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Electricity



References:

1. Jones, D.A., "Electrical engineering: the backbone of society", *Proceedings of the IEE: Science, Measurement and Technology* 138 (1): 1–10
2. Moller, Peter (December 1991), "Review: Electric Fish", *BioScience* 41 (11): 794–6 [794]
3. Bullock, Theodore H. (2005), *Electroreception*, Springer, pp. 5–7, [ISBN 0387231927](#)
4. Morris, Simon C. (2003), *Life's Solution: Inevitable Humans in a Lonely Universe*, Cambridge University Press, pp. 182–185, [ISBN 0521827043](#)
5. The [Encyclopedia Americana](#) *The Encyclopedia Americana; a library of universal knowledge* (1918), [New York: Encyclopedia Americana Corp](#)
6. Stewart, Joseph (2001), *Intermediate Electromagnetic Theory*, World Scientific, p. 50, [ISBN 9-8102-4471-1](#)
7. Simpson, Brian (2003), *Electrical Stimulation and the Relief of Pain*, Elsevier Health Sciences, pp. 6–7, [ISBN 0-4445-1258-6](#)
8. Frood, Arran ([27 February 2003](#)) *Frood, Arran (27 February 2003), Riddle of 'Baghdad's batteries'*, BBC, <http://news.bbc.co.uk/1/hi/sci/tech/2804257.stm>, retrieved on 2008-02-16
9. Baigrie, Brian (2006), *Electricity and Magnetism: A Historical Perspective*, Greenwood Press, pp. 7–8, [ISBN 0-3133-3358-0](#)
10. Chalmers, Gordon (1937), "The Lodestone and the Understanding of Matter in Seventeenth Century England", *Philosophy of Science* 4 (1): 75–95
11. Srodes, James (2002), *Franklin: The Essential Founding Father*, Regnery Publishing, pp. 92–94, [ISBN 0895261634](#) *It is uncertain if Franklin personally carried out this experiment, but it is popularly attributed to him.*

12. [Uman, Martin](#) Uman, Martin (1987) (PDF). [All About Lightning](#) Uman, Martin (1987) (PDF). *All About Lightning*. Dover Publications. [ISBN 048625237X](#) Uman, Martin (1987) (PDF). *All About Lightning*. Dover Publications. ISBN 048625237X.
http://ira.usf.edu/CAM/exhibitions/1998_12_McCollum/supplemental_didactics/23.Uman1.pdf
13. Kirby, Richard S. (1990), *Engineering in History*, Courier Dover Publications, pp. 331–333, [ISBN 0486264122](#)
14. Marković, Dragana, [The Second Industrial Revolution](#) Marković, Dragana, *The Second Industrial Revolution*, http://www.b92.net/eng/special/tesla/life.php?nav_id=36502, retrieved on 2007-12-09
15. Trefil, James (2003), *The Nature of Science: An A-Z Guide to the Laws and Principles Governing Our Universe*, Houghton Mifflin Books, p. 74, [ISBN 0-6183-1938-7](#)
16. Duffin, W.J. (1980), *Electricity and Magnetism*, 3rd edition, McGraw-Hill, pp. 2–5, [ISBN 007084111X](#)
17. Sears, et al., Francis (1982), *University Physics, Sixth Edition*, Addison Wesley, p. 457, [ISBN 0-2010-7199-1](#)
18. "The repulsive force between two small spheres charged with the same type of electricity is inversely proportional to the square of the distance between the centres of the two spheres." Charles-Augustin de Coulomb, *Histoire de l'Academie Royal des Sciences*, Paris 1785.
19. Duffin, W.J. (1980), *Electricity and Magnetism*, 3rd edition, McGraw-Hill, p. 35, [ISBN 007084111X](#)
20. National Research Council (1998), *Physics Through the 1990s*, National Academies Press, pp. 215–216, [ISBN 0309035767](#)
21. Umashankar, Korada (1989), *Introduction to Engineering Electromagnetic Fields*, World Scientific, pp. 77–79, [ISBN 9971509210](#)
22. Hawking, Stephen (1988), *A Brief History of Time*, Bantam Press, p. 77, [ISBN 0-553-17521-1](#)

