

**ACADEMIC
WORDS
WITHIN
PASSAGES**

Merhaba,

DAHA ONCE SIZLERE BIRCOK OKUMA PARCASINDAN OLUSAN BIR DOSYA GONDERMISTIK. BU DOSYAYI EDINMEYENLER SITEMIZDEKI EN SON EKLENENLER BASLIGININ ALTINDAKI OKUMA PARCALARI ADLI BOLUMDEN ULASABILIRLER.

YINE SIZLERE OKUMA PARCALARININ YERALDIGI BIR DOSYA GONDERIYORUZ. BU DOSYA DA DEGISIK ALANLARDAN OKUMALAR YERALIYOR. BU PARCALARDA AKADEMIC WORD LIST (AWL) DE YERALAN SOZCUKLER ALTI CIZILI DURUMDADIR.

YINE INTERNETTEN TEK TEK INDIRIP SIZLER ICIN DAHA DUZENLI HALE SOKMAKTAN BASKA BIR EMEGIM YOKTUR. OKUMALARI YAPTIKCA KELIME DAGARCIGI,GRAMER VE AKADEMIK METINLERI ANLAMA POTANSIZYELINIZ,PARCALARA GEREKLI OZENI VE CABAYI GOSTERDIGINIZ TAKDIRDE ARTACAKTIR.

HER ZAMAN DEDIGIMIZ GIBI UMARIZ MATERYAL DEGIL INGILIZCE ZENGINI OLURSUNUZ.

Saygılarımızla...

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Motor Car

A Motor Car is, broadly, any self-powered vehicle with more than two wheels and an enclosed passenger compartment, capable of being steered by the operator and designed for use on a road or street. The term is used more specifically to denote any such vehicle designed to carry two to seven people. A synonym is automobile (Grk. autos, "self"; Lat., mobilis, "movable"). Larger vehicles designed for more passengers are called buses, and those designed to carry freight are called lorries. The term automotive vehicle includes all of the above, as well as certain specialised industrial and military vehicles.

Construction

The primary components of a car are the power plant, the power transmission, the running gear, and the control system. These constitute the chassis, on which the body is mounted.

The Power Plant

The power plant includes the engine and its fuel, the carburettor, ignition, lubrication, and cooling systems, and the starter motor.

The Engine

By far the greatest number of cars use piston engines, but from the early 1970s a significant number of rotary-engine vehicles came into use.

The four-cycle piston engine requires four strokes of the piston per cycle. The first downstroke draws in the petrol mixture. The first upstroke compresses it. The second downstroke - the power stroke - following the combustion of the fuel, supplies the power, and the second upstroke evacuates the burned gases. Intake and exhaust valves in the cylinder control the intake of fuel and the release of burned gases. At the end of the power stroke the pressure of the burned gases in the cylinder is 2.8 to 3.5 kg/sq cm. These gases escape with almost explosive violence with the sudden opening of the exhaust valve. They rush through an exhaust manifold to a silencer, an enlarged section of piping containing expanding ducts and perforated plates through which the gases expand and are released into the atmosphere.

Continuous availability of power and greater smoothness of operation of the four-cycle engine were provided by the development of the four-cylinder engine, which supplies power from one or another of the cylinders on each stroke of the cycle. A further increase in power and smoothness is obtained in engines of 6, 8, 12, and 16 cylinders, which are arranged in either a straight line or two banks assembled in the form of a V.

In the early 1970s one Japanese carmaker began to manufacture cars powered by the rotary-combustion, or Wankel, engine, invented by the German engineer Felix Wankel in the early 1950s. The Wankel engine, in which the combustion movement

employs rotors instead of vertical pistons, can be up to one-third lighter than conventional vehicle engines because it needs fewer spark plugs, piston rings, and moving parts.

Carburation

Air is mixed with the vapour of the petrol in the carburettor. To prevent the air and the carburettor from becoming too cold for successful evaporation of the fuel, the air for the carburettor is usually taken from a point close to a heated part of the engine. Modern carburettors are fitted with a so-called float-feed chamber and a mixing or spraying chamber. The first is a receptacle in which a small supply of petrol is maintained at a constant level. The petrol in most makes of cars is pumped from the main tank to this chamber, the float rising as the petrol flows in until the desired level is reached, when the inlet closes. The carburettor is equipped with such devices as accelerating pumps and economiser valves, which automatically control the mixture ratio for efficient operation under varying conditions. Level-road driving at constant speed requires a lower ratio of petrol to air than that needed for climbing hills, for acceleration, or for starting the engine in cold weather. When a mixture extremely rich in petrol is necessary, a valve known as the choke cuts down the air intake drastically, permitting large quantities of unvaporised fuel to enter the cylinder.

Ignition

The mixture of air and petrol vapour delivered to the cylinder from the carburettor is compressed by the first upstroke of the piston. This heats the gas, and the higher temperature and pressure favour ready ignition and quick combustion. The next operation is that of igniting the charge by causing a spark to jump the gap between the electrodes of a spark plug, which projects through the walls of the cylinder. One electrode is insulated by porcelain or mica; the other is grounded through the metal of the plug, and both form part of the secondary circuit of an induction system.

