PHYSICS

science & technology
Department:
Science and Technology
REPUBLIC OF SOUTH AFRICA

Improves Quality of Life
Makes the World Beautiful!

PHYSICS is the branch of science concerned with the study of matter, energy, the universe and the fundamental laws that govern them

PHYSICS is about solving daily problems and understanding how the world works, and so physicists are brilliantly equipped to deal with all sorts of issues, from technological challenges, chaotic financial problems, to complex strategic planning

SPOT THE PHYSICS - ANYWHERE ANY TIME

1. LCD screens on the wall, phones and laptop
2. Solar powered LED backup lights
3. Microprocessors and transistors in electronic gadgets
4. Accurate time via satellite
5. Battery technologies for phones, laptop and watch
6. Accurate measurement of weights of trade items such as chips, drinks and bread
7. Digital Camera Chips
8. Spectacles Optics
9. Eye sight corrected by Laser Surgery
10. Facial Cosmetics and Sunscreen from Nanomaterials
11. WiFi Radio Network to access internet
12. Novel paint design using Nano powders
13. Stain free clothes with nanoparticles
14. Material Physics for electronic devices casings

PHYSICS is the basis for science, engineering and technology thus in order to increase human capital in science engineering and technology more learners must study physical science at high school

PHYSICS plays the role of the canary in the mine in the sense that if Physics gets seriously ill, it is a warning that science and technology as a whole, and hence the growth of a knowledge-based economy, are in grave danger

SOUTH AFRICAN INSTITUTE OF PHYSICS

National Science Week

NRF National Research Foundation | SAASTA South African Agency for Science and Technology Advancement

PHYSICS discoveries are integrated into our daily lives making us comfortable

1. Do you use the internet, cell phone, GPS or a computer?
2. Did you check your watch, cell phone or computer for time?
3. Do you visit the shops to buy some kilograms of meat, rice or sugar?
4. Do you relax by play video games, watching a movie, listening to radio, playing a CD or DVD?
5. Do you check weather forecast before you travel or choose clothing?
6. Have you visited a doctor for any form of imaging, whether sonar for your unborn baby, MRIs, CAT scans or x-rays to find broken bones or cancerous tumour?
7. Do you know someone who owes their survival to radiation therapy?

PHYSICS discoveries have made all the above possible!

PHYSICS in society

- **PHYSICS** improves health; (MRI and XRAY etc)
- **PHYSICS** connects the World; (Satellites, fibre optics s and dishes, telephone, WiFi, etc)
- **PHYSICS** brings high-technology; (Computers, LCD's, electronic components such as ICs, circuits resistors capacitors)
- **PHYSICS** lights up our world (Nuclear power, solar power, bulbs, LED lights etc)
- **PHYSICS** drives big scientific research (CERN, Large Hadron Collider, SKA, SAAO, nanotechnology)
- **PHYSICS** fills our homes; (Solar lights, CDs, radios, plasma screens, microwaves ovens, video games)
- **PHYSICS** keeps us safe (Seismology earth quarks, weather-focus, military radar systems)
- **PHYSICS** moves us around the world (Car GPS, aeroplanes etc)

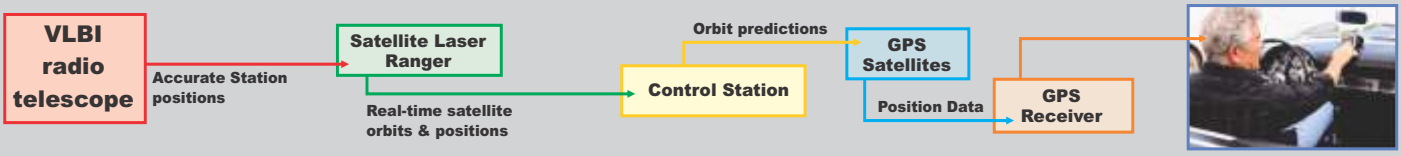
PHYSICS drives sustainable Socio-Economic Development through creation of various industries

