if action currents from single units consist of repeating waves the voltage-frequency method could be used to good advantage. However, because very few pictures published of such action currents present absolutely periodic waves this method seems almost as necessary for the study of the electrical activity of a single unit as of many functional units. This is particularly true since the method of Fourier analysis can not be applied to waves unless the waves are absolutely periodic in form, frequency and amplitude. Such periodicity is the rare exception even in action currents from single units. Thus the statement of Davis, Forbes and Garceau that a "Fourier analysis may be applied to the oscillograms of the individual impulses" is not generally true.

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SCIENTIFIC BOOKS

The Wisdom of the Body. By WALTER B. CANNON, M.D., Sc.D., LL.D. W. W. Norton & Co., Inc., 1932, pp. 1–312.

THIS volume reads as though a college professor, with a mind rich in knowledge based on a lifetime of fruitful research in the laboratory, had set himself down upon his piazza in the cool evenings of the summer time and there recorded in simple but glowing language his thoughts concerning the facts and problems which had been uncovered by his life's work and were vibrating in his mind at the time. As to the language employed one might quote the fine description of the storage of water in the skin and in the muscles: "The entrance of water into these storage places appears to be a sort of *inundation.* I have already likened the lymph spaces to a swamp in which fluid stagnates. The analogy is implied also in the word inundation. We may think of the tissue spaces as being a sort of bog into which water soaks when the supply is bountiful and from which the water seeps back into the distributing system (the blood vessels) when the supply is meager." The use of lucid language of this sort justifies the author's expectation that the volume will be of interest not only to biologists but to the general reader as well. The book presents in comprehensible language the exquisitely sensitive regulatory mechanisms which maintain the units of the body in a state of nearly balanced equilibrium. Cannon terms this state "homeostasis," meaning thereby a condition which is relatively constant. The description of how homeostasis is maintained is accomplished without resort to complicated mathematical formulae but in straightforward talk of the obvious results of physiological experimentation.

In this manner the safeguarding of the fluid matrix is considered, and the homeostasis of the blood in regard to its content of water, of salt, of glucose, of protein, of fat, of calcium and of its neutrality of reaction. Also the regulation of body temperature is described. With great precision Cannon has revealed that the first action of exposure to cold is to cause a discharge of epinephrin into the circulation. This he determined by giving ice water to a cat the nerves of whose heart had been cut. Such a heart is very sensitive to an increased supply of epinephrin in the circulating blood, and an experimental application of cold, either internally as above or externally, resulted in a rapid increase in the heart rate. It is a matter of knowledge which we owe especially to Boothby that epinephrin increases the heat production, or in other words exerts a calorigenic action. In another place Cannon has called this increase of heat production through liberation of epinephrin from the adrenal gland the fine adjustment in the maintenance of body temperature, whereas shivering constitutes the coarse adjustment by which the heat production is increased to compensate for heat loss at the surface. The two factors, which were first clearly differentiated by Cannon, constitute the entity which Rubner called the "chemical regulation of body temperature" in contrast with the protection offered by

the distribution of blood and the evaporation of water which constitute the "physical regulation of body temperature." Although Cannon has quoted generously from recent contemporaneous literature, the critic may perhaps be pardoned for asking why, of the older authorities, Claude Bernard alone should be the scientist freely cited. Perhaps, however, the charm of the book lies in the fact that it represents enticingly the view-point of a laboratory worker of rich experience speaking out of that fulness of personal knowledge, a method which compels interest in the subject and regard for the author.

In a final chapter Cannon discusses the possibility of the establishment of a "steady state" in the social and economic world. In this he follows the example of Aristotle in a celebrated passage which began, "The animal organism is to be conceived after the similitude of a well-governed commonwealth." Cannon suggests that the steady state of the fluid matrix of the animal organism indicates that the social organism should be provided with specially organized control over the processes of commerce. This would include the power to limit the production of goods so as to adjust the supply reasonably to the demand, the power to lay aside stores of goods and stores of wages and the power to arrange emergency employment. All these in a measure are represented as factors of safety in the human body. Perhaps one might suggest another analogy, which is, the fact that a human being, through undernutrition, may be brought to a level of maintenance of two thirds the quantity of food necessary for the normally nourished, even though at some loss of the sense of personal well-being. At a time when wheat is selling at the farm at 25 cents a bushel, in contrast with $2.20 during the war, it does not seem right that war-time wages should be practically guaranteed to railroad workers. Perhaps in times of economic distress the political leaders of Aristotle's "well-governed commonwealth" would have been so wise and so free from vote-getting ambition as to have decreed a reduction in railroad wages suggested by the 30 per cent. physiologically possible reduction in food calories, to the end that other wage-earners might be continuously employed. Into such seemingly fantastic analogies contemplation of the "Wisdom of the Body" leads us.

GRAHAM LUSK

The Universe Unfolding, By ROBERT H. BAKER, x + 140 pages. The Williams and Wilkins Company, Baltimore, 1932. $1.00.

THIS is an excellent book to be one of the volumes of the Century of Progress Series. The originality shown in the manner of presenting the astronomical facts will appeal alike to those who already know these facts, and to those who do not. It is a long way from the flat circular plane of the Greek's earth, over which bends the solid stationary dome of the sky, to the universe of galaxies and supergalaxies lying millions of light years beyond the solar system. However, the 140 pages of the book do cover this distance in a very satisfactory manner, and among these pages will be found the answers to many questions frequently asked by people in general about the modern methods of investigating the astronomical universe. This book can hardly fail to give any reader a better understanding and a greater interest in "the vast universe around us and the mysterious mind of man."

The first chapter tells of the universe as man in the past understood it, first according to the Ptolemaic system with the stationary earth at the center, and then according to the system of Copernicus with a central sun about which the earth and the other planets revolve. The second chapter takes up the story of the investigation of the sidereal system from the star gauges of Herschel to the statistical studies of Kapteyn, and then on to the work of the present day which has disclosed millions of vast stellar systems. The remaining chapters are devoted to the modern methods of investigating the structure of the universe. These describe the various methods of attack on this problem and tell the amount of success achieved by each method. The last chapter brings this interesting account up to the most recent discovery, which is that the exterior galaxies appear to have huge velocities of recession with respect to our own galactic system.

IDA BARNEY

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SOCIETIES AND ACADEMIES

THE IOWA ACADEMY OF SCIENCE

THE forty-sixth annual meeting of the Iowa Academy of Science was held with Iowa State Teachers College at Cedar Falls on April 29 and 30, 1932, with 245 members and visitors in registered attendance.

The presidential address, "Our Underground Geology," was presented by Dr. James H. Lees, of the Iowa Geological Survey. Other papers of general interest were: "The Oxidation of Citric Acid," by Adrian S. Kuyper, of Iowa State University; "Some Observations on Spectral Color Discrimination," by Le Roy D. Weld, of Coe College; "The Effect of Preschool Attendance upon Intelligence Quotient," by Dr. Beth L. Wellman, of the Iowa Child Welfare Research Station; "The Iowa Conservation Plan," by