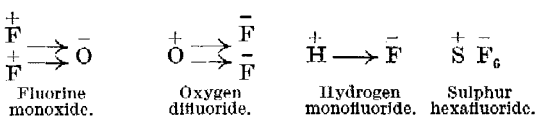
Oxide of Fluorine or Fluoride of Oxygen?

THE issue of NATURE of Nov. 5, p. 672, contains the news of a very important discovery made by Messrs. P. Lebeau and A. Damiens and communicated to the Paris Academy of Sciences on Oct. 3 (see *Comptes rendus*, pp. 652-654, 1927). In the preparation of fluorine by the electrolysis of the acid potassium fluoride, it was noticed that at the commencement of the operation, owing to the presence in the liquid of a small quantity of water, a new gas was obtained of which the formula has been established as F_2O, probably a monoxide of fluorine. In my view the new gas is not a monoxide of fluorine, F_2O, but a difluoride of oxygen, OF_2. The two formulæ are by no means identical, and it is interesting to note that a famous investigator like Prof. Lebeau has overlooked the true state of the matter, for he says that it is OF_2 (*i.e.* our F_2O, but he places the negative element first!) "paraissant être plutôt un oxyde qu'un anhydride."

Having been brought up on the electrochemical theory of Berzelius, I always regarded the chemical elements from the point of view whether they are, more or less, electropositive or electronegative—a point of view which was not accepted by my great teacher Mendeléeff (see Ostwald's "Klassiker," No. 68, p. 60)—and I was much gratified when Arrhenius in his electrochemical theory appeared as a 'Berzelius redivivus.' As regards the second series of the Periodic System or Classification of Mendeléeff (it was formerly called 'Law' in England, but the denomination 'Table' seems to me to be inadequate for a brilliant, fundamental, theoretical idea!) this series begins with a strongly electropositive element, lithium, and ends with the most negative of all elements, fluorine, thus:

$$+ \text{Li Be B C N O F} - (\text{Ne}).$$

All the first five elements form oxides in which they are positive and the oxygen negative, and even ozone may be regarded as an oxide of (+quadrivalent) oxygen. But it was pointed out by me alone, in my lectures more than thirty years ago, in my introduction to Mendeléeff's Periodic System, 1907, and in Abegg's "Handbuch," vol. iv. 2, p. 2 (with Auerbach, 1913), that fluorine cannot form oxides, hydroxides, or oxy-acids, because it is more negative than oxygen. At the utmost a fluoride of oxygen $(O+)(F-)_x$ could exist. Indeed, this is the new gas discovered by Lebeau and Damiens: OF_2, not F_2O. The difference between the two formulæ is best seen on representing how the electrons pass from the positive to the negative atom:



The first formula is impossible, the second, third, and fourth are analogous. As the inner constitution of the difluoride of oxygen, OF_2 is different from that of the chlorine monoxide Cl_2O, it is easily understood that their chemical and physical properties will not be analogous.

It may be that a trace of this gas, possessing a peculiar odour, different from hydrofluoric acid or fluorine, was formed when I treated the new double oxide $Pb_5O_7 . 3H_2O$ with concentrated hydrofluoric acid (Manchester, 1881).

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Winter Thunderstorms.

IN January last an appeal was made for reports of any thunder or lightning which might be observed before April 1, 1927 (NATURE, **119**, Jan. 22, 1927, p. 123). The census of storms was carried out in conjunction with the Meteorological Office, and efforts were made to obtain the co-operation of observers in all parts of the British Islands. Considering the whole of the six months from October 1926 to March 1927, thunderstorms occurred somewhere in the British Isles on 96 days out of 182. Details for the individual months are given in the following Table:

	England.	Wales.	Scotland.	Ireland.	British Isles.
1926					
October .	16	11	10	9	21
November .	18	11	10	12	20
December .	5	1	4	0	8
1927					
January .	14	8	16	14	23
February .	6	1	3	2	7
March .	14	5	3	7	17
Total (six months)	73	37	46	44	96

In England and Wales there were five prominent stormy areas, namely, Sussex and Surrey, Devon and Cornwall, the Severn valley, south-west Yorkshire and the Lake District. In Scotland and Ireland the central portions of the west coasts of each country were particularly disturbed. Similar features have been noticed in previous winters. A lane of no storms ran from Dorset to the Wash, and large portions of the northern English counties were also free from storms.

Considering the first three months only of each of the past five years, 1927, 1926, and 1924 were comparatively free from thunder, while 1925 was particularly stormy.

The investigation is being continued during the present winter, and I shall again be very grateful for reports of any thunder, lightning, or hail which may be observed by readers of NATURE before April 1, 1928. A note of the place, date, and time of the occurrence, with the direction in which the lightning was seen, especially at night, will be very valuable. Any additional information of the following character will, in the case of actual thunderstorms, be extremely welcome: (1) The time when the storm passed overhead, or was nearest, with its direction; how long it lasted; (2) severity of storm, much or little thunder or lightning; (3) whether accompanied by hail, rain, or snow; (4) direction and strength of wind; change of wind (if any); (5) whether there was a change in temperature during the storm.

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Science and Survival.

IN an article on page 613 of NATURE for Oct. 29, headed "Science and Survival," the reviewer of a book called "The Bridge" asks certain pertinent questions which deserve an answer. Unanswered, they may suggest to a student of the book erroneous hypotheses which will lead him astray. I appreciate the fairness of the review: my object is only to furnish the additional