Maxwells ekvationer – del 1

Föreläsning 11 – Retarderade potentialer

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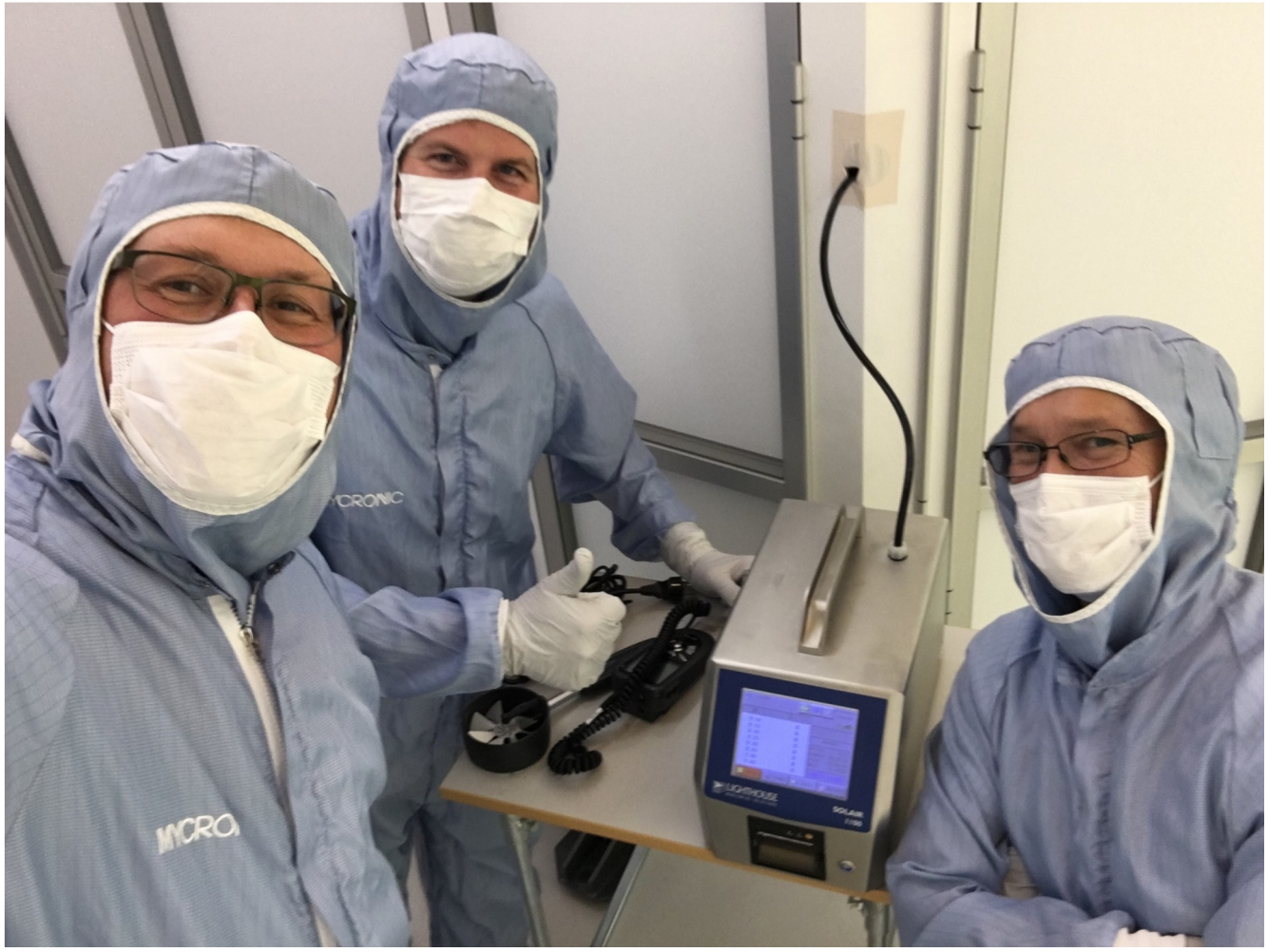
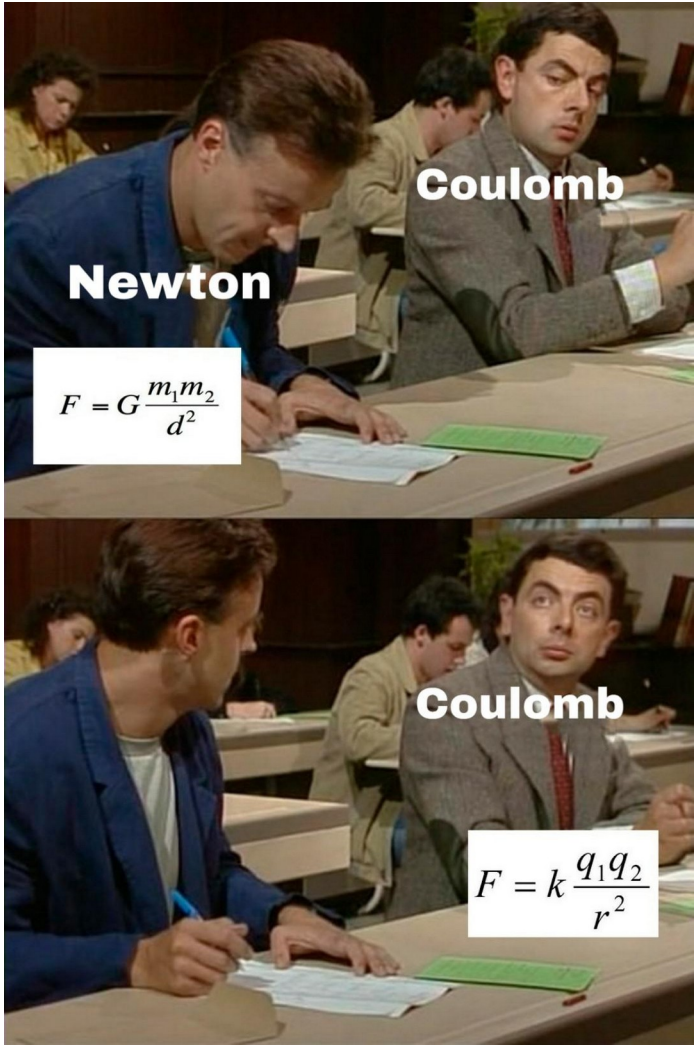
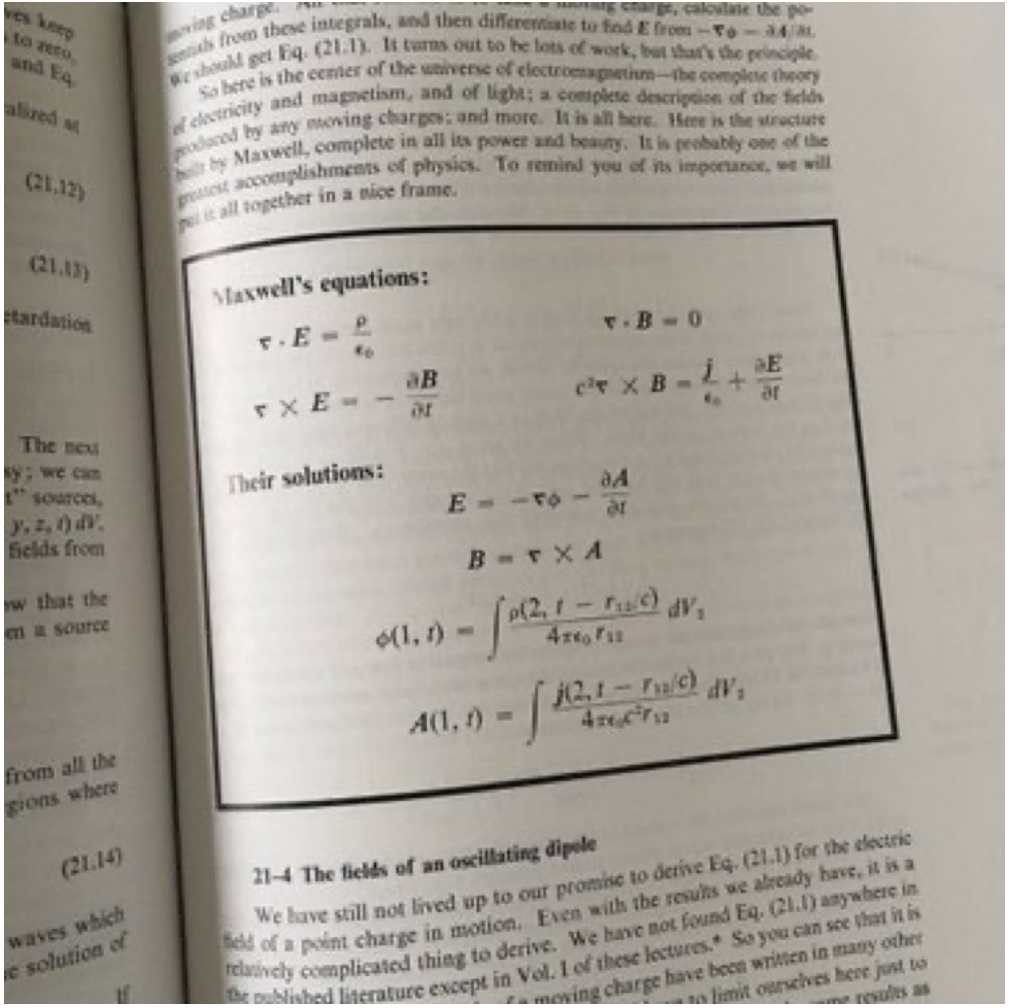



