

V. Electrodynamics before Maxwell

$$\begin{aligned}\nabla \cdot \mathbf{E} &= \frac{1}{\epsilon_0} \rho & \nabla \times \mathbf{B} &= \mu_0 \mathbf{j} \\ \nabla \cdot \mathbf{B} &= 0 & \nabla \times \mathbf{E} &= -\frac{\partial \mathbf{B}}{\partial t}\end{aligned}\tag{5.1}$$

Gauss's (electric + magnetic), Faraday's, and Ampère's laws.



Coulomb, Charles Augustin (1736-1806) a French Physicist. In 1785 Coulomb presented his three reports on Electricity and Magnetism:- *Premier Mémoire sur l'Electricité et le Magnétisme*, Histoire de l'Académie Royale des Sciences, 569-577, 1785. In this publication Coulomb describes "How to construct and use an electric balance (torsion balance) based on the property of the metal wires of having a reaction torsion force proportional to the torsion angle". Coulomb also determinates experimentally the law that explains how "two bodies electrified of the same kind of Electricity exert on each other".- *Sécond Mémoire sur l'Electricité et le Magnétisme*, Histoire de l'Académie Royale des Sciences, 578-611, 1785. In this publication Coulomb carries out the "determination according to which laws both the Magnetic and the Electric fluids act, either by repulsion or by attraction".- *Troisième Mémoire sur l'Electricité et le Magnétisme*, Histoire de l'Académie Royale des Sciences, 612-638, 1785. "On the quantity of Electricity that an isolated body losses in a certain time period, either by contact with less humid air, or in the supports more or les idio-electric".



Gauss, Carl Friedrich (1777-1855), German mathematician.



Faraday, Michael (1791-1867), English natural philosopher. In 1821, following the discovery by **Hans Christian Oersted** of electromagnetism, he discovered electromagnetic rotations, the principle behind the electric motor. In 1831 he discovered electromagnetic induction. In this work, Faraday effectively invented the first electric transformer and generator.



Ampère, André Marie (1775-1836), French scientist. His views on the relationship of electricity and magnetism were published in his *Recueil d'observations électrodynamiques* (*Collection of Observations on Electrodynamics*, 1822) and in his *Théorie des phénomènes électrodynamiques* (*Theory of Electrodynamical Phenomena*, 1826).