wavelength 1850 AU, and on two or three occasions we have obtained records extending to wavelength 584 AU, but in general the behavior of the plates in the extreme ultra-violet is capricious and unsatisfactory.

Duclaux and Jeantet (*Journal de Physique*, II, 1921, p. 154) have described a way of "Schumannising" an ordinary dry plate by treating it with sulphuric acid, and recently Aston has referred to the same process. M. Duclaux has been so kind as to send me some specimens of the results he has obtained. He informs me, however, that he prefers another method which he and his colleague have discovered and which was described in their article just cited. His experiments were confined to the region of the spectrum which may be investigated with a quartz prism spectrograph; I have continued them into the extreme ultra-violet.

The procedure is extremely simple. A fast commercial photographic plate—I have employed a "Seed 30"—is coated with a thin film of a colorless paraffin oil; it is then exposed in the usual way in a vacuum spectroscope, the oil is removed with acetone and the plate is developed. The results are nearly, though not quite, as good as those which I have obtained with the most sensitive Schumann plates prepared according to the old method; it is quite easy to get a record of the strong helium line at 584 AU.

The success of the process evidently depends on fluorescent action; I have tried a number of different kinds of oil and I find that "Nujol," a very pure oil sold in this country for medical purposes, yields good results.

I feel sure that this discovery of Duclaux and Jeantet will prove a real blessing to all spectroscopists who work in the extreme ultra-violet.

THEODORE LYMAN

JEFFERSON LABORATORY,
HARVARD UNIVERSITY,
JUNE 28, 1923

THE PHYSICO-CHEMICAL BASIS OF PSYCHIC PHENOMENA

TO THE EDITOR OF SCIENCE: A paper entitled "Physico-chemical basis of psychic phenomena," by Hughes and King, in SCIENCE, May 18, 1923, touches on a problem of the most fundamental importance. For the sake of those who have been unable to follow the literature of nerve physiology I believe that certain comments on this paper are appropriate. The article in question begins with the sentence, "Ever since Galvani discovered the relation between an electric current and muscular action, there has been a feeling among scientists that the nerves are electrical conductors and that nerve impulses are really electrical currents." To a physiologist acquainted with the work of Bernstein,[1] Brünings,[2] Gotch,[3] Lucas,[4] Adrian[5] and Lillie[6] this sentence makes somewhat the same impression that would be conveyed to a physicist by such a statement as this, "Ever since the days of Franklin there has been a feeling among scientists that electricity is the cause of magnetism."

Since the work of DuBois-Reymond and Bernstein the intimate and fundamental relation between the nerve impulse and the electrical disturbance which marks its progress has been known, although not as yet fully understood, much as the intimate relation between electricity and magnetism has been known since the days of Oersted and Faraday. On the other hand the last possibility of explaining the nerve impulse as an electric current along the fiber in the same manner as it is conducted along a metal wire was definitely swept away by the research of Adrian in 1912[5] in which he showed conclusively that the energy of the nerve impulse comes not from the stimulus, but from the nerve fiber itself, thus proving that the nerve impulse belongs to an altogether different class of disturbance from the current in a wire. This fundamental experiment of Adrian's in a somewhat simplified and modified form is now performed as a class exercise by medical students in more than one university in this country. In 1914 Adrian,[5] by a wholly different line of experiment, established the all-or-nothing law for the nerve impulse, not in the sense frequently ascribed to this law, that the impulse is of immutable magnitude under all conditions, but in the sense that it is independent of the strength of stimulus, provided this be adequate, depending only on the condition of the tissue at the moment. These researches were in a sense the culmination of work inaugurated by Gotch and Lucas which had already created strong presumptive evidence pointing towards the conclusion at which Adrian finally arrived. More recent work by Olmsted and Warner[7] has reinforced and extended these conclusions.

The precise nature of the nerve impulse is still unknown, but those properties just mentioned are well established. The principles which have emerged from these researches should not be confounded with speculative hypothesis; they are clearly established facts.

[1] "Untersuchungen über d. Erregungsvorgang im Nerven- und Muskelsysteme. Heidelberg," 1871.

[2] *Arch. f. d. ges Physiol.*, 1903, xcviii, 241.

[3] *Journ. Physiol.*, 1902, xxviii, 395.

[4] *Proc. Roy. Soc., B*, 1912, lxxxv, 495; "The Conduction of the Nervous Impulse," London, 1917.