23. *Shectman, Jonathan (2003), Groundbreaking Scientific Experiments, Inventions, and Discoveries of the 18th Century, Greenwood Press, pp. 87–91, [ISBN 0-3133-2015-2](#)*
24. *Sewell, Tyson (1902), The Elements of Electrical Engineering, Lockwood, p. 18. The Q originally stood for 'quantity of electricity', the term 'electricity' now more commonly expressed as 'charge'.*
25. *Close, Frank (2007), The New Cosmic Onion: Quarks and the Nature of the Universe, CRC Press, p. 51, [ISBN 1-5848-8798-2](#)*
26. *Ward, Robert (1960), Introduction to Electrical Engineering, Prentice-Hall, p. 18*
27. *Solyman, L. (1984), Lectures on electromagnetic theory, Oxford University Press, p. 140, [ISBN 0-19-856169-5](#)*
28. *Duffin, W.J. (1980), Electricity and Magnetism, 3rd edition, McGraw-Hill, pp. 23–24, [ISBN 007084111X](#)*
29. *Berkson, William (1974), Fields of Force: The Development of a World View from Faraday to Einstein, Routledge, p. 370, [ISBN 0-7100-7626-6](#) Accounts differ as to whether this was before, during, or after a lecture.*
30. *Bird, John (2007), Electrical and Electronic Principles and Technology, 3rd edition, Newnes, p. 11, ISBN 0-978-8556-6*
31. *Bird, John (2007), Electrical and Electronic Principles and Technology, 3rd edition, Newnes, pp. 206–207, ISBN 0-978-8556-6*
32. *Bird, John (2007), Electrical and Electronic Principles and Technology, 3rd edition, Newnes, pp. 223–225, ISBN 0-978-8556-6*
33. *Sears, et al., Francis (1982), University Physics, Sixth Edition, Addison Wesley, pp. 469–470, [ISBN 0-2010-7199-1](#)*
34. *Sears, et al., Francis (1982), University Physics, Sixth Edition, Addison Wesley, p. 479, [ISBN 0-2010-7199-1](#)*

Electricity





Electricity (from New Latin *ēlectricus*, "amber-like") is a general term that **encompasses** Electricity (from New Latin *ēlectricus*, "amber-like") is a general term that encompasses a variety of phenomena resulting from the presence and flow of electric charge. These **include** Electricity (from New Latin *ēlectricus*, "amber-like") is a general term that encompasses a



term that encompasses a

In general usage, the word 'electricity' is adequate to refer to a number of physical effects.

HoweverIn general usage, the word 'electricity' is adequate to refer to a number of physical effects. However, in scientific usage, the term is **vague**In general usage, the word 'electricity' is adequate to refer to a number of physical effects. However, in scientific usage, the term is vague, and these related, but **distinct**In general usage, the word 'electricity' is adequate to refer to a number of physical effects. However,





Electric charge – a property – a property of some subatomic – a property of some subatomic particles, which determines their electromagnetic interactions. Electrically charged matter is influenced by, and produces, electromagnetic fields

Electric field – an influence – an influence produced by an electric charge on other charges in its vicinity.

Electric potential – the capacity of an electric field to do work, typically measured in volts.



Electric current – a movement or flow of electrically charged particles, typically measured in amperes.

Electromagnetism – a fundamental interaction between the electric field and motion of electric charge.





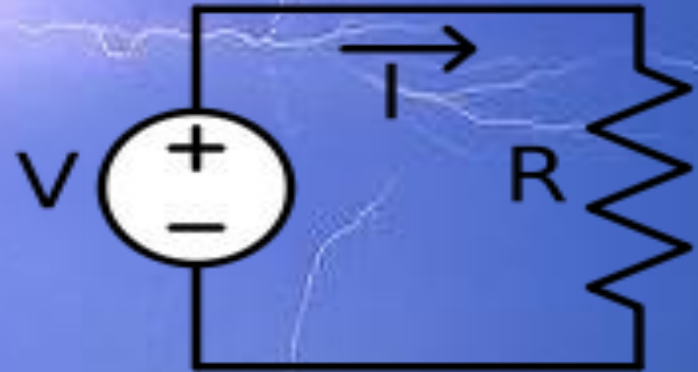
Benjamin Franklin conducted extensive research on electricity in the 18th century