The principal type of high-tension ignition now commonly used is the battery-and-coil system. The current from the battery flows through the low-tension coil and magnetises the iron core. When this circuit is opened at the distributor points by the interrupter cam, a transient high-frequency current is produced in the primary coil with the assistance of the condenser. This induces a transient, high-frequency, high-voltage current in the secondary winding. This secondary high voltage is needed to cause the spark to jump the gap in the spark plug. The spark is directed to the proper cylinder by the distributor, which connects the secondary coil to the spark plugs in the several cylinders in their proper firing sequence. The interrupter cam and distributor are driven from the same shaft, the number of breaking points on the interrupter cam being the same as the number of cylinders.

The electrical equipment controls the starting of the engine, its ignition system, and the lighting of the car. It consists of the storage battery, a generator for charging it when the engine is running, a motor for starting the engine, and the necessary wiring. Electricity also operates various automatic devices and accessories, including windscreen wipers, directional signals, heating and air conditioning, cigarette lighters, powered windows, and audio equipment.

Lubrication

In the force-feed system, a pump forces the oil to the main crankshaft bearings and then through drilled holes in the crankpins. In the full-force system, oil is also forced to the connecting rod and then out to the walls of the cylinder at the piston pin.

Cooling

At the moment of explosion, the temperature within the cylinder is much higher than the melting point of cast iron. Since the explosions take place as often as 2,000 times per minute in each cylinder, the cylinder would soon become so hot that the piston, through **expansion**, would "freeze" in the cylinder. The cylinders are therefore provided with jackets, through which water is rapidly circulated by a small pump driven by a gear on the crankshaft or camshaft. During cold weather, the water is generally mixed with a suitable antifreeze, such as alcohol, wood alcohol, or ethylene glycol.

To keep the water from boiling away, a radiator forms part of the engine-cooling system. Radiators **vary** in shape and **style**. They all have the same **function**, however, of allowing the water to pass through tubing with a large **area**, the outer surface of which can be cooled by the atmosphere. In air cooling of engine cylinders, various means are used to give the heat an outlet and carry it off by a forced draught of air.

The Starter Motor

Unlike the steam engine, the petrol engine must usually be set in motion before an explosion can take place and power can be developed; moreover, it cannot develop much power at low speeds. These difficulties have been overcome by the use of gears and clutches, which permit the engine to travel at a speed higher than that of the wheels, and to work when the **vehicle** is at rest. Ease of starting and steadiness of operation are **secured** in the highest degree in a multicylinder engine. An electric starter motor, receiving its current from the storage battery, turns the crankshaft, thus starting the petrol engine. The starter motor is of a special type that operates under a heavy overload, producing high power for very short **periods**. In modern cars, the starter motor is **automatically** actuated when the ignition switch is closed.

The Power Transmission

The engine power is delivered first to the flywheel and then to the clutch. From the clutch, which is the means of **coupling** the engine with the power-**transmission** units, the power flows through the **transmission** and is delivered into the rear-axle drive gears, or differential, by means of the drive shaft and universal joints. The differential delivers the power to each of the rear wheels through the rear-axle drive shafts.

The Clutch

Some type of clutch is found in every car. The clutch may be operated by means of a foot pedal, or it may be **automatic** or **semiautomatic**. The friction clutch and the fluid **coupling** are the two basic varieties. The friction clutch, which depends on solid **contact** between engine and **transmission**, **consists** of: the rear face of the flywheel;

the driving plate, mounted to rotate with the flywheel; and the driven plate, between the other two. When the clutch is engaged, the driving plate presses the driven plate against the rear face of the flywheel. Engine power is then delivered through the contacting surfaces to the transmission by means of a splined (keyed) shaft.

Fluid coupling may be used either with or without the friction clutch. When it is the sole means of engaging the engine to the transmission, power is delivered exclusively through an oil medium without any contact of solid parts. In this type, known as a fluid drive, an engine-driven, fan-bladed disc, known as the fluid flywheel, agitates the oil with sufficient force to rotate a second disc that is connected to the transmission. As the rotation of the second disc directly depends on the amount of engine power delivered, the prime result of fluid coupling is an automatic clutch action, which greatly simplifies the requirements for gear shifting.

Manual and Automatic Transmissions

The transmission is a mechanism that changes speed and power ratios between the engine and the driving wheels. Three general types of transmission are in current use: conventional or sliding-gear, Hydra-Matic, and torque-converter systems.

The conventional transmission provides for three or four forward speeds and one reverse speed. It consists of two shafts, each with gears of varying diameters. One shaft drives the other at a preselected speed by meshing the appropriate set of gears. For reverse speed, an extra gear, known as the idler gear, is required to turn the driven shaft in the opposite direction from normal rotation. In high gear, the two shafts usually turn at the same speed. In low, second, and reverse gears, the driven shaft turns more slowly than the driving shaft. When a pair of gears permits the driven shaft to turn more rapidly than the driving shaft, the transmission is said to have overdrive. Overdrive is designed to increase the speed of an automobile without taxing the engine beyond what is considered its normal operating limit.

The Hydra-Matic type of transmission combines the automatic clutch provided by fluid coupling with a semiautomatic transmission. A mechanical governor, controlled by the pressure exerted on the accelerator pedal, regulates gear selection through a system of hydraulically controlled shift valves. Hydra-Matic transmission provides for several forward gears.