[5] *Journ. Physiol.*, 1912, xlv, 389; 1914, xlvii, 460; 1920, liv, 1; 1921, lv, 193.

[6] *Physiol. Reviews*, 1922, ii, 1.

[7] *Am. Journ. Physiol.*, 1922, lxi, 228.

In view of this, any further attempt to prove that the nerve fiber conducts impulses in the same way that a wire conducts an electric current is merely a waste of time.

I do not mean to imply that the considerations mentioned in the paper of Hughes and King about two-phase systems of immiscible liquids and interfacial tension are not significant. They are doubtless highly significant. A careful study of recent papers by Lillie and Adrian will show the strong probability that the conduction of the nerve impulse depends on a semi-permeable state of the membrane surrounding the fiber and on the electrical difference of potential resulting therefrom. This semi-permeable state of the membrane in turn may probably depend in part on certain features of a two-phase system. Furthermore, experiments with narcotics are among the most likely to throw light on the important problem of the ultimate nature of the nerve impulse, but they should be conducted with due consideration for the great mass of facts already accumulated by a number of the ablest scientists of modern times—facts and principles which have already gone a long way towards giving us a picture of the nerve impulse. The neuropathologists and the psychologists already have something of a basis on which to work; but future research, coordinated with past research, will greatly strengthen this basis. In this work there is room for chemists, physicists and physiologists alike, if their work be properly coordinated.

ALEXANDER FORBES

WHAT IS A WEED?

THE word "weed" is usually defined as a plant growing out of place. This conception is not easily tangible for the following reasons:

(1) An innocent inquirer may think of a plant being out of place, in one or two respects—(a) As out of its natural habitat; for example, Jack-in-the-Pulpit in an open dry field, or, pigweed in a moist shaded forest; (b) As growing where some human being wishes it not to grow; for example, Bouncing Bet in the cabbage patch, or, rye in the wheat field. This latter conception (b) doubtless expresses the virgin idea of the formal definition, "A weed is a plant growing out of place."

(2) If so, we have an odd rule, under which any plant in the universe may instantly become a weed without the slightest change in character, habitat or position. Under this rule, a plant is a weed, not according to specific qualities nor by a definite concept in the mind of any man, but by human caprice; for example, the sugar maple trees become weeds when some man wishes to convert the grove into a corn field.

(3) To say that a weed is a plant growing out of place is to include in the weed realm all obnoxious parasitic plants. This is objectionable for two reasons: (a) In actual practice no person thinks of those dependent plants that cause wheat rust, corn smut, etc., as weeds. However, these species constantly grow where human beings wish them not to grow, but they are *parasites*. (b) A parasite has the definite distinction of drawing its food detrimentally and directly from a host, but to speak teleologically a weed is an honest, independent competitor for food materials in the "struggle for existence."

What seems, therefore, to be a more workable conception of a weed may be stated as follows: "A weed is an independent plant whose species is persistently obnoxious on cultivation areas." The salient words in this statement are "independent species persistently obnoxious," and these four words may be taken as a definition of a weed, as against the salient words in the old definition—"A plant growing out of place." In this new definition all parasites are excluded, and weed-craft is confined definitely to independent species that are repeatedly obnoxious to phytocultural operations.

ELMER GRANT CAMPBELL

PURDUE UNIVERSITY

QUOTATIONS

REWARDS FOR SCIENTIFIC RESEARCH

SHOULD the Canadian Parliament take the action which the Canadian Premier, Mackenzie King, has announced the intention to propose, and award to Dr. F. G. Banting, the discoverer of "insulin," a life annuity of $7,500, it will be an event of importance both in itself and as an example for other nations. [Parliament has unanimously voted the annuity.] Incidentally, it will give convincing proof that the Canadian lawmakers have an intelligent appreciation of a service to the world such as has been rendered by the Toronto physician and an equally intelligent understanding of the best way to reward that service.

Professional ethics as understood among the English-speaking peoples, and most others except the Germans, will prevent Dr. Banting from exploiting the large commercial possibilities of his remedy, and the fame acquired from his achievement will be confined rather closely to his colleagues and will not pay grocers' bills. It is therefore the wisest of generosity for Canada to give to the son whose honors she shares enough to permit the devotion, without material anxieties, of the rest of his life to the form of research for which he has demonstrated his competence. Even though he never should find another specific for one of humanity's scourges, his work is sure to increase the general stock of medical knowledge.