ment very convenient, he also was enabled to pass the ear-piece to gentlemen standing near him, while he held the cup on the part to be examined. I always thought it was his own invention. But, whether so or not, I do not think any great effort of genius was required to frame a flexible instrument, and then adapt it for the use of one or two ears. This being done, the next step would be to make two mouth-pieces to apply to the chest at different spots. Various modifications of these instruments have been made of late years, but the first notice of them I have any knowledge of in my reading is to be found in a letter to the "Lancet" of August 29, 1829, by Mr. Comins, of Edinburgh, headed "A Flexible Stethoscope." This was only twelve years after Laennec's invention. It is difficult from his description to picture the instrument, but it seems to have been composed of jointed tubes, and made for two ears as well as one. Mr. Comins expresses his surprise that the discoverer of mediate auscultation did not suggest a flexible instrument, as he says "it can be used in the highest ranks of society without offending fastidious delicacy."

A very interesting fact was first pointed out to me by Dr. Andrew Clark, with respect to a peculiarity of the binaural in the objective appreciation of sounds; that if each ear-piece be separately used, and any sound be made near the mouth-piece, it is heard in the ear itself, but, if the two pieces are employed together, the sound is heard at the spot where it is produced. The fact is very interesting in a physiological point of view, and further corroborates the theory as to the value of a double set of senses, or, in a word, of the body being made up of two halves, for just as the two hands feeling different parts of an object gain an idea of extension, and the two eyes by obtaining different views of any substance get a knowledge of its solidity, so in the same way the two ears listening to the same sound more thoroughly appreciate its objectivity.

If you look at this series of drawings you may perceive but little resemblance between the first figure and the last, but take them one by one and you will see that the figures are really progressive. My story of development is not imaginary, but historical.—*Lancet.*

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# Notes of a Course of Lectures on Electricity and Magnetism.

By Prof. W. Garnett.

INTRODUCTORY.

N. B.—These lectures were delivered in connection with the Cambridge University extension system of higher education.

It was noticed at a very early date that amber when rubbed had the power of attracting light bodies. Thales, of Miletus, mentioned this property about B.C. 600, and it is also referred to by Theophrastus and Pliny. The shocks of the Torpedo were mentioned by Pliny (A.D. 70) and by Aristotle.

Dr. Gilbert, of Colchester, Physician to Queen Elizabeth, may be regarded as the founder of the science of Electricity. He found that a very large number of bodies could be excited by friction so as to attract other bodies; but that a second very large class, including the metals, could not be so excited. He divided all bodies into the two classes of *electrics*, or bodies which could be excited by friction, and *non-electrics*, or bodies which could not be so excited.

Robert Boyle found that some bodies retained their electrification for a long time after the friction which excited it had ceased. He added several other bodies to Gilbert's list of *electrics*.

Otto von Guericke, about the middle of the seventeenth century, constructed the first electric machine by mounting a ball of sulphur on an axis, and causing it to rotate against the friction exerted by the hand. He noticed the light which accompanied the electric discharge, and also observed that when a light body was attracted by an electrified body, and came in contact with it, it was afterwards repelled. He also discovered electric *induction*, by observing that certain bodies placed near to strongly electrified bodies acquired the same powers of attraction as the electrified bodies themselves.

Sir Isaac Newton was the first to employ a glass globe in place of the sulphur globe of Vo Guericke. A machine similar to that of Newton was afterwards employed by Hawksbee.

Stephen Gray, in 1729, discovered that some bodies had the power of conducting electrification through their substance, while others did not allow of its transmission. He succeeded in conducting electricity to a distance of 886 feet by means of pack-thread supported by silk loops.

Desaguliers shewed that Gilbert's *electrics* were those bodies which had not the power of conducting electricity, while all conductors were *non-electrics*. About the same time Dufay found that all bodies could be electrified by friction if supported on insulatingstands. This established the true distinction between the so-called electrics and non-electrics. *Conductors* cannot be electrified by friction unless supported on insulating stands, because the electrification escapes to the earth as soon as generated. *Non-conductors*, or *insulators*, on the other hand, retain the electrification which has been imparted to them. The division of bodies into *electrics* and *non-electrics* consequently gave place to the division into *conductors* and *non conductors*.

Dufay also observed the dual character of electrification, and called that kind of electrification which is generally excited upon glass *vitreous*, while that which is excited upon resin, amber, sealing-wax, etc., he called *resinous*. Gray, Hawksbee, and Dr. Wall, all noticed a similarity between the electric discharge and thunder and lightning.

In the early part of the eighteenth century, Boze, of Wittenberg, added the prime conductor to the electric machine; Winkler, of Leipsic, employed a cushion instead of the hand for the excitation of the glass; and Gordon, of Erfurt, a Scotch Benedictine Monk, replaced Newton's globe by a glass cylinder.

The Leyden Jar, which serves for the accumulation of large charges of electricity, appears to have been accidentally discovered by Cuneus, a pupil of Muschenbroeck, of Leyden, about 1745. Cuneus was attempting to electrify water which was contained in a phial held in his hand, the connection between the electric machine and the water being made by a nail which passed through the cork. On touching the nail with the other hand after charging the water, he experienced a severe shock. The present form of the Leyden Jar is due to Sir William Watson, who enunciated the germ of the one fluid theory of electricity as now held.

In June, 1752, Franklin succeeded in collecting electricity from thunder clouds by means of his kite. In August, 1753. Professor Richman, of St. Petersburg, was killed by discharge from an iron rod which he had erected to collect electricity from the clouds.

Canton, in 1753, found that *ground* glass received resinous electricity when rubbed with flannel, and that generally the character of the electrification depends on the nature of the rubber as well as of the body rubbed.