The torque-converter type of transmission provides an unlimited number of gear ratios with no shifting of gears. The torque converter is a hydraulic mechanism using engine power to drive a pump, which impels streams of oil against the blades of a turbine. The turbine is connected to the drive shaft and causes it to rotate.

Both Hydra-Matic and torque-converter systems are controlled by a selector lever on the steering column, which provides also for reverse and sometimes for emergency-low gears.

The Running Gear

The running gear of the car includes the wheel-suspension system, the stabilisers, and the wheels and tyres. The frame of the car may be considered the integrating

member of the running gear. It is attached to the rear axle and to the front wheels by springs. These springs, along with the axles, the control and support arms, and the shock absorbers, constitute the wheel-suspension system. In modern cars the front wheels are independently suspended from the frame in a manner that permits either wheel to change its plane without appreciably affecting the other. This type of front-wheel suspension is known popularly as knee-action suspension. The stabilisers consist of spring-steel bars, connected between the shock-absorber arms by levers, to decrease body roll and improve steerability.

The Control System

Steering is controlled by a hand wheel, mounted on an inclined column and attached to a steering tube inside the column. The other end of the tube is connected to the steering gear, which is designed to provide maximum ease of operation. Power steering, adapted for passenger cars in the early 1950s, is generally a hydraulic mechanism used as a booster to reduce the effort of steering.

A car has two sets of brakes: the hand or emergency brake and the foot brake. The emergency brake generally operates on the rear wheels only, but it may operate on the drive shaft. The foot brake in modern cars is always of the four-wheel type, operating on all wheels. Hydraulic brakes on cars and hydraulic vacuum, air, or power brakes on lorries apply the braking force to the wheels with much less exertion of force on the brake pedal than is required with ordinary mechanical brakes. The wheel brakes are generally of the internally expanding type, in which a convex strip of material is forced against a concave steel brake drum.

New Developments

Oil shortages and rising fuel prices during the 1970s encouraged car engineers to develop new technologies for improving the fuel economy of existing petrol engines and to accelerate work on alternative engines. Large V-8 petrol engines became less common from the early 1980s, being replaced by 6-, 5-, 4-, and 3-cylinder V-engines, using microprocessors for improved fuel-air control and thus better fuel economy. During the early 1980s research and development began on automatic transmissions controlled electronically for maximum efficiency and having infinitely variable gear ratios. At the same time, digital speedometers, trip-information devices, and electronic devices to cue owners regarding maintenance and other chores were appearing in increasing numbers of cars.

Engines

Among alternatives to petrol engines, diesel and electric engines appeared the most promising. The turbine engine continued to be held back by high manufacturing costs and other problems; technical hurdles remained for the revived Stirling engine; the steam engine, which was the object of experiment in passenger cars during the 1960s and 1970s, proved impractical; and the Wankel rotary engine, inherently less fuel-efficient, remained a low-production, high-performance power plant.

Diesel V-8 engines appeared in the late 1970s in cars made by the United States manufacturer General Motors, and V-6, V-5, and V-4 diesels were used increasingly

during the early 1980s because of the engine's superior fuel **economy**, which is up to 25 per cent better than that of a comparable petrol engine. Concern that diesel exhaust may contain carcinogens continues to retard diesel development. The advent of turbocharged diesels overcame one **inherent** problem of the engine: slow acceleration.

Electric Cars

Important advances in battery **technology** have led to electric cars **capable** of speeds up to 80 km/h and a **range** of 160 km or more. Such cars might become popular because they can be recharged overnight when the power demand on electric **generating** stations is low. Mass use of electric **vehicles** would lower the demand for crude oil.

By using lightweight steel, aluminium, plastics, and magnesium, car manufacturers drastically reduced the size and weight of their models in the late 1970s and early 1980s in an effort to improve fuel efficiency. Front-wheel drive **technology**, which allows more passenger and cargo space inside smaller cars, has been adopted by carmakers worldwide, replacing the rear-drive arrangement commonly used since the motor industry's earliest days.

Introduction to Computers

Although the **computer** has been in existence since the late 1940s, the idea of such a machine was first **conceived** as early as 1833 by Charles P. Babbage. He called it an **Analytical Engine**. It was **conceived** because of his frustration with the many **errors** produced by clerks in making their calculations.

Charles Babbage, a Professor of Mathematics at Cambridge University in England, wanted to build a machine **capable** of calculating **any equation** he cared to enter. It was never completed since there was one thing missing from the world in the early 19th century, namely **electronics**. Babbage was **restricted** to mechanical **technology**, i.e. cogs, levers, wheels. He was able to complete one part of the **Analytical Engine** and this can be seen today in the **Computing** Gallery of the Science Museum, in London. If you like mechanics, it is a beautiful **construction**. But the fact remains that it was not possible to build a mechanical **computer**. Had Babbage **access** to electronics, then he would most certainly have been the first person to build a **computer**.

In the event the world had to wait until the early 1940s for the first electromechanical **computer**. One of the early pioneers was Howard A. Aiken who coincidentally also came from Cambridge, but in Massachusetts in America.

Electronics

Electronics is today the most convenient **technology** for **constructing computers**. Electronic **devices** such as transistors, diodes, capacitors and resistors form the basis of the modern **computer**.