INDUSTRIAL SECTOR	PHYSICS CONCEPTS EMPLOYED	EXAMPLES
Liquid Crystal Display - LCDs were first developed for pocket calculators and digital wristwatches in the 1970s	• Condensed-matter physics • Optical physics • Materials physics • Physical chemistry • Mathematics	• TV displays • Cellphone Displays • Computer screens • Global market for flat-panel displays is now worth about R2,1 trillion, of which LCDs form the largest segment
Plastic electronics - A new technology promises light-weight and flexible electronic devices. Semi-conductors are the foundation of modern electronics. Plastic is widely used because it is cheap and easy to make and handle. Plastic electronics can create new sources of light for homes and offices, generate electricity from the most abundant source of power on the planet - sunlight - and be used to make cheap, disposable medical devices.	• Molecular physics • Materials processing • Semiconductor physics • Optics	• Flexible Lighting e.g curtains that emit light could even form part of soft Solar power – flexible solar panels • Medical devices - Plastic electronics are being used to develop portable, point-of-care medical devices capable of chieving similar results to much more expensive laboratory-based instruments • Screens and displays Carbon-based light-emitting devices are found in sleek, lightweight products such as some of the latest smartphones, and are a complementary technology to LCDs. • R1,2 trillion the predicted global worth of plastic electronics by 2022 • R7 trillion the estimated worth of the global carbon business by 2032
Radio-frequency identification tags - A radio-frequency identity (RFID) system consists of a small electronic chip embedded in a plastic tag or card, and a radio-frequency transmitter and receiver, which reads the chip, depending on the type of tag, when it is anything between a centimetre and 100m away	• Electromagnetism • Semiconductor physics • Materials science	• The RFID market was worth R154 billion worldwide in 2012, according to market analyst IDTechEx. • Public transport - Gautrain card • Bank cards • Access cards at University or work • Passports and ID cards for national security in some countries • R520 bn the projected value of the RFID market by 2022

INDUSTRIAL SECTOR	PHYSICS CONCEPTS EMPLOYED	EXAMPLES
Space Industry - has helped to spur globalisation by cutting the cost of communication, revolutionised telecom-munications, broadcasting and internet access, all of which have increased overall productivity	• Classical mechanics • Materials science • Magnetohydrodynamic • Condensed-matter physics	• DSTv in your home • The GPS system • Military and security • Earth observation and early warning systems
Optical fibres - Light-carrying glass fibres have transformed communications and medicine. Optical fibres are fine threads of glass, comprising a core and cladding that are approximately the same width as human hair, which can transmit light over long distances. They have revolutionized telecom-munications, transmitting more information over greater distances than could ever be achieved with copper wires, enabling the spread of broad-band networks and the many services that depend on them.	• Optics • Optoelectronics • Lasers • Photonics	• Telecommunications - SECOM Cable for SA, SANREN network • Medicine - One of the first uses of optical fibres was in the endoscope, which allows doctors to see inside patients' bodies without expensive and invasive surgery. • 40% of bowel cancer operations are now performed via keyhole surgery • Sensors - Optical fibres make excellent and inexpensive sensors for environmental, chemical and biological monitoring in such places as mines, oil wells and other remote locations. • The world market for fibre-optic components alone was around R620 bn in 2015. • In 2011, 217 million kilometres of optical fibre were produced globally – most of it for optical communications cables – and the market is doubling each year.
Cancer treatment - Research into the nature of matter and the structure of the universe has led to life-saving techniques to diagnose and treat cancer. One in three people will get cancer at some point in their lives. More than half of cancer patients will receive radiotherapy as part of their treatment, and radiotherapy contributes about 40% to the successful treatment of cancer. Half of the world's 20,000 particle accelerators are in use in hospitals, and each can treat between 4500 and 6500 patients per year.	• Medical physics • Electromagnetism • Particle physics • Nuclear physics • Astrophysics • Atomic and molecular physics • Acoustics • Materials science • Computational physics	• 10,000 hospital particle accelerators worldwide, treat 4500–6500 patients per year each • Locally we have iThemba labs • Cancer diagnostics techniques based on physics **Computed tomography** - Computed tomography (CT) scanners use X-rays to 1. produce 3D images of the internal anatomy, using sophisticated software to reconstruct the image. 2. Single photon emission computed tomography - A single photon emission computed tomography (SPECT) scan is a non-invasive nuclear imaging test that shows the blood flow to tissues 3. and organs and is widely applied in oncology 4. Positron emission tomography - Positron emission tomography (PET) uses positrons to produce functional images of the body 5. Magnetic resonance imaging - Magnetic resonance imaging (MRI) uses very high magnetic fields and rapidly varying electro-magnetic fields to detect the distribution of protons in the body and so create 3D images of the organs. 6. Ultrasound - In ultrasound scans, high-frequency sound waves are used to create an image of part of the inside of the body. **Cancer treatment** Radiation kills cells, particularly cancer cells, by disrupting DNA and preventing the cells from reproducing. Radiation can be delivered in several ways: 1. External beam radiotherapy 2. Brachytherapy 3. Boron neutron capture therapy
Energy Provision - Physics is providing a multitude of ways to reduce energy use, significantly reducing both costs and carbon-dioxide emissions. Research in renewable energies.	• Opto-electronics • Semiconductors • Condensed-matter physics • Low temperature physics • Materials science • Thin films • Plasma physics • Photovoltaics	• **LED light bulbs** are now available to replace any standard household bulb. They use around six times less electricity than an incandescent light bulb, and 70% of the electricity of a compact fluorescent light (CFL) bulb. They can last for around 50,000 hours • **Energy-efficient windows** It was first demonstrated in the 1970s that a thin film of metal oxide could be deposited onto glass to make windows much more energy efficient. • **Heating and cooling materials** - Phase-change materials (PCMs) are a recent innovation that is helping to significantly reduce the amount energy required • **Wind and solar energy**

