inch, then the lamp appeared safe, under all circumstances, in mixtures of coal gas and air.

With a view to explain the non-transmission of inflammation through small apertures, the author considers the nature of flame in general; and since a piece of phosphorus, or even a small taper, will burn in the midst of a large flame made by the combustion of alcohol, he is of opinion that oxygen exists in the centre of all flame, forming an explosive mixture with the vapour, but which burns solely at the exterior surface, because it is there alone sufficiently heated to take fire.

If a piece of wire-gauze be held in the flame of a lamp, or of coal gas, no flame passes through the gauze; for though a portion of the inflammable vapour passes, it loses too much heat in its passage to propagate the flame; but in the case of inflammable mixtures of coal gas entering a lamp, and burning at the interior surface, that which is exterior has not been exposed to any heating cause, and consequently is in no danger of taking fire at the sides of the lamp; and the results of combustion which escape at the top, though heated, are no longer inflammable.

In conclusion the author informs us, that these lamps have now been tried in two of the most dangerous mines near Newcastle with perfect success; and he has great hopes that they will shortly be adopted in many of the collieries in that neighbourhood.

Some Observations and Experiments made on the Torpedo of the Cape of Good Hope in the Year 1812. *By* John T. Todd, *late Surgeon of His Majesty's ship Lion. Communicated by Sir* Everard Home, *Bart. V.P.R.S.* Read February 15, 1816. [*Phil. Trans.* 1816, *p.* 120.]

The fish on which these experiments were made, were generally caught early in the morning, and examined as soon after as possible, but in some instances were kept in buckets of water as long as three days, or more.

They are frequently caught by the seine in Table Bay, to the westward of the Cape, but very rarely in Simon's Bay, which is to the eastward, and never caught by the hook with any kind of bait.

The Torpedo of the Cape differs in no respect from those of the Northern Hemisphere, except in size, which is never more than eight inches long and five in breadth. The columns of their electric organs appeared larger and less numerous than those described by Mr. Hunter. The form of any one singly is cylindric, but in a section of a whole organ the figure is modified by lateral compression.

The author found the supply of nerves to these organs, agreeably to former descriptions, to be larger than to any other parts.

The greatest shock they give was never felt above the shoulder, and rarely above the elbow joint, the strength of it depending more upon the vivacity of the animal than upon its size. There appeared

no regular interval between the shocks, which sometimes followed so quickly as not to be counted, while other animals could scarcely be provoked to give any shock.

The electric discharge was mostly accompanied by an evident muscular action in the animal, with an apparent swelling of the superior surface of the organs, and by a retraction of the eyes.

Two of these fish being placed in different buckets of water, one, which was irritated so as to give frequently repeated shocks, soon became languid, its shocks diminishing rapidly in intensity, and it soon died; but the other. not being irritated, continued living to the third day. And this was universally observable, that those which parted with shocks most freely soonest died.

A Torpedo, in which the nerves proceeding to the electric organs had been divided, seemed to have no power of giving shocks, but appeared just as lively as another Torpedo taken at the same time, and placed in a separate bucket of water uninjured.

Of two Torpedos taken at the same time, one had the electric organs divided. They were then both irritated equally, so that the perfect animal was soon exhausted of all power, and died; but the other, which had lost the power of giving shocks, appeared as vivacious as before, and lived to the second day.

An animal, from which one electric organ had been removed, was found still capable of giving shocks, though possibly not so strong as before.

Another fish, in which only one nerve to each organ had been divided, was also able to give shocks as before.

When they were held only by the tail or by the extremity of their lateral fins, they appeared to have no power of giving shocks.

Mr. Todd infers from these experiments,

That the electric discharge is a vital action.

That it is perfectly voluntary.

That frequent action is injurious to life, and may soon exhaust it.

That an animal deprived of this power is more vivacious, and lives longer than one which exerts this means of exhausting itself.

That both organs are not necessary for giving the shock.

That all the nerves of one organ are not necessary to be entire.

That a most intimate relation subsists between the nervous system and the electric organs.

Direct and expeditious Methods of calculating the Excentric from the Mean Anomaly of a Planet. By the Rev. Abram Robertson, *D.D. F.R.S. Savilian Professor of Astronomy in the University of Oxford, and Radcliffian Observer. Communicated by the Right Hon. Sir* Joseph Banks, *Bart. G.C.B. P.R.S.* Read February 15, 1816. [*Phil. Trans.* 1816, *p.* 127.]

Each of these methods, says the author, is to be considered as direct, although it proceeds through the medium of Cassini's approximation, which, as here used, can only be regarded as a first step