Fortunately, we do not need to know anything about electronics in order to understand what **computers** can do and how they are programmed, apart from one most important **factor**. The electronic **devices** are called *two-state devices* and **computers** comprise millions of these two-state devices.

Two-state Devices

An electronic **device** need not be a simple two-state **device**. It could be three, four or more. However, **designers** of electronic **components** have found it easier (and, therefore, cheaper) to **construct** two-state devices. In the past, **computer designers** have built ten-state electronic **components**, but the resulting **computer** was expensive and **complex**. For this reason, all **computers** tend to **rely** on the two-state basic component.

A **two-state device** is something we are all familiar with. Take a tap; this may be in one of only two states at any given time - allowing water to flow (ON) or not (OFF). A light bulb is another example; it may be either passing an electric current (i.e. illuminated) or not passing an electric current (i.e. not illuminated). A two-state **device** then, like a switch on a wall, can be in only one of two possible states at any given instant, i.e. it may be either ON or OFF.

The two states that electronic **devices** in **computers** can take up are concerned with voltage levels. What is **required** is two clearly **distinct** voltages with no possibility of confusion between them. The **output** from one **device** provides the **input** to the next **device**, and this next **device** must be certain of **detecting** which of the two levels it is receiving. In practice, several combinations (pairs) can be used, depending on the application and the manufacturer. Such combinations are of this kind:

A **positive** voltage and zero voltage (e.g. +5 volts and 0 volts)

A **positive** voltage and a **negative** voltage (e.g. +2 volts and -2 volts)

A larger **positive** voltage and a smaller **positive** voltage (e.g. +3.3 volts and +0.2 volts)

Computer people, however, do not like talking about voltage levels or the presence or absence of electrical charges. They prefer to represent the two voltage levels or the presence or absence of a charge in another way, namely by *binary*.

Binary

Binary is a number system. Since every number system has zero as one of its digits, and because binary comes from the Latin meaning twice or two, the only other digit it can have is 1. Binary, then, with its 0s and 1s, is a very convenient **method** of representing the two **internal** states of a **computer's** electronic **components**. Binary digits do not actually exist inside **computers**, only electrical charges (or voltages). So, for example, +5 volts can be represented by binary 1 and zero volts by binary 0 (i.e. the absence of a charge). **Similarly** for the other combinations shown above. However, we shall frequently talk about binary digits as though they do exist inside a **computer**. We must just make certain that we remember that this is only a convenient representation.

In the decimal number system, the ten digits 0, 1, 2, 3, 4, 5, 6, 7, 8, 9 are used. Any value can be represented using one or more of these digits, for example 253. Any value can also be represented by binary digits, except that we can only use the two digits 0 and 1. Thus, 253(decimal) is 11111101 in binary. Later on we shall have more to say about binary. Let us now begin to look at the basic **structure** of a **computer**.

Basic Structure of a Computer

One **method** of introducing the basic **structure** of a **computer** is to present it with a problem to solve. In our case this will be a simple problem, one for which we would not **normally** use a **computer**. Suppose we want to find the largest number in a given set of numbers. If we were to engage a human **colleague** to solve this problem, two **elements** would be **required**. First, we would have to provide an **instruction**. This could be a simple statement, e.g. find the largest number in this set. Secondly, we would have to provide the list of numbers.

The **computer** will also **require** both these **elements** in order to solve a problem. The “**instruction**”, however, will need to be much more detailed than the one given to a human being. It may **involve** perhaps as many as 15 separate **instructions**. We shall see the reason for this soon. You should note that **instructing computers** to perform various **tasks** involves a much more **comprehensive** set of details than we **normally require** when **communicating** with each other.

The total set of **instructions** to perform a given **task** is called a **program**. The list of numbers upon which the **computer** program works is called the **data numbers**, or **data** for short. Thus, like the human being a **computer** requires both **instructions** and **data** in order to solve a problem. The difference is that the program **instructions** are at a much more detailed level.

Memory Unit and Arithmetic Unit

The human **colleague** requires a memory in order to **retain** (store) the **instruction**. So does a **computer**. Therefore, one **component** unit of a **computer** must be a **Memory Unit** or store. However, no **computation** can take place in this unit. It is just a **device** for storing or **retaining** information.

If we recall, Charles Babbage wished his **computer** to perform calculations upon **any equation** he cared to enter. Thus, as a second unit there must be some **device** which can perform the four basic arithmetical **functions** of addition, subtraction, multiplication and division. This unit is called the **Arithmetic Unit**, or AU for short. It is in here that any **computation** is performed. This unit is also **capable** of comparing two numbers and deciding which is the smaller, the larger or whether they are equal. But how do numbers (**data**) get into the arithmetic unit from the memory unit?

Control Unit

The purpose of this third and **final component**, the **Control Unit** (or CU), is to pass numbers or other forms of **data** into the arithmetic unit and then “inform” this unit which arithmetic or comparison **function** to perform. Once the arithmetic unit has

computed the result, the control unit passes it into the memory. The control unit, then, is the unit which controls the passage of data to and from the memory and the AU and, also, decides which arithmetic operation the program instruction has asked for.