INDUSTRIAL SECTOR	PHYSICS CONCEPTS EMPLOYED	EXAMPLES
Data storage - The Nobel prize-winning discovery by physicists made it possible to store vast amounts of data in tiny devices – creating the media revolution. The phenomenon of giant magnetoresistance (GMR) enabled the development of ultra-sensitive read-out heads that are able to detect these tiny signals.	• Condensed-matter physics • Quantum electronics • Semiconductor physics· Spintronics • Electrostatic physics	• The global market for hard disk drives is currently around R760 bn. • 3x the annual rate of increase in hard disk storage capacity trebled in the years following the commercialization of GMR • 10,000x more data is now stored on a typical hard drive than those before GMR • 4 mb the capacity of the earliest hard drives, which were the size of a large refrigerator and weighed nearly a tonne • 4 tb (4 million megabytes) the capacity of the latest hard drives, which are 20 cubic centimetres and weigh less than • 50 grams
Satellite timing and navigation - Einstein's discoveries underpin technology used by satellite-navigation systems and precise timing	• Quantum mechanics atomic physics • Space science • Satellite technology • Atmospheric and solar science • General relativity	• Transport - GPS, used for accurate navigation, • Precision-time measurements - With its very reliable time signal, the GPS system is used to provide a very accurate measurement of time for terrestrial applications. Many areas of huge economic importance are dependent upon the GPS time signals - including financial services, computer systems, mobile communication, security and energy supply. Global stock trading among others
Metrology and Trade – We really on measurements for trade, health and engineering. When you buy a kg of meat, do you know that physics is involved in defining what a kg is? When you pay for electricity do you know physics is involved in defining what a kWhr of electricity is? When you visit a doctors and he measures your temperature do you know physics is involved in defining what a degree Celsius?	• Electromagnetism • Mechanics • Nuclear physics • Material science • Photonics and laser physics	**The seven base units** • **Unit of length (meter)** The meter is the length of the path travelled by light in vacuum during a time interval of 1/299 792 458 of a second. • **Unit of mass (kilogram)** The kilogram is the unit of mass; it is equal to the mass of the international prototype of the kilogram. • **Unit of time (second)** The second is the duration of 9 192 631 770 periods of the radiation corresponding to the transition between the two hyperfine levels of the ground state of the cesium 133 atom. • **Unit of electric current (ampere)** The ampere is that constant current which, if maintained in two straight parallel conductors of infinite length, of negligible circular cross-section, and placed 1 meter apart in vacuum, would produce between these conductors a force equal to 2 x 10-7 newton per meter of length. • **Unit of thermodynamic temperature (kelvin)** The kelvin, unit of thermodynamic temperature, is the fraction 1/273.16 of the thermodynamic temperature of the triple point of water. • **Unit of amount of substance (mole).** The mole is the amount of substance of a system which contains as many elementary entities as there are atoms in 0.012 kilogram of carbon 12; its symbol is "mol." • **Unit of luminous intensity (candela)** The candela is the luminous intensity, in a given direction, of a source that emits monochromatic radiation of frequency 540 x 1012 hertz and that has a radiant intensity in that direction of 1/683 watt per steradian.
Geophysics Industry, which uses methods such as seismic, gravitational, magnetic, electrical and electromagnetic waves on surface of the earth to detect or infer the presence and position of economically useful geological deposits, such as ore minerals; fossil fuels and other hydrocarbons; geothermal reservoirs; and groundwater reservoirs.	• Geophysics • Seismology • Semiconductor Physics • Electromagnetism • Mechanics • Nuclear physics	• Mineral exploration geophysics • Gas sensors in mines • Rock Mechanics
Automotive and Transport	• Opto-electronics • Semiconductors • Materials science • Mechanics • Fluid Mechanics	• Aeroplane wings design • Racing cars design • LED lights on AUDI cars • Various sensors used in both cars and aeroplanes