The background is a complex, abstract composition of numerous overlapping, glowing lines and patterns. The colors are vibrant and varied, including shades of purple, blue, green, yellow, and red. The lines are of varying thickness and length, some forming circular or spiral shapes, while others are straight and intersecting. The overall effect is one of dynamic energy and intricate connectivity, reminiscent of a complex circuit board or a data network visualization.

Electric circuits

An electric circuit is an interconnection of electric components, usually to perform some useful task, with a return path to enable the charge to return to its source. The components in an electric circuit can take many forms, which can include elements such as resistors, capacitors, switches, transformers and electronics. Electronic circuits contain active components, usually semiconductors, and typically exhibit non-linear behaviour, requiring complex analysis. The simplest electric components are those that are termed passive and linear: while they may temporarily store energy, they contain no sources of it, and exhibit linear responses to stimuli.



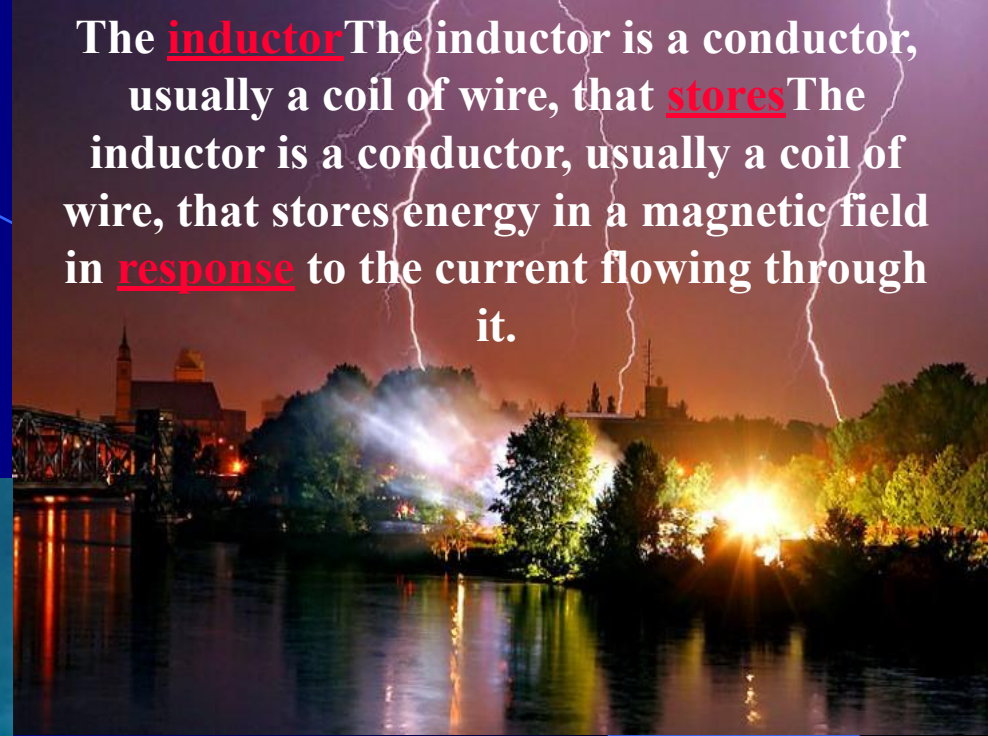
A basic electric circuit. The voltage source V on the left drives a current I around the circuit, delivering electrical energy into the resistance R . From the resistor, the current returns to the source, completing the circuit.

The capacitor is a device **capable** of storing charge, and thereby storing electrical energy in the resulting field. It consists of two conducting **plates** separated by a thin insulating layer, in practice, thin metal foils are coiled together, increasing the surface area per unit volume and therefore

The capacitor is a device capable of storing charge, and named after Michael Faraday, and given the symbol F; one farad is the capacitance that develops a potential difference of one volt when it stores a charge of one **coulomb**.