These three units, the memory, the arithmetic unit and the control unit, are known collectively as the **Central Processing Unit**, or CPU for short. These are the three units common to all computers, no matter how large or small, how cheap or expensive.

Input and Output

How does a human being put information (data or program instructions) into the memory of the central processing unit? This is the purpose of a special device called an **input device**, which is also under the control of the control unit. An input device will convert the everyday characters which we use, into binary and pass them into the memory unit.

Once the program has processed the data ready to produce results, we would like to see them. We would find it difficult to read long strings of binary noughts and ones and, in consequence, an **output device** is used to convert binary patterns inside the CPU into our everyday characters. That is, it performs the opposite function to an input device.

There are many different types of input and output devices. Some are more suitable than others in given applications. Chapter 4 discusses the various types in detail. Here we need mention just two common devices. The Keyboard device is used for putting in information. This input device is very similar to an ordinary QWERTY typewriter (the first six letters being q-w-e-r-t-y), except that it has additional keys by which the user can communicate with the computer. Often, the keyboard has a screen attached which can display any information typed in by the user, or any information sent out by the central processing unit. Together, the keyboard and screen are called a VDU (visual display unit). If a printed copy is required, so that we can keep a record of computer output, then a *hardcopy* (i.e. printed) device is required.

The input and output devices are not part of the main CPU. They are on the periphery (edge) and are sometimes called **peripheral devices**.

Input-Process-Output System

If we look at a diagram of a computer, we see that the computing process is nothing other than a simple input-process-output system. This is something which we are all familiar with in many everyday situations. For example, baking a cake. The *input* is the collecting together of the various ingredients, the *process* is the mixing and the cooking, the *output* is the edible cake. Computing is not a magical procedure, it is a straightforward logical input-process-output procedure, in essence simpler to understand than the chemical reactions that go on inside a cake in the oven.

More about the Memory

The main memory of a **computer** (i.e. the memory unit) can often account for 50% of the total cost of the CPU. For this reason, its size is deliberately limited. The larger the main memory, the more expensive the **computer** becomes. To put this another way, **computer** manufacturers frequently limit the size of the memory in order to bring the **computer** within the **purchasing** power of the market to which they are selling.

Some **computers**, such as the Control **Data Corporation** (CDC) **computer**, have a very large memory and can contain as many as one million characters. This may appear to be large but, in practice, it is not large enough to contain all the programs and **data** for which a **computer** is used. A payroll application for a company with about a thousand employees will **require** several hundred thousands of characters just to hold all the **data**. The program **instructions** themselves will run into many thousands. **Furthermore**, a **computer** is not **purchased** simply to run a payroll; there will be invoicing, stock control, sales forecasting programs, as well as all the **data** each program **requires**. These cannot all be held inside the main memory. In any case, information inside the **computer** is lost every time the machine is switched off, rather like a television screen which loses its information (picture) when turned off.

Auxiliary Storage Devices

What is **required** is some form of additional (auxiliary) storage for all the programs and **data** whereby they can be **retained** on a permanent basis. These **auxiliary storage devices** (also called secondary or backing stores) are magnetic **devices**, **similar** to music cassette **tapes** and long-playing records.

Information stored on magnetic **devices** can be used time and time again, as with LP records which can be played over and over again with-out losing the original. On such **devices**, information may be held permanently in a **computer** system. When information on a magnetic **device** is **required**, it must be passed into the main or central memory of the CPU before it can be **processed**. In other words, only a copy of the information is **transferred**, leaving the original **version** still intact.

There are two main types of auxiliary storage **device**, *magnetic tape* and *magnetic disc*. One large **tape** can hold between 10 and 40 million characters; a large magnetic disc may contain in excess of 200 million characters. These **devices** are far cheaper than the main memory of the CPU and are discussed in **Chapter 5**.

Some people get worried about the vast **volume** of information held on auxiliary storage **devices**. They feel that, since the main memory is limited in size, the information which flows into it from auxiliary **devices** might flood or swamp the main memory. This could indeed be the case. However, programmers have to organise the information held on secondary storage **devices** into smaller units or groups, or *blocks* as they are more formally called. Suppose that a **computer** is running a payroll program. The information (**data**) is held on magnetic **tape**. **Normally**, a few, perhaps three, records (see **Chapter 7**), one for each employee, are **transferred** into main memory. The program will **process** these three and then **transfer** the results to the **output device**. The next three records will be brought in and **processed**, the results being **transferred** onto the same **output device**. This **process** is repeated until all the records of all the employees have been **processed**. In this way, by breaking up the **data** into blocks, the entire **data file** can be **processed** a few records at a time.

Hardware and Software

At a **computer** installation, the various units which we have discussed can be seen and touched. They will **vary** in colour, size and shape, depending upon the imagination of the **computer** manufacturer. These units are called the **hardware** of a **computer**. But by themselves they are useless, in the way that a taxi standing in the road is. By itself it cannot do anything. What is **required** is a taxi driver to come along and turn the hardware into a **functioning** whole by **inserting** the ignition key, pressing the various pedals, and **manipulating** the gear lever and the steering wheel.

Computer hardware **requires** a *driver* in order to make the hardware **function** correctly. This “driver” is called **software**. The software operates and controls the hardware units and makes certain that they all work in unison. The more formal term for this special software is **computer operating system software**.

