As regards the accuracy-test of the building-up process, the calculation of the H_α wave-length given by Mr. Sears is also unfair, as it is made clear in the paper (p. 321) that the hydrogen results are not relied on, being influenced by the fact that the red line H_α is a doublet, and therefore only used in general confirmation of the neon results. It is the final result with yellow neon Ne_c light, 1,562,409 wave-lengths in the yard, which is alone relied on, the Ne_c line being unresolvably single and its wave-length a standard constant, so that the number of wave-lengths of cadmium red Cd_r light in the yard, 1,420,210, calculated by use of this constant and the standard wave-length of Cd_r, is unimpeachable.

It is, indeed, important that the value of the yard in standard wave-lengths should be known with the greatest possible accuracy, and no one will welcome more than myself the result of the determination by Fabry and Perot's method now in progress at the National Physical Laboratory. My own being a totally different method, it must surely be an advantage if the two different methods eventually turn out to give results in practical agreement.

A. E. H. Tutton.

Electron Exchange Phenomena in the Excited Atom.

In an interesting paper recently published,[1] H. S. W. Massey and C. B. O. Mohr have calculated the relative electron excitation probabilities in the case of helium.

These calculations, while following up the previous work of Oppenheimer, Born, and Dirac, take into particular account electron exchange phenomena in the excited atom.

Their final results show that in the case of 200 volt electrons in helium the relative probabilities to be expected are as follows :

Transition .	$1S-2S$.	$1S-2P$.	$1S-3P$.	$1S-3D$.
Singlet . .	0·03	0·09	0·0015	0·00025
Triplet . .	0·001	0·00002	$0{\cdot}0_71$	$0{\cdot}0_61$

It so happens that we have been engaged in an experimental investigation involving this very point, some of our results being published in the *Proceedings of the Leeds Philosophical and Literary Society* in March 1931, and in the *Philosophical Magazine* for November 1931.

Our experiments agree, approximately at any rate, with the above results so far as the 1^1S-2^1P and 1^1S-3^1P transitions are concerned, but *we have failed to find any evidence at all of any transition corresponding to* $1S-2S$ singlet or triplet.

It is clear that we should have found it, if present, according to the relative intensity predicted by Massey and Mohr.

It may not be without interest further to point out that Jones and Whiddington[2] found that in the electron excitation of H_2 there was a marked maximum in the probability of an observed loss of about 9·0 volts in the neighbourhood of 16 volts velocity of impacting electrons. The suggestion made at the time was that this loss was an excitation resulting in the emission of the optical continuous spectrum.

This notion is strengthened if regarded in the light of the work of Massey and Mohr, since the loss in the case of H_2 seems by analogy as likely to be a triplet excitation, the continuous spectrum being produced by transitions to a supposed unstable 1^3S state.

R. Whiddington.
J. E. Roberts.

Physics Laboratories,
University of Leeds, Nov. 11.

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[1] *Proceedings of the Royal Society*, vol. 132; 1931.
[2] *Philosophical Magazine*, vol. 6, p. 899; 1928.

The Atomic Weight of Fluorine.

Messrs. H. S. Patterson, R. Whytlaw-Gray, and W. Cawood have published[1] some preliminary results on a new revision of the molecular weight of methyl fluoride which seems to lead to the value 19·010 for the atomic weight of fluorine. I should like to point out that the references given in favour of this value are by no means trustworthy. In the first place, the work of McAdam and Smith[2] on the analytical ratio, sodium fluoride to sodium chloride, was a preliminary one. The only two transformations carried out give, after correction to a vacuum, fluorine = 19·019 (instead of 19·010). Smith and van Hagen[3] conclude more recently that "the experience of these authors shows that the reaction in question did not proceed smoothly", and that "the errors of experience—traces of water in sodium fluoride and conversion incomplete to sodium chloride—would have increased the value of the atomic weight of fluorine". Germann and Booth[4] have determined the normal density of silicon tetrafluoride, but, as Clarke has pointed out,[5] "do not go so far as to compute from this figure the molecular weight of the fluoride". By comparison with the deductions of Jacquerod and Tourpaian,[6] Clarke obtains for the molecular weight 104·47 and hence for the atomic weight of fluorine 19·09 (not 19·010). Van Laar, on the other hand, assuming that the critical constants for silicon tetrafluoride as determined by Moissan are incorrect, has calculated the molecular weight as 104·13 and hence they find 18·995 for fluorine.

The most recent work of Smith and van Hagen has proved that the ratio of fluorine to another halogen, say chlorine, may be established analytically much more readily by an indirect comparison—say, by converting a sample of a suitable compound to the choride and another sample of the same preparation to the fluoride by an independent method. With borax as such an intermediate compound, Smith and van Hagen have established many cross-ratios between sodium fluoride and sodium chloride, sulphate, nitrate, and carbonate. With the most probable values for chlorine, nitrogen, sulphur, and carbon we get for fluorine 19·002, 19·001, and 19·000. Only the conversion from borax to sodium carbonate, which would be incomplete, gives fluorine 19·006. The other exceedingly reliable values support the value 19·000 as found by Moles and Batuecas.[7]

Aston, using the new mass-spectrograph and with boron trifluoride, deduces 19·000 as the atomic weight of fluorine, in agreement with our conclusions.[8]

With reference to the criticisms on our work on the normal density of methyl fluoride, I should like to point out that the gas was prepared by two different methods : by the reaction of potassium fluoride with potassium methylsulphate and by the action of methyl iodide on silver fluoride. The mean values for the density from the two methods agree by 1·7 part in 10,000. For the compressibility measurements, only the gas from the second source, which will certainly not be contaminated with methyl oxide, was employed.

The method of Collie (decomposition of tetramethyl ammonium fluoride by heat) has been tested in my laboratory by Gonzalez.[9] By heating the salt to 160° over phosphorus pentoxide in a vacuum for several weeks, it was not possible to obtain an anhydrous product. Traces of water are retained by the fluoride, and by heating this salt to 180°, decomposition and at the same time a secondary reaction with production of ammonia, nitrogen oxide, and methane take place. Purification of the evolved gas with potash, ferrous sulphate, sulphuric acid, and phosphoric anhydride and repeated liquefaction and fractionation give a gas fraction with constant density