PHYSICS in South Africa at HartRAO Radio Astronomy Facility



All navigational systems such as those used in cars, aeroplanes and handheld devices, use Global Navigation Satellite Systems (GNSS) data such as the Global Positioning System (GPS - the USA's navigational satellite system) to determine instantaneous positions. From these, velocity, estimated arrival time, etc. can be calculated.

For these devices to work accurately, they must get signals from at least 4 GPS satellites. These GPS satellites in turn must know their own position (or orbit) accurately, otherwise they will be unable to provide the device with accurate positioning data. Satellite Laser Ranging (SLR) is used from all over the globe to accurately measure these GPS satellite orbits. This involves measuring the time it takes for a short, bright laser pulse to travel from the ranging station to a satellite and back. This provides a range determination at the centimetre level of precision. These measurements are accumulated to provide accurate orbits for navigational satellites. The orbital data are sent to a central control station where the data is processed to accurately predict the satellite orbit in the near future.These predictions are then uploaded to the GPS satellites.

Very Long Baseline Interferometry (VLBI) must in turn be used to obtain accurate positions of the Satellite Laser Ranging stations. This technique, developed in radio astronomy, provides extremely high resolution images (as though measured by a telescope with the diameter of the entire Earth) as well as millimetre-level accuracy of the telescopes position relative to the galactic centre. VLBI is therefore the standard ruler against which all other techniques in Earth measurement are calibrated.

The diagram shows how all these techniques are required to provide the Navigational Devices (Global Positioning Sysytem - GPS - receivers) with data. These GPS devices humankind uses daily across the Globe to find positional information on the Earth's surface. The Hartebeesthoek Radio Astronomy Observatory (HartRAO) is the ONLY fully operational radio telescope in Africa at the current time. At the HartRAO site the three above mentioned techniques for measuring positions on Earth's surface are co-located (VLBI, SLR, together with a a GPS base station). Should the HartRAO telescope drop out of the world-wide GNSS system, all GPS receivers across the entire world would be seriously compromised.