Even so, the taxi with its driver is not performing a service nor will the taxi driver earn his living. What is **required** is a passenger. **Likewise** the **computer** with its hardware and operating system software cannot perform a useful service until it is **instructed** to perform a **specific job**. It is the *application program* (such as a payroll, traffic control, space exploration) which turns the hardware and software into a useful system. Thus, there are three **elements** **required** by any **computer** system:

- The hardware units
- The operating system software
- The application program(s)

(*Introduction to **Computers*** by John Shelly & Roger Hunt)

Measurements of Current

Absolute measurements of current and **potential** difference are of importance **primarily** in laboratory work, so for most purposes relative measurements are **sufficient**. The meters described in the following **paragraphs** are all intended for relative measurements.

Galvanometers

Galvanometers are the main instruments used to **detect** and measure current. They depend on the fact that force is **generated** by an electric current flowing in a magnetic field. The **mechanism** of the galvanometer is so arranged that a small permanent magnet or electromagnet sets up a magnetic field that **generates** a force when current flows in a wire coil **adjacent** to the magnet. Either the magnet or the **adjacent** coil may be movable. The force deflects the movable member by an amount **proportional** to the strength of the current. The movable member may have a pointer or some other **device** to **enable** the amount of deflection to be read on a calibrated scale.

In the D'Arsonval reflecting galvanometer, a small mirror **attached** to a movable coil reflects a beam of light on a scale of about 1 m (3 ft) away from the instrument. This arrangement **involves** less inertia and friction than does a pointer, and **consequently**, greater **accuracy** is **achieved**. The instrument is named after the French biologist and physicist Jacques d'Arsonval, who also **conducted** experiments with the mechanical **equivalent** of heat, and in the high-frequency oscillating current of low voltage and high amperage (D'Arsonval current) used in the treatment of certain diseases, such as arthritis. Known as diathermy, this treatment **involves** the production of heat in, for example, a limb, by passing a high-frequency current between two electrodes placed on the skin. The addition of a scale and proper calibration **converts** a galvanometer into an ammeter, the instrument used for measuring electric current in amperes. D'Arsonval was also responsible for inventing a direct-current (DC) ammeter.

Only a limited amount of current can be passed through the fine wire of a galvanometer coil. When large currents have to be measured, a shunt of low resistance is **attached** across the **terminals** of the meter. Most of the current is bypassed through this shunt resistance, but the small current flowing through the meter is still **proportional** to the total current. By taking advantage of this **proportionality**, a galvanometer can be used to measure currents of hundreds of amperes.

Galvanometers are usually named according to the magnitude of the currents they will measure.

Microammeters

A microammeter is calibrated in millionths of an ampere and a milliammeter in thousandths of an ampere.

Ordinary galvanometers cannot be used for the measurement of an **alternating** current (AC), because the alternation of the current would produce deflection in both directions.

Electrodynamometers

An **adaptation** of the galvanometer, however, called an electro-dynamometer, can be used to measure alternating currents by means of electromagnetic deflection. In this meter a fixed coil, in **series** with the moving coil, is employed in place of the permanent magnet of the galvanometer. Because the current in the fixed and moving coils **reverses** at the same instant, the deflection of the moving coil is always in the same direction, and the meter gives a **constant** current reading. Meters of this type can also be used to measure direct currents.

Iron-vane meters

Another form of electromagnetic meter is the iron-vane meter or soft-iron meter. In this **device** two vanes of soft iron, one fixed and one pivoted, are placed between the poles of a long, cylindrical coil through which is passed the current to be measured. The current **induces** magnetism in the two vanes, causing the same deflection no

matter what the direction of the current. The amount of the current is ascertained by measuring the deflection of the moving vane.

Thermocouple meters

Meters that depend on the heating effect of an electric current are used to measure alternating current of high frequency. In thermocouple meters the current passes through a fine wire that heats a thermocouple junction; the electricity generated by the thermocouple is measured by an ordinary galvanometer. In hot-wire meters the current passes through a thin wire that heats and stretches. This wire is mechanically linked to a pointer that moves over a scale calibrated in terms of current.

AN EXPERIMENT IN CHEMISTRY

PRELIMINARY

The chemistry laboratory is a place where you will learn by observation what the behaviour of matter is. Forget preconceived notions about what is supposed to happen in a particular experiment. Follow directions carefully, and see what actually does happen. Be meticulous (very exact and careful) in recording the true observation even though you 'know' something else should happen. Ask yourself why the particular behaviour was observed. Consult your instructor (teacher) if necessary. In this way, you will develop your ability for critical scientific observation.

EXPERIMENT I: DENSITY OF SOLIDS

The density of a substance is defined as its mass per unit volume. The most obvious way to determine the density of a solid is to weigh a sample of the solid and then find out the volume that the sample occupies. In this experiment, you will be supplied with variously shaped pieces of metal. You are asked to determine the density of each specimen and then, by comparison with a table of known densities, to identify the metal in each specimen. As shown in Table E1, density is a characteristic property.

Table E1: Densities of Some Common Metals, g/cc.

