Magnetism

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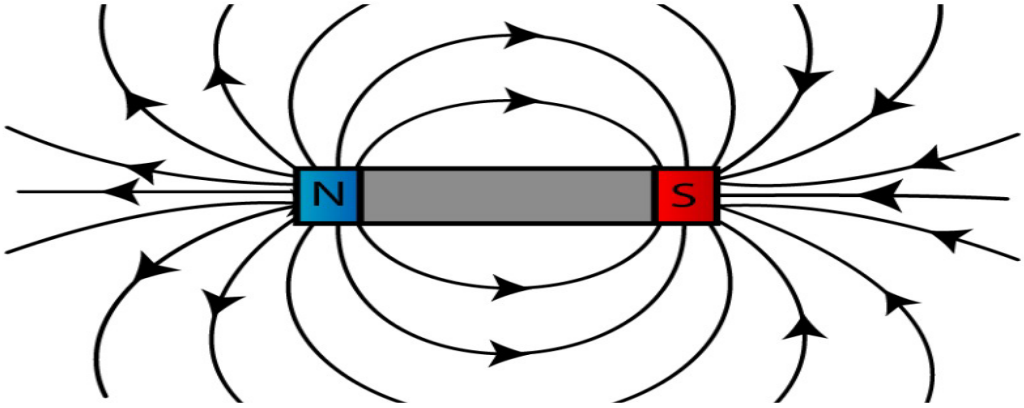
In layman's language, physics refers to the study of matter and energy, and their interaction. However, it is more than that. "Physics is a natural science based on experiments, measurements and mathematical analysis with the purpose of finding quantitative physical laws for everything from the nanoworld of the microcosmos to the planets, solar systems and galaxies that occupy the macrocosmos" (Norwegian University of Science and Technology, n.d., para. 1). This body of science can be used to understand and explain micro and macrocosmos, and machinery. This science is so wide such that it has been divided into various fields. Prior to the 17th century, mathematics was not widely used in the quantitative physical laws. However, Galilei and Newton did set the pace of using mathematics in physics, which led to the development of principles that explained how heavenly bodies move, three laws of motion, and gravity. Other discoveries such as laws of magnetism, electricity, radioactivity, quantum hypothesis, atomic theory, quantum mechanics, relativity, nuclear and elementary particle physics have been made and are useful in understanding nature. This paper will give a brief history of magnetism.

History of Magnetism

Magnetism is energy that is generated by the movement of electrons in a matter (ScienceStruck, 2017). Unlike gravity force, magnetic force field is strongest at the poles of the magnet. For instance, in the figure 1 below, the magnet is strongest at the North and South Pole. However, gravity is relatively uniform. That strength is influenced by the presence of imaginary line of force per unit of an area. A magnetic field can be formed as a result of magnetization or passing of electric current through metals. Some of the metals that react to magnetic field include, but are not limited to nickel, iron-metals, cobalt and their alloys.

