PROFESSOR P. J. DANIELL, of the Rice Institute, has been appointed to the Town Trust chair of mathematics at the University of Sheffield.

DISCUSSION AND CORRESPONDENCE

THE TERMS ANODE AND CATHODE

THERE is a common statement about these two terms which is to be found in most text-books and which is frequently retailed by lecturers upon electrical and electrochemical subjects to the effect that the word anode, derived from the Greek terms for "up" and "a way," indicates the way "up into the cell" and that the word cathode, coined similarly from "down" and "a way," denotes the way "down out of the cell." The responsibility for this terminology is put upon Faraday.

The truth is that such statements do the great physicist and chemist an injustice. In order to establish a conventional idea of electrolysis that would not commit him to any hypothesis, the overthrow of which would render obsolete a system of nomenclature dependent upon it, Faraday sought some natural and permanent standard to which he might refer the proposed system. He decided upon the earth whose magnetism he considered the result of electric currents passing around the sphere from east to west. Establishing this as the conventional direction of his electric current, the anode became the eastern and the cathode the western terminus of the path of the current; the anode, then, was towards the rising sun and the cathode towards the setting sun. The sun rises "up" and sets "down." This is the conception upon which Faraday based his new terminology.

Another common deviation from the intentions of Faraday is the use of the terms anode and cathode to designate the electrodes of a cell whereby each becomes either positive or negative according to the portion of the circuit that is under discussion. In its original sense the term electrode indicated simply that conductor of the first class which is in contact with the anode or the cathode, and these latter are defined as the surfaces which bound the electrolytic solution at the electrodes. This idea removes a source of ambiguity which has been very confusing to students. If we accept this, Faraday's explicit definition, then the cathode will always be the positive extremity of the electrolytic liquid and the electrode in contact with it will always be negative while the corresponding pole will always be the positive pole of the cell; the anode will ever be the negative extremity of the electrolytic fluid, its electrode will always be positive and the corresponding pole will be negative. A clear statement of these relationships should remove the source of much of the confusion which has enveloped the subject.

Faraday's statement is as follows:[1]

In place of the term pole, I propose using that of *Electrode* (ἤλεκτρον and ὁδὸς *a way*), and I mean thereby that substance, or rather surface, whether of air, water, metal, or any other body, which bounds the extent of the decomposing matter in the direction of the electric current.

663. The surfaces at which, according to common phraseology, the electric current enters and leaves a decomposing body, are the most important places of action, and require to be distinguished apart from the poles, with which they are mostly, and the electrodes, with which they are always, in contact. Wishing for a natural standard of electric direction to which I might refer these, expressive of their difference and at the same time free from all theory, I have thought it might be found in the earth. If the magnetism of the earth be due to electric currents passing around it, the latter must be in a constant direction, which, according to the present usage of speech, would be from east to west, or, which will strengthen this help to the memory, that in which the sun appears to move. If in any case of electro-decomposition we consider the decomposing body as placed so that the current passing through it shall be in the same direction, and parallel to that supposed to exist in the earth, then the surfaces at which the electricity is passing into and out of the substance would have an invariable reference, and exhibit constantly the same relations of powers. Upon this notion we purpose calling that towards the east the *anode* (ἄνω *upwards,* and ὁδὸς *a way*; the way which the sun rises), and that towards the west the *cathode* (κατὰ *downwards,* and ὁδὸς *a way*; the way which the sun sets); and whatever changes may take place in our views of the nature of electricity and electrical action, as they must affect the *natural standard* referred to, in the same direction, and to an equal amount with any decomposing substances to which these terms may at any time be applied, there seems no reason to expect that they will lead to confusion, or tend in any way to support false views. The *anode* is therefore that surface at which the electric current, according to our present expression, enters: it is the negative extremity of the decomposing body; is where oxygen, chlorine, acids, etc., are evolved, and is against or opposite the positive electrode. The *cathode* is that surface at which the current leaves the decomposing body, and is its positive extremity; the combustible bodies, metals, alkalies and bases, are evolved there, and it is in contact with the negative electrode.

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THE SYNCHRONOUS FLASHING OF FIREFLIES

SEVERAL years ago I published in SCIENCE a few brief letters on the synchronous flashing of fireflies which led to other observations and discussions on the subject. In the magazine *Asia* for February, 1924, is an article by Carveth Wells on his experiences in the

[1] "Experimental Researches in Electricity," 1, 196–7, 1839.