Aluminium	2.7
Lead	11.4
Magnesium	1.8
Monel metal alloy	8.9
Steel (Fe, 1 % C)	7.8
Tin	7.3
Wood's metal alloy	9.7
Zinc	7.1

PROCEDURE

Procure (obtain) an unknown specimen from your instructor. Weigh the sample accurately on an analytical balance.

Determine the volume of your specimen by measuring the appropriate dimensions. For example, for a cylindrical sample, measure the diameter and length of the cylinder. Calculate the volume of the sample.

Determine the volume of your specimen directly by carefully sliding the specimen into a graduated cylinder containing a known volume of water. Make sure that no air bubbles are trapped. Note the total volume of the water and specimen.

Repeat with another unknown as directed by your instructor.

QUESTIONS

1. Which of the two methods of finding the volume of the solid is more precise? Explain.
2. Indicate how each of the following affects your calculated density: (a) part of the specimen sticks out of the water; (b) an air bubble is trapped under the specimen in the graduated cylinder; (c) alcohol (density, 0.79 g/cc.) is inadvertently substituted for water (density, 1.00 g/cc) in the cylinder.
3. On the basis of the above experiment, devise a method for determining the density of a powdered solid.
4. Given a metal specimen from Table E1 in the shape of a right cone of altitude 3.5cm with a base of diameter 25 cm. If its total weight is 41.82 g, what is the metal?

(*Experimental Chemistry*, by Sienko and Plane).

The History of Life on Earth

The history of life on earth has been a history of interaction between living things and their surroundings. To a large extent, the physical form and the habits of the earth's vegetation and its animal life have been moulded by the environment. Considering the whole span of earthly time, the opposite effect, in which life actually modifies its surroundings, has been relatively slight. Only within the moment of time represented by the present century has one species - man - acquired significant power to alter the nature of his world.

During the past quarter-century this power has not only increased to one of disturbing magnitude but it has changed in character. The most alarming of all man's assaults upon the environment is the contamination of air, earth, rivers, and sea with dangerous and even lethal materials. This pollution is for the most part irrecoverable; the chain of evil it initiates not only in the world that must support life but in living tissues is for the most part irreversible. In this now universal contamination of the environment, chemicals are the sinister and little-recognized partners of radiation in

changing the very nature of the world - the very nature of its life. Strontium 90, released through nuclear explosions into the air, comes to earth in rain or drifts down as fallout, lodges in soil, enters into the grass or corn or wheat grown there, and in time takes up its abode in the bones of a human being, there to remain until his death. Similarly, chemicals sprayed on croplands or forests or gardens lie long in soil, entering into living organisms, passing from one to another in a chain of poisoning and death. Or they pass mysteriously by underground streams until they emerge and, through the alchemy of air and sunlight, combine into new forms that kill vegetation, sicken cattle, and work unknown harm on those who drink from once-pure wells. As Albert Schweitzer has said, 'Man can hardly even recognize the devils of his own creation.'

It took hundreds of millions of years to produce the life that now inhabits the earth - aeons of time in which that developing and evolving and diversifying life attained a state of adjustment and balance with its surroundings. The environment, rigorously shaping and directing the life it supported, contained elements that were hostile as well as supporting. Certain rocks gave out dangerous radiation; even within the light of the sun, from which all life draws its energy, there were short-wave radiations with power to injure. Given time - time not in years but in millennia - life adjusts, and a balance has been reached. For time is the essential ingredient; but in the modern world there is no time.

The rapidity of change and the speed with which new situations are created follow the impetuous and heedless pace of man rather than the deliberate pace of nature. Radiation is no longer merely the background radiation of rocks, the bombardment of cosmic rays, the ultra-violet of the sun that have existed before there was any life on earth; radiation is now the unnatural creation of man's tampering with the atom. The chemicals to which life is asked to make its adjustment are no longer merely the calcium and silica and copper and all the rest of the minerals washed out of the rocks and carried in rivers to the sea; they are the synthetic creations of man's inventive mind, brewed in his laboratories, and having no counterparts in nature.

To adjust to these chemicals would require time on the scale that is nature's; it would require not merely the years of a man's life but the life of generations. And even this, were it by some miracle possible, would be futile, for the new chemicals come from our laboratories in an endless stream; almost five hundred annually find their way into actual use in the United States alone. The figure is staggering and its implications are not easily grasped - five hundred new chemicals to which the bodies of men and animals are required somehow to adapt each year, chemicals totally outside the limits of biologic experience.

Among them are many that are used in man's war against nature. Since the mid-1940s over two hundred basic chemicals have been created for use in killing insects, weeds, rodents, and other organisms described in the modern vernacular as 'pests'; and they are sold under several thousand different brand names.

These sprays, dusts, and aerosols are now applied almost universally to farms, gardens, forests, and homes - non-selective chemicals that have the power to kill every insect, the 'good' and the 'bad', to still the song of birds and the leaping of fish in the streams, to coat the leaves with a deadly film, and to linger on in soil - all this

though the intended **target** may be only a few weeds or insects. Can anyone believe it is possible to lay down such a barrage of poisons on the surface of the earth without making it unfit for all life? They should not be called 'insecticides', but 'biocides'.