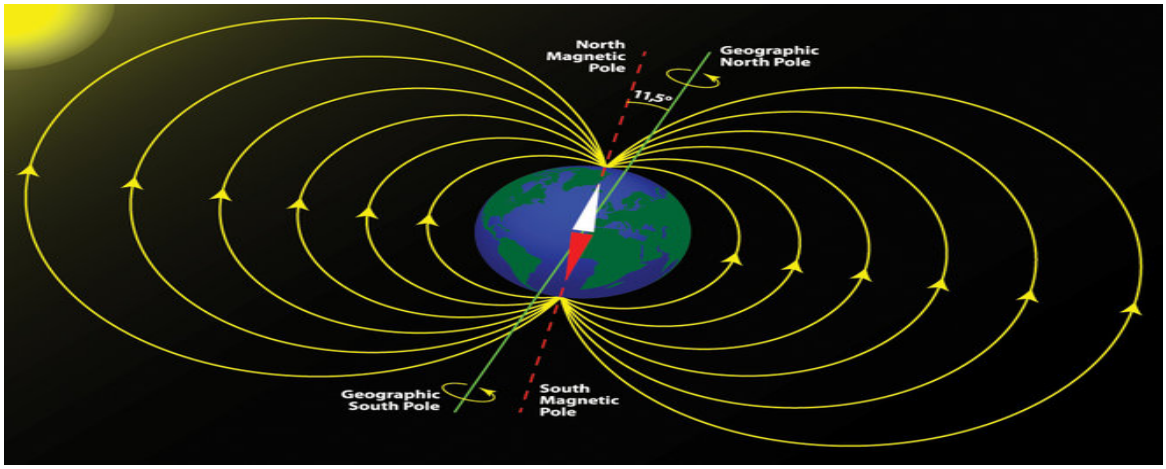
Figure 1



(JustScience, 2017, para. 1).

The history of magnetism can be traced about 600 B. C. Some Greek philosophers note that a lodestone or a magnetite (Fe3O4) was found in a natural state as a magnetic (Frenergy Magnets, n.d.). The magnetite attracted the iron nails of the shoes of the shepherd. Similarly, there are some recordings, which indicate that the Chinese used lodestone as a compass (ScienceStruck, 2017). About 1600, Dr. William Gilbert did a further study on magnetism and discovered that the earth was like a weak magnet (Frenergy Magnets, n.d.). The scientist argued that geographic poles were like magnetic poles as shown in the figure 2 below.

Figure 2



(Choi, 2012, para. 1)

Gilbert studies contributed further the findings of laws attraction and repulsion and he also came up with the idea of magnetic dip (Frenergy Magnets, n.d.). He held that one could strengthen a lodestone by making an alloy of this metal with soft iron. Moreover, he stated that steel and iron could be magnetized and discovered that magnet lost its magnetism when it became hot and regained it when it cooled. Gilbert is also remembered for differentiating between electric and magnetic attraction (Frenergy Magnets, n.d.). Between 1730 to 1785, there was a production of compound magnets and their commercialization by Gowen Knight and John Mitchell, respectively. In 1785, Charles Coulomb discovered that when two magnetized objects attract each other, "the attractive force between two magnetized objects is directly proportional to the product of their individual fields and inversely proportional to the square of the distance between them" (para. 7).

In the 19th century, Christian Oersted insinuated that there was a connection between electricity and magnetism in a lecture (Timm, 2015). In an experiment by Oersted, he found out that a wire became magnetized through electricity. Soon after, Strugeon discovered electromagnet. Six years from that discovery, Gauss in collaboration with Webar found out two instruments that would be used to measure voltage and electric current, electrodynamometer and magnometer (Frenergy Magnets, n.d.). During the 20th century, there were great breakthroughs in the field of magnetism. In 1905, Langevin contributed to this field by explaining the theory of paramagnetism and diamagnetism. A year later, ferromagnetic theory was developed by Weiss.

Moreover, during the early 1900s, K. Honda and T. Takai realized that one could increase the coercive power of permanent magnets by using merging cobalt with tungsten steel (Frenergy Magnets, n.d.). Also, during that period, there was an increase in magnetism application in the

business world by making steel magnets. As time progressed, Alnico magnet that was made of alloy of nickel, aluminum, and iron was produced. In the same period, there was an interest in application of magnetism in the transport system especially air and railway. The modern development and understanding of magnetism are based on Ising and Heisenberg, who elaborated the theory of quantum electrodynamics, interactions and motion of electrons (Frenergy Magnets, n.d.). Today, "the magnetic field or flux density is measured in metric units of a Gauss (G) and the corresponding international system unit of a Tesla (T). The magnetic field strength is measured in metric units of Oersteds (Oe) and international units of amperes per meter (A/m)" (Magnetism - Measurement of Magnetic Field, n.d., para. 1). Further, one that is produced by a current standing wire is measured using this formula;

$$B = \frac{\mu_0 I}{2\pi \mathrm{r}} \text{ (long straight wire)}$$

(College Physics, n.d., para. 3)

Conclusion

Therefore, the first discovery of a magnet was made by a shepherd, which was recorded by Greek philosophers. Nonetheless, there were indications that lodestone was being used by Chinese to navigate direction. As time progressed various scientists contributed to the understanding of this field to what is known today.

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