The **inductor** is a conductor, usually a coil of wire, that **stores** energy in a magnetic field in **response** to the current flowing through it.

When the current changes, the magnetic field does too, inducing a voltage between the **ends** of the conductor. The magnetic field does too, inducing a voltage between the ends of the conductor. The **induced** voltage is proportional to the time rate of change of the current. The constant of proportionality is termed the inductance. The unit of inductance is the henry, named



Production and uses



Generation



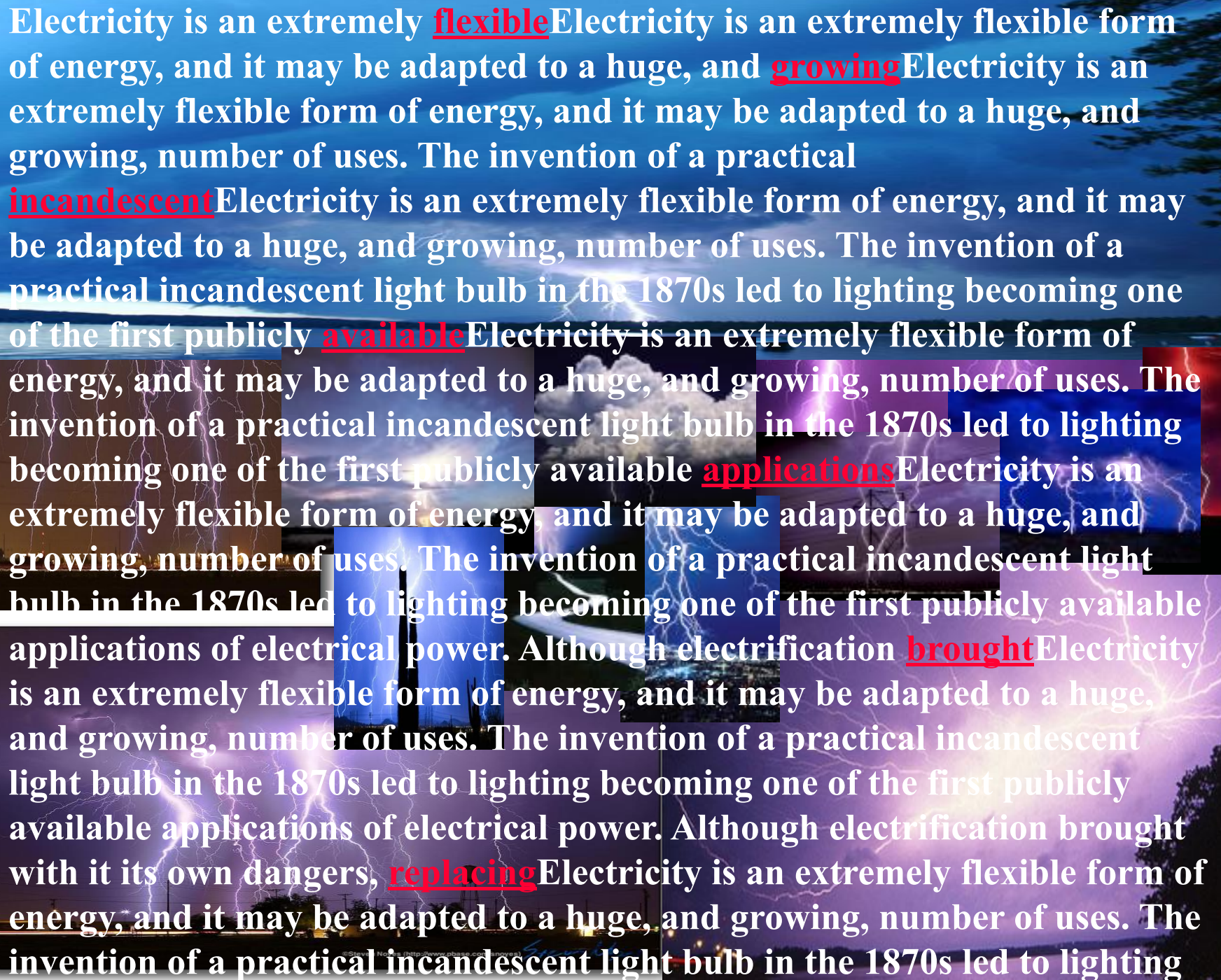
Electrical energy is usually generated by electro-mechanical generators driven by steam produced from **fossil** Electrical energy is usually generated by electro-mechanical generators driven by steam produced from fossil fuel **combustion** Electrical energy is usually generated by electro-mechanical generators driven by steam produced from fossil fuel combustion, or the heat released from nuclear **reactions** Electrical energy is usually generated by electro-mechanical generators driven by steam produced from fossil fuel combustion, or the heat released from nuclear reactions; or from other sources such as kinetic energy extracted from wind or flowing water. Such generators bear no **resemblance** Electrical energy is usually generated by electro-mechanical generators driven by steam produced from fossil fuel combustion, or the heat released from nuclear reactions; or from other sources such as kinetic energy extracted from wind or flowing water. Such generators bear no resemblance to Faraday's homopolar disc generator of 1831, but they still rely on his electromagnetic