The whole **process** of spraying seems caught up in an endless spiral. Since DDT was **released** for civilian use, a **process** of escalation has been going on in which ever more toxic materials must be found. This has happened because insects, in a triumphant vindication of Darwin's **principle** of the **survival** of the fittest, have **evolved** super races immune to the particular insecticide used, **hence** a deadlier one has always to be developed - and then a deadlier one than that. It has happened also because, for reasons to be described later, destructive insects often **undergo** a 'flareback', or resurgence, after spraying, in numbers greater than before. Thus the **chemical** war is never won, and all life is caught in its violent crossfire.

Along with the possibility of the extinction of mankind by **nuclear** war, the central problem of our age has therefore become the contamination of man's total **environment** with such substances of incredible **potential** for harm - substances that **accumulate** in the tissues of plants and animals and even penetrate the germ cells to shatter or alter the very material of heredity upon which the shape of the future depends.

Some would-be architects of our future look towards a time when it will be possible to alter the human germ plasm by **design**. But we may easily be doing so now by inadvertence, for many **chemicals**, like radiation, bring about gene mutations. It is ironic to think that man might determine his own future by something so seemingly trivial as the choice of an insect spray.

All this has been risked - for what? Future historians may well be amazed by our **distorted** sense of **proportion**. How could **intelligent** beings **seek** to control a few unwanted species by a **method** that contaminated the entire **environment** and brought the threat of disease and death even to their own kind? Yet this is **precisely** what we have done. We have done it, moreover, for reasons that **collapse** the moment we examine them. We are told that the **enormous** and **expanding** use of pesticides is necessary to **maintain** farm production. Yet is our real problem not one of *over-production*? Our farms, **despite** measures to **remove** acreages from production and to pay farmers *not* to produce, have yielded such a staggering excess of crops that the American taxpayer in 1962 is paying out more than one billion dollars a year as the total carrying cost of the surplus-food storage programme. And is the situation helped when one branch of the Agriculture Department tries to reduce production while another states, as it did in 1958, 'It is believed generally that reduction of crop acreages under provisions of the Soil Bank will stimulate interest in use of **chemicals** to **obtain maximum** production on the land **retained** in crops.'

All this is not to say there is no insect problem and no need of control. I am saying, rather, that control must be geared to realities, not to mythical situations, and that the **methods** employed must be such that they do not destroy us along with the insects.

(Silent spring by Rachel Carson)

Cells

Cells are the basic units of life. They are the true miracle of **evolution**. Miracle in the figurative sense, since although we do not know how cells **evolved**, quite plausible **scenarios** have been proposed. Miraculous, none the less, in the sense that they are so remarkable. Most remarkable, and, in a way, a **definition** of life, is their ability to reproduce themselves. They are able to take in **chemicals** and **convert** them into usable **energy** and to synthesize all the **components** of the cell during growth that **eventually** leads to cell

Animals are made up of specialized cells, such as blood cells, cartilage cells, fat cells, muscle cells, nerve cells - humans have about 350 different cell types while lower animals, like hydra, only 10 to 20. Cells carry out an amazing **range** of specialised **functions**, such as carrying oxygen, **transmitting** messages, **contracting**, secreting **chemicals**, synthesizing molecules, and multiplying. The cells in the embryo are **initially** much less specialized and differ from each other in more subtle ways. All have certain basic characters and in order to understand their **role** in development it is helpful to be **aware** of four cell activities, three cell **structures**, and two main kinds of molecule.

The four cell activities are cell multiplication, cell movement, change in character, and cell signalling. These are mainly self-explanatory. Cells multiply by dividing and this usually **requires** cell growth, the cells doubling in size before dividing in two. Cells can also change shape, exert forces, and move from one place in the embryo to another. They can also change character: during development cells change from having rather unspecialised characters to **mature** cells with very specific **functions**. Cells in different parts of the embryo can be thought of as developing along quite different pathways, diverging more and more in character. **Finally**, cells give out and receive signals from neighbouring cells.

Cells cannot **normally** be seen without a microscope, being about one-thousandth of a millimetre in diameter. However, some cells, like the large eggs of frogs, are easily **visible**, and the human egg is just **visible** to the naked eye. The three key cell **structures** are the cell membrane, the cytoplasm, and the nucleus. Surrounding the cell is a very thin cell membrane which controls the entry and exit of molecules, and **maintains** the **integrity** of the cell. On the surface of the membrane are special receptors for signals from other cells, as well as molecules that **enable** cells to adhere to one another. **Confined** by the cell membrane the cytoplasm contains all the machinery for production of **energy** and cell growth; and there are also **structures** in the cytoplasm which can **generate** forces to change the shape of the cell, resulting in cell movement. Embedded within the cytoplasm is the cell nucleus surrounded by its own special membrane. Within the nucleus are the chromosomes of the cell, which contain the genes.

The life of the cell is dependent on the **chemical reactions** among the many million **constituent** molecules. Two key classes of molecules are nucleic acids and proteins which will be described much more fully in **Chapter 5** and can be largely **ignored** for the present. Genes are made of the nucleic acid DNA, and they exert their effect by determining which proteins are made in the cell. Proteins are **fundamental** to the life of the cell because they are essential for all the key **chemical reactions** as well as

providing the main **framework** of all the **structures** in the cell. Almost all the **chemical reactions** in the cell such as the provision of **energy** or the synthesis