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.

JAMES F. COUCH

WASHINGTON, D. C.

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.

Malay Peninsula. The following extract describing the flashing in unison of fireflies will be of interest to those who have studied the subject:

One evening I saw a demonstration of insect organization which I believe it is impossible to explain. It was a beautiful night. The air was full of extraordinary fireflies. About every fifteen minutes these flies separated into two armies, one settling on the trees growing on the left bank of the river and the other on the right. Then, when I had decided that the fireflies had gone to bed for the night, the whole army on the left bank gave one big flash in perfect unison, which was immediately answered by another big flash from the right. How those flies managed to keep time absolutely beats me, but they did so, though there must have been thousands of them stretching along the river-banks for a hundred yards or more. The illumination was so strong that the branches of the trees could be seen quite distinctly.

EDWARD S. MORSE

THE PROBLEM OF THE MONKEY AND THE WEIGHT

THE following simple, interesting and instructive problem in mechanics, though old, is still of interest as different answers are given by those whose opinions are to be respected and who ought to agree.

A supposedly weightless rope passing over a frictionless pulley has a 10 lb. weight hanging on one end and a 10 lb. monkey on the other. What will happen when the monkey climbs up the rope.

We are told that the correct answer is that the weight will move up as fast as the monkey and that they will ultimately meet at the top. The monkey, therefore, does twice the work of lifting himself to that height. This is said to have been crudely confirmed by a boy who found it far more difficult to pull himself up in such a case than when the top of the rope was immovably secured.

It seems necessary to distinguish between a jerky and a uniform movement of the monkey; the former involves acceleration, deceleration and inertia. It is claimed that with a uniform motion the weight would not move, as the monkey can not pull with a greater force than his weight. And that with a jerky upward motion of the monkey, involving acceleration and deceleration, the weight would move up and down for each jerk, but its average and ultimate position would remain the same. Others claim that the weight would move up with every jerk, but would not descend again during the deceleration, hence its ultimate upward motion would be equal to that of the monkey. A spring or elastic rope introduces another complication.

For a uniform motion the problem may be put in a simpler form. Suppose a motor suspended on a rope moves itself up or down fast but at a uniform velocity, by winding or unwinding the rope around its shaft. Will the tension on the rope then be greater or less respectively than that when the motor is at rest?

The problem is not without practical value.

CARL HERING

PHILADELPHIA, OCTOBER 16, 1923

THE PROFESSOR AND HIS WAGES

The Professor, God bless him, he works long and hard,
And diplomas and medals are his sole reward.
On "Love of his work" he must feed his dear own,
With a pleasant smile and never a groan.

He must move in society; live with the best;
He must be very careful of how he is dressed;
He must buy many books and must study at night;
Everything that he does must be proper and right.

He must never have children, it's vulgar and bad,
And besides, who would feed them, supposing he had?
He must not smoke a pipe, for that wouldn't be nice,
And he can't smoke cigars, for he hasn't the price.

To the theater he is permitted to go,
But he rarely does so for it takes too much dough.
He must always be cheerful before every class,
Though bills through his mind ever, endlessly pass.

And while he is teaching, his dear wife must scrub;
She must manage her part with a mop and a tub;
But she has her own pleasures as well as does he,
They are solely the Women's Club's afternoon tea.

These things are quite bad, you in truth will concede,
But to make matters worse, he in SCIENCE must read
That he's paid all he's worth and should be quite content
With a pittance that scarcely pays for his rent.

The Professor, God bless him, I take off my hat
To a man who has courage to face all of that.
Nothing short of a genius could ever pull through
And accomplish what he is required to do.

ANON

CORRECTIONS

THE article entitled "Gels and Theory of Adsorption" given in the December fourteenth issue of SCIENCE reads on page 496 as follows:

$pH < 1.217$ $pH > 1.217$

but should read:

$pH > 1.217$ $pH < 1.217$

NEIL E. GORDON

In SCIENCE, 1924, p. 10, first column, line 2 up, for "eighteen" read "thirty-one."

F. CAJORI

SCIENTIFIC BOOKS

THE WEBER SEVENTY-YEAR BOOK

A "FEEST-NUMMER" of the "Bijdragen tot de Dierkunde" in an edition de luxe has been lately issued by the Royal Zoological Society, "Natura Artis Magis-