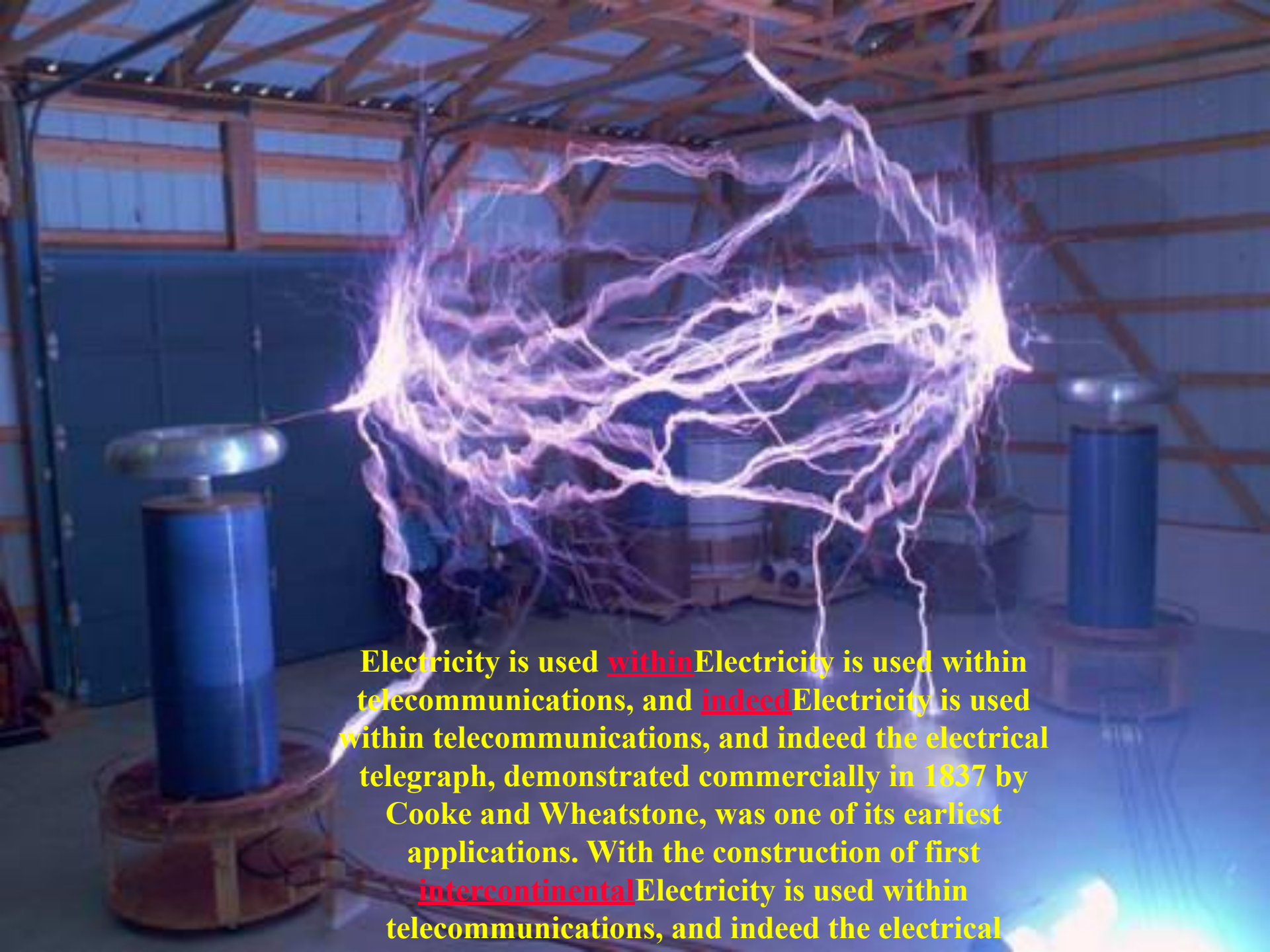
Demand Demand for electricity grows with great rapidity. Demand for electricity grows with great rapidity as a nation modernizes and its economy develops. The United States showed a 12% increase Demand for electricity grows with great rapidity as a nation modernizes and its economy develops. The United States showed a 12% increase in demand during each year of the first three decades of the twentieth century, a rate of growth that is now being