Coulomb
Newton
$F = G\frac{m_1 m_2}{d^2}$
Coulomb
$F = k\frac{q_1 q_2}{r^2}$



moving charge. ... a moving charge, calculate the potentials from these integrals, and then differentiate to find E from $-\nabla\phi - \partial A/\partial t$. We should get Eq. (21.1). It turns out to be lots of work, but that's the principle.

So here is the center of the universe of electromagnetism—the complete theory of electricity and magnetism, and of light; a complete description of the fields produced by any moving charges; and more. It is all here. Here is the structure built by Maxwell, complete in all its power and beauty. It is probably one of the greatest accomplishments of physics. To remind you of its importance, we will put it all together in a nice frame.

Maxwell's equations:

$$\nabla \cdot E = \frac{\rho}{\epsilon_0} \qquad \nabla \cdot B = 0$$

$$\nabla \times E = -\frac{\partial B}{\partial t} \qquad c^2 \nabla \times B = \frac{j}{\epsilon_0} + \frac{\partial E}{\partial t}$$

Their solutions:

$$E = -\nabla\phi - \frac{\partial A}{\partial t}$$

$$B = \nabla \times A$$

$$\phi(1,t) = \int \frac{\rho(2, t - r_{12}/c)}{4\pi\epsilon_0 r_{12}}\, dV_2$$

$$A(1,t) = \int \frac{j(2, t - r_{12}/c)}{4\pi\epsilon_0 c^2 r_{12}}\, dV_2$$

21–4 The fields of an oscillating dipole

We have still not lived up to our promise to derive Eq. (21.1) for the electric field of a point charge in motion. Even with the results we already have, it is a relatively complicated thing to derive. We have not found Eq. (21.1) anywhere in the published literature except in Vol. I of these lectures.* So you can see that it is ... of a moving charge have been written in many other ... to limit ourselves here just to ... some results as

Feynman Lectures on Physics