23 Pk Parade
Cambridge
20th Jan 95

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Dear Mr Fitzgerald

I must confess that I don't see how you get the radius of the drop 10^{-5}. The density of electrification if one in every 10^7 were charged would be $\frac{10^{14}}{3 \, 10^{10}} = \frac{1}{3} 10^4$ which is 10^7 times the actual charge per c.c. that I get. The theory I have been working upon is that if E is the charge a stable position is obtained when

$$\frac{E^2}{8\pi a^4} = \frac{2T}{a}$$

a = radius & T the surface tension. But I find the charge on each is about 10^{-11} so this would give a radius of $\frac{1}{3} 10^{-8}$ which is far too small.

The thing that I have not done well yet is to get the size of the drops but I am perfectly certain that for a charge $2.3 \, 10^{-3}$ per c.c. the wt of the cloud at 11° is $18.4 \, 10^{-6}$. If I can only get a good determination, experimentally of the size of the drop the thing could be tested then by the formula, but at present I can only get the drop between $2\,10^{-5}$ & $5\,10^{-5}$.

I find I can't get it on before the Philosophical Society here before Feb 8th, as I want to show some expts & the meeting would have to be at the Cavendish, so that I will have another week to do experiments & may probably get some thing out of the hydrogen cloud.

Is there any other effect due to the charged molecules outside the drop that could affect the equilibrium? I don't think the formula $\frac{E^2}{8\pi a^4} = \frac{2T}{a}$ would explain the size of the drops.

Yours sincerely

John S. Townsend

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tography — We also propose to have another lecture on Architecture making a course of 5 in all —

Yrs faithfully

Edward Farquharson

G. F. FitzGerald } F.R.S. ?

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$$\frac{2T}{r} = \frac{1}{8\pi}\frac{Q^2}{r^3}$$

$$Q^2 = ~~16\pi~~\, r^3\, T\; 8\omega$$

$$= 50 \times 80 \times r^3$$

$$= 4000 \times r^3$$

$$Q = ~~6.2\times 10~~ \quad 62 \times r^{3/2}$$

$$r = 10^{-5}$$

$$r^{3/2} = 10^{-15/2}$$

$$= \sqrt{10} \times 10^{-16/2}$$

$$= 3 \times 10^{-8}$$

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$$Q = 186 \times 10^{-8}$$

$$~~= 1.8~~ Q = 2 \times 10^{-4}$$

∴ 10^7 conc per drop.

So would hardly hold this not together.

1.8×10

a much smaller amount than is would be required to keep up

$$Q = 10^{-11} = 62 \times r^{3/2}$$

$$r^{3/2} = \frac{1}{62} \times 10^{-11}$$

$$62^2 = 4000$$

$$r^3 = \frac{10^{-22}}{4000} = \frac{10^{-24}}{40}$$

$$r = \frac{10^{-8}}{3.3} = 3 \times 10^{-9}$$