Uses





Electricity is an extremely **flexible** Electricity is an extremely flexible form of energy, and it may be adapted to a huge, and **growing** Electricity is an extremely flexible form of energy, and it may be adapted to a huge, and growing, number of uses. The invention of a practical **incandescent** Electricity is an extremely flexible form of energy, and it may be adapted to a huge, and growing, number of uses. The invention of a practical incandescent light bulb in the 1870s led to lighting becoming one of the first publicly **available** Electricity is an extremely flexible form of energy, and it may be adapted to a huge, and growing, number of uses. The invention of a practical incandescent light bulb in the 1870s led to lighting becoming one of the first publicly available **applications** Electricity is an extremely flexible form of energy, and it may be adapted to a huge, and growing, number of uses. The invention of a practical incandescent light bulb in the 1870s led to lighting becoming one of the first publicly available applications of electrical power. Although electrification **brought** Electricity is an extremely flexible form of energy, and it may be adapted to a huge, and growing, number of uses. The invention of a practical incandescent light bulb in the 1870s led to lighting becoming one of the first publicly available applications of electrical power. Although electrification brought with it its own dangers, **replacing** Electricity is an extremely flexible form of energy, and it may be adapted to a huge, and growing, number of uses. The invention of a practical incandescent light bulb in the 1870s led to lighting



