be published shortly in the *Verhandlungen der deutschen physikalischen Gesellschaft,* the relation between the wave-length and the positive charge may be obtained in a large number of different ways. For the present it may suffice to point out that it may be derived from a simple consideration of the dimensions of the quantities involved.

The frequency ν can only be supposed to depend upon the magnitude of the positive and negative charges Ne and ne, upon the mass of the moving charge m, upon the distance between the charges r, and, if we wish to introduce the quanta, upon Planck's element of action, h. As Nne^2, m, r, and h must be combined in such a way that the dimension of the resulting quantity is that of one finds

$$(NnML^3T^{-2})x My Lz(ML^2T^{-1})u = T^{-1}, \quad \text{or}$$

$x+y+u=0$, $3x+z+2u=0$, and $-2x-u=-1$, whence $y=x-1$, $z=x-2$, and $u=1-2x$.

It is interesting to see what assumptions are necessary to produce an approximate agreement with the experimental data if one inserts various values for x.

If $x=0$ we find $\nu = \text{const.} \dfrac{h}{mr^2}$ the constant being of the order unity as Einstein pointed out. Assuming the characteristic X-rays to be due to the movement of a single electron, we must suppose r to be proportional to $1/N$, where N corresponds to the number of free positive charges on the nucleus found by Rutherford and van den Broek. Roughly speaking, this would be the case if the repulsive force keeping the electrons away from the centre were proportional to $1/r^3$, as suggested by Sir Joseph Thomson. If $x=\frac{1}{2}$

we find $\nu = \text{const} \sqrt{\dfrac{nNe^2}{mr^3}}$. This formula is interesting, as it does not contain h, *i.e.* it may be derived from the ordinary laws of mechanics. It also reduces to Moseley's formula if $r \sim 1/N$.

If $x=1$ the formula is $\nu = \text{const.} \dfrac{nNe^2}{hr}$. If one electron is supposed to oscillate, r must again be assumed proportional to $1/N$ to fit the facts. If all $n=N$ electrons oscillate, r must be supposed to be constant. In this case the formula accounts also for the second series of lines which Moseley's formula fails to do. They may be calculated with great exactitude by putting $\nu = \text{const.} \dfrac{N(N-1)e^2}{hr}$, which corresponds to an atom which has lost an electron.

If we put $x=2$ we find $\nu = \text{const.} \dfrac{n^2N^2e^4m}{h^3}$, which is obviously identical with Moseley's formula, if we suppose only one electron to oscillate. The agreement of Bohr's constant with experimental data is not convincing to my mind in view of the large number of arbitrary assumptions in his derivation.

All the above formulæ are independent of the choice of any special model. They are selected so that the expression for ν is successively independent of e^2, h, m, or r. They would seem to prove that Moseley's figures need not be taken to confirm Bohr's views on the constitution of the atom. The only essential assumption common to all of them is that N should correspond to the place of the element in the periodic table approximately as suggested by Rutherford and van den Broek, and it would seem therefore that this hypothesis only can be said to be supported by Moseley's experiments.　　　F. A. LINDEMANN.

Sidmouth, December 28, 1913.

The Plumage Bill.

Sir Harry Johnston's plea for the Plumage Bill in Nature of December 11 will, no doubt, be considered an acceptable contribution by those who believe they possess the mental altitude to which he was born.

I venture, however, to suggest that if he and his friends will leave their high mental estate and descend to the plain facts that business men must consider in this lower sphere, he will be obliged to admit that, like the trade, the educated naturalist has much to learn.

He admits the glaring defects of the Plumage Bill, but welcomes the measure as better than none. If he and his friends are able to conceive nothing more than an admittedly bad Bill, that will have no effect on bird-life, he is scarcely justified in his abuse of those who are willing, and trying to solve the problem of saving both the birds and the trade.

His presumption that none but an educated naturalist knows how the skins are procured, or the approximate habitat of the birds, or their right name in English or Latin, does not raise the controversy to any higher plane. Was he not an educated naturalist who bestowed the name of Apoda upon one of the species of paradise bird, believing it be born without feet? In 1908, before the Select Committee of the House of Lords, did not Sir Harry Johnston's friend, Mr. Buckland, declare that the destruction of birds of paradise was at that time so rapid that the species could not last more than two or three years? I see little more in the article which Sir Harry Johnston quotes from *The Times of Ceylon* than a confirmation of the trade statements that the birds of paradise are collected under a system regulating their killing, and that the family is in no danger of extermination. The article shows the valuable commercial asset that Dutch New Guinea possesses, and that its Government is taking full advantage of it under an adequate system of protection.

Mr. Buckland will be surprised to hear that there are so many birds left that this year's production is likely to result in a trade of about 200,000 skins, but he will perhaps be pleased to know that I do not believe it. Both gentlemen should be more concerned in those beautiful specimens said to fetch as much as 40*l.* or more. These are undoubtedly the rare and disappearing species that have no trade interest, but are eagerly sought after for scientific purposes. Even though they be the last survivors of their kind and need some stronger measures than any existing, in order to prevent their utter extermination, supporters of the Plumage Bill have conceived nothing more than a measure that permits their import until none are left, and also prohibits the import of species that are plentiful.　　　L. JOSEPH.

Plumage Committee of the Textile Trade Section
of the London Chamber of Commerce,
Oxford Court, Cannon Street, London, E.C.
December 17.

My reply to Mr. Joseph is as follows :—

I only admit the defects of the proposed Plumage Bill in that it is not sufficiently drastic. But I am always one of those who think half a loaf is better than no bread, and that great restrictive or revolutionary measures of legislation are seldom carried all at once. I should like to see British officers and tourists restrained from destroying the wild mammalian fauna throughout the British Dominions; meantime I welcome sporting licences, close times— any measure which may tend to prolong the existence of interesting wild beasts. So although I should prefer a more complete exclusion from this country of the plumage of rare and remarkable wild birds, I am prepared to accept Mr. Hobhouse's Bill as an instalment of protective legislation.

I continue to assert the utter ignorance of their trade and of the sources and correct nomenclature of their goods which characterise the firms trading the skins and plumes of wild birds. The fact that Linnaeus and