PHYSICS in South Africa at South African Astronomical Observatory (SAAO)
Is the national centre for optical and infrared astronomy in South Africa, its prime function is to conduct fundamental research in astronomy and astrophysics. ***http://www.saao.ac.za/***

PHYSICS in South Africa at Square Kilometre Array Radio Telescope (SKA)
Will be the world's biggest telescope - and one of the biggest scientific projects - ever! Scientists will use it to help us understand how the Universe evolved, how stars and galaxies form and change, and what "dark matter" really is. Scientists expect that the SKA will make new discoveries that we can't even imagine now. They may even find life elsewhere in the Universe! ***http://www.ska.ac.za***

PHYSICS in South Africa at iThemba Labs
The iThemba Laboratory for Accelerator-Based Sciences is a group of multi-disciplinary research laboratories that provide basic and applied research using particle beams, particle radiotherapy for the treatment of cancer, supply of accelerator-produced radioactive isotopes for nuclear medicine and research. ***http://tlabs.ac.za/***

PHYSICS in South Africa at Nuclear Energy Cooperation (NECSA)
Necsa carries out research in radioactivity radiation safety, offers services such as regulation of nuclear industry, production of industrial isotopes, positron emission tomography (PET) for imaging. More details available at ***www.necsa.co.za***

PHYSICS in South Africa at National Laser Centre (CSIR - NLC)
NLC carries out laser physics research to improve laser technology in manufacturing; to develop novel laser sources; to develop light activated bio-nanodevices and to improve various therapeutic and diagnostic medical applications of lasers ***http://www.csir.co.za/lasers/overview_nlc.html***

PHYSICS in South Africa at National Metrology Institute of South Africa (NIMSA)
Is responsible for maintaining the SI units and to maintain and develop primary scientific standards of physical quantities for SA and compare those standards with other national standards to ensure global measurement equivalence. It must also provide reference analysis in the case of a measurement disputes. ***http://www.nmisa.org***

PHYSICS in South Africa at Centre for Quantum Computing at UKZN
Carries out research in applications of quantum physics in Quantum Information Processing and Communication, Computational Physics, Quantum Optics, Quantum Key Distribution and Quantum Biology. ***http://quantum.ukzn.ac.za/***

PHYSICS in South Africa at The National Institute for Theoretical Physics (NITheP)
facility that Leads research programmes and educational opportunities in the field of theoretical physics.
http://www.nithep.ac.za/

PHYSICS in South Africa at Fort Hare Institute of Technology
Carries out research and capacity building in Renewable Energy technologies such as Solar Energy, Photovoltaics, Photochemical solar cells, Biomass, Energy efficient housing, wind energy, hydropower.
http://www.ufh.ac.za/?q=centres-and-institutes/fort-hare-institute-technology-fhit

PHYSICS in South Africa at Centre of Excellence in Materials Modelling Centre at UL
Research in materials modelling applying computational physics approach to the science of materials in order to predict and understand the physic-chemical properties of a huge variety of materials such as minerals, alloys, polymers, oxides, and materials related to energy storage technologies. ***http://www.ul.ac.za***

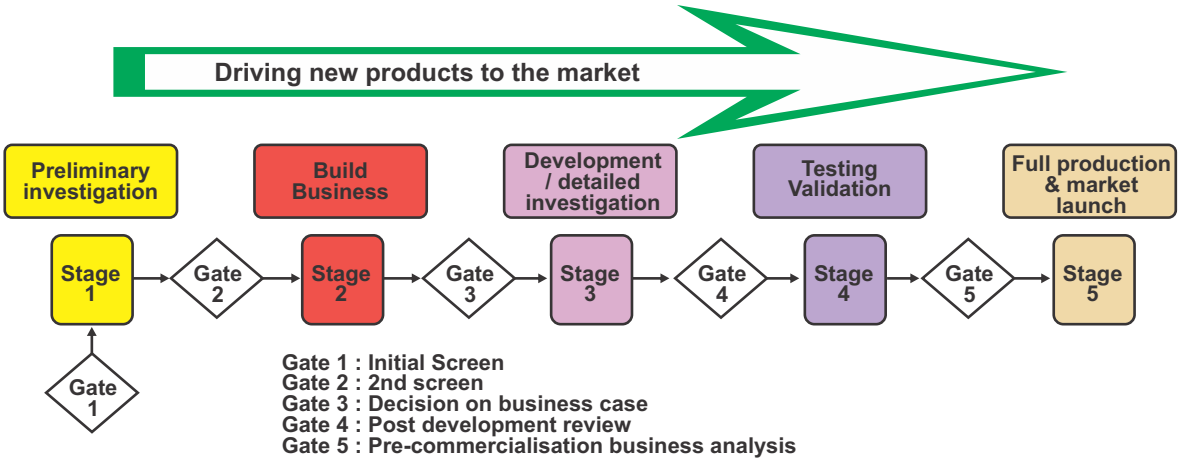
PHYSICS in South Africa at National Centre for Nano-Structured Materials CSIR
The research focus is on design, modelling and synthesis of advanced nanomaterials with specific properties and various possible applications, for example carbon nanotubes, silicon nanoparticles, nanoclay, polymer nanocomposites etc.
http://ls-ncnsm.csir.co.za/