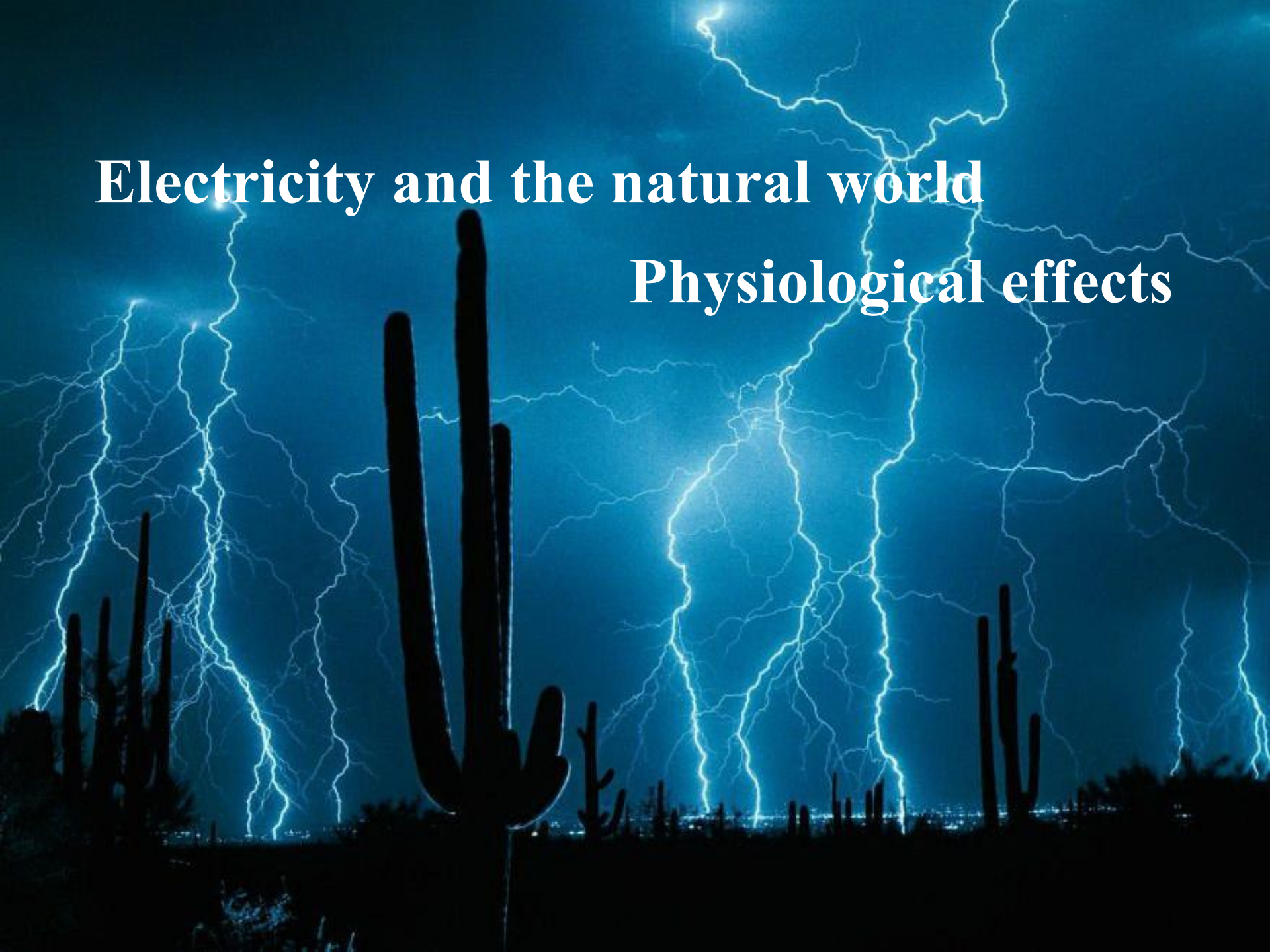
Electricity is used within Electricity is used within telecommunications, and indeed Electricity is used within telecommunications, and indeed the electrical telegraph, demonstrated commercially in 1837 by Cooke and Wheatstone, was one of its earliest applications. With the construction of first intercontinental Electricity is used within telecommunications, and indeed the electrical

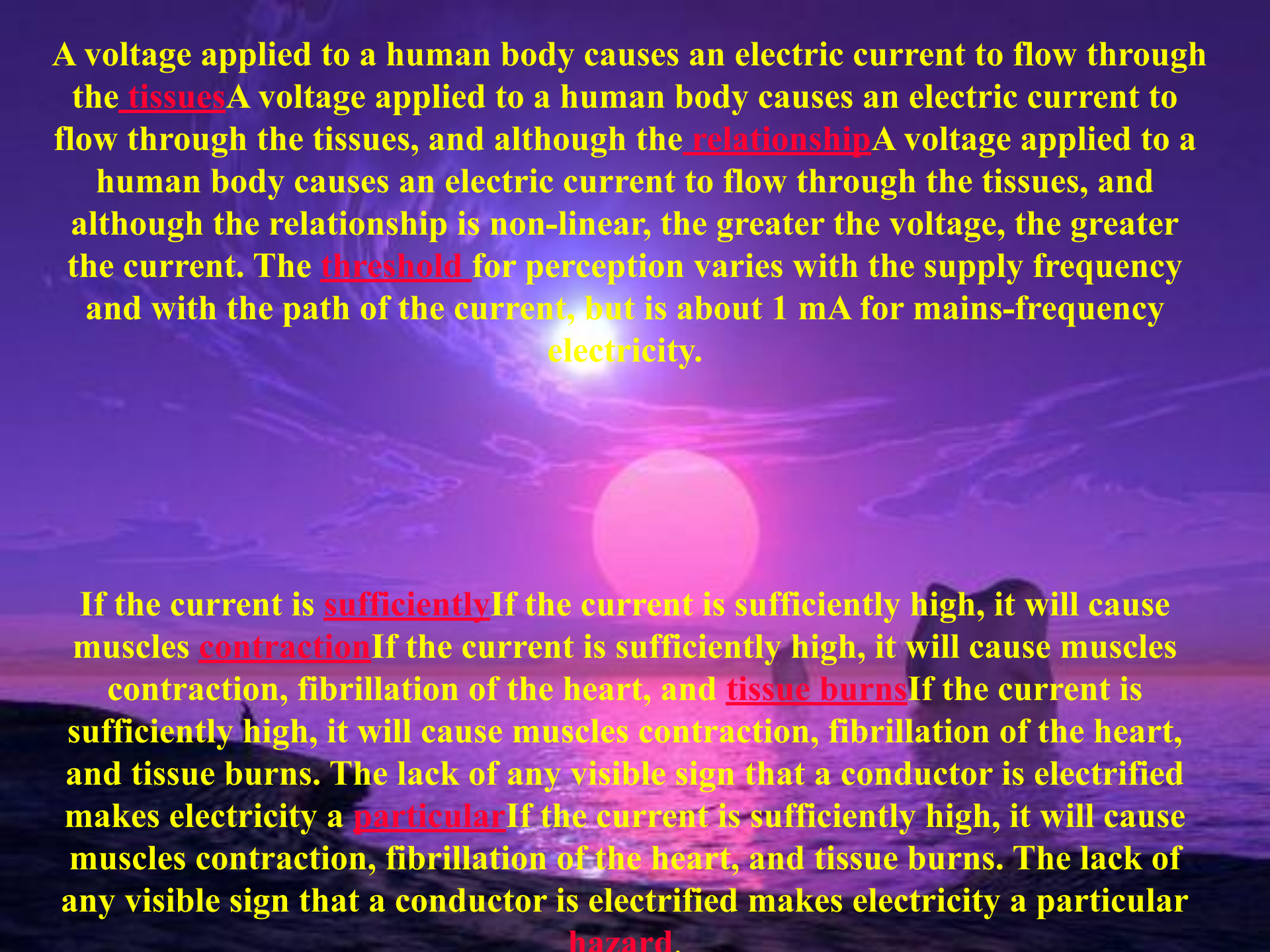


Optical fibre and satellite Optical fibre and satellite communication technology have taken Optical fibre and satellite communication technology have taken a share of the market for communications systems, but electricity can be expected to remain an essential part of the process.

Electricity and the natural world

Physiological effects



A sunset over a body of water with a person's silhouette in the foreground. The sun is a large, bright orange circle in the center, with rays of light extending outwards. The sky is a mix of orange, yellow, and blue. The water is dark blue with some white foam from waves. A person's silhouette is visible in the lower right foreground, looking out at the water.

A voltage applied to a human body causes an electric current to flow through the tissues. A voltage applied to a human body causes an electric current to flow through the tissues, and although the relationship is non-linear, the greater the voltage, the greater the current. The threshold for perception varies with the supply frequency and with the path of the current, but is about 1 mA for mains-frequency electricity.

If the current is sufficiently high, it will cause muscles contraction, fibrillation of the heart, and tissue burns. The lack of any visible sign that a conductor is electrified makes electricity a particular hazard.

The pain The pain caused by an electric shock The pain caused by an electric shock can be intense, leading electricity at times to be employed as a method of torture. Death caused by an electric shock is referred to as electrocution.



Electrocution is still Electrocutation is still the means of judicial execution Electrocutation is still the means of judicial execution in some

END