PHYSICS in South Africa at Centre for Strong Materials Wits
Research focus on Strong Materials are materials which retain their distinctive properties under extreme conditions for example Carbides and Cermets, Carbon Nanotubes and Strong Composites, Ceramic Materials, Diamond, Thin Hard Films and Related Materials, New Ultrahard Materials and Strong Metallic Alloys. - See more at:
https://www.wits.ac.za/strongmaterials/

PHYSICS in South Africa at the Centre for Space Research (CSR) at North-West University
Research and training in multi-wavelength astronomy, astrophysics, and space science. The CSR is an NWU Centre of Excellence, which reflects the quality of the research done over more than 50 years. More information:
http://fskbhe1.puk.ac.za/csr/

PHYSICS infused with Entrepreneurship results in Socio-Economic Development

When physics breakthroughs are combined with entrepreneurship skills the world is enabled to solve the big socio-economic challenges we face today such as energy security, clean water, food security, environmental sustainability, among others. However South Africa today faces the innovation-chasm challenge, that is failure to transfer research discoveries to the market. One tool that scientists and tech based companies have used to drive ideas from the lab to the market is the STAGE – GATE process summarized shown below more information available here ***www.stage-gate.com/***



PHYSICS inventions and ideas can be taken to the following for support and development

- NIPO - National Intellectual Property Management Office ***www.nipmo.org.za***
- TIA – Technology Innovation Agency ***www.tia.org.za***
- The Innovation Hub - a start-up incubation centre ***http://www.theinnovationhub.com***
- CSIR for refinement and piloting ***www.csir.co.za***
- University Physics Departments
- University Technology Management Offices

PHYSICS CAREER PATH requires you to study physical science and maths at high school

PHYSICS degrees are offered at the following Universities in South Africa

Nelson Mandela Metropolitan University
http://physics.nmmu.ac.za/

North-West University
http://www.nwu.ac.za/physics

Rhodes University
https://www.ru.ac.za/physicsandelectronics/

University of Cape Town
http://www.phy.uct.ac.za/

University of Fort Hare
http://www.ufh.ac.za/faculties/sna/

University of the Free State
http://www.ufs.ac.za/content.aspx?uid=26

Medical Physics at UFS
http://health.ufs.ac.za/content.aspx?DCode=037

Industrial Physics at TUT
http://www.tut.ac.za/Students/facultiesdepartments/science/departments/physics/Pages/default.aspx

University of Johannesburg
http://www.uj.ac.za/EN/Faculties/science/departments/physics/Pages/default.aspx

University of KwaZulu-Natal
http://scp.ukzn.ac.za/Homepage.aspx

University of Limpopo
http://www.ul.ac.za/index.php?Entity=phy_geo

University of Pretoria
http://web.up.ac.za/default.asp?ipkCategoryID=2050

University of South Africa
http://www.unisa.ac.za/Default.asp?Cmd=ViewContent&ContentID=223

University of Stellenbosch
http://www.sun.ac.za/english/faculty/science/physics

University of Venda
http://www.univen.ac.za/index.php?Entity=Physics&Sch=8

University of the Western Cape
http://www.uwc.ac.za/Faculties/NS/Physics/Pages/default.aspx

University of the Witwatersrand
http://www.wits.ac.za/physics/

University of Zululand
http://www.unizulu.ac.za/faculties/faculty-ofscience/3about-us/

Walter Sisulu University
http://www.wsu.ac.za

Careers in SCIENCE

Infinite options through Physics...

TRANSPORT

- Aeronautical Engineer
- Air Traffic Controller
- Armed Services
- Astronaut
- Automobile Engineer
- Ceramicist
- Ergonomics Expert
- Flight Engineer
- Material Scientist
- Merchant Navy Officer
- Motor Mechanic
- Naval Architect
- Navigator
- Nautical Scientist
- Pilot
- Structural Engineer
- Transport Manager
- Transport Researcher
- Vehicle Designer

INDUSTRY

- Aeronautical Engineer
- Agricultural Engineer
- Biotechnologist
- Brewing Technologist
- Building Technologist
- Chemical Engineer
- Colour Technologist
- Computer-aided Designer
- Cyberneticist
- Design Engineer
- Factory Inspector
- Financial Analyst
- Food Scientist
- Industrial Designer
- Investment Banker
- Mechanical Engineer
- Research Scientist
- Patent Engineer
- Printing Technologist
- Production Engineer

MEDICINE

- Audiology Technician
- Biochemist
- Biomedical Engineer
- Biophysicist
- Dentist
- Dietician
- Dispensing Optician
- Medical Doctor
- Environment Health Officer
- Forensic Scientist
- Medical Physicist
- Optometrist
- Osteopath
- Pharmacist
- Physiotherapist
- Radiographer
- Speech Therapist
- Veterinary
- Surgeon

ENVIRONMENT

- Agricultural Scientist
- Archaeologist
- Architect
- Building Supervisor
- Cartographer
- Civil Engineer
- Climatologist
- Conservation Officer
- Draughts Person
- Environmental Scientist
- Geologist
- Geophysicist
- Health And Safety Officer
- Marine Scientist
- Meteorologist
- Noise Engineer
- Oceanographer
- Soil Scientist
- Surveyor
- Water Manager

SPACE

- Astronaut
- Astronomer
- Cartographer
- Climatologist
- Instrumentation Tech.
- Meteorologist
- Satellite Engineer
- Space Scientist
- Test Engineer

EDUCATION

- Company Training Officer
- Information Scientist
- Laboratory Technician
- Mathematician
- Physics Lecturer
- Teacher
- Science Administrator
- Science Advisor
- Science Broadcaster
- Science Inspector
- Science Journalist
- Science Teacher
- Statistician
- Technical Illustrator
- Technical Writer

ENERGY

- Chemical Engineer
- Civil Engineer
- Computer Scientist
- Control Systems Engineer
- Electrical Engineer
- Electronic Engineer
- Environmental Scientist
- Exploration Engineer
- Production Engineer
- Geologist
- Geophysicist
- Health And Safety
- Physicist
- Instrument Technician
- Mining Engineer
- Oilfield Services Engineer
- Pollution Scientist
- R&D scientist

LEISURE

- Acoustic Engineer
- Computer Game Designer
- Graphic Artist
- Lighting Engineer
- Material Scientist
- Model Maker
- Museum And Science
- Centre Manager
- Photographer
- Picture Restorer
- Safety Engineer
- Sport Equipment Designer
- Sports Injury Specialist
- Water Manager
- Yacht Designer

Physics is the fast-track to the biggest choice of jobs and the widest range of opportunities.

This poster samples the infinite options open to people who have studied physics.

Are you interested in the big question in life:
How will the **universe end?** Does a black hole lead to a **parallel universe** or is it the secret of **time travel?** Then physics is definitely for you.

Do you want to improve our quality of life?
Engineers are working to **improve technology**, looking for solutions to the **energy crisis** and ways of controlling pollution. **Engineers all start out studying physics.**

Perhaps you want to work in medicine, in the leisure industry, in education or the media. **Physics** offers a surprising range of options.

Are you excited by the buzz of life in the city:
Working in **high powered jobs** in law, finance or computing? People with **physics** qualifications are being snapped up to work in these areas because **they are logical and quick thinking.**
Whatever you dream of doing, physics offers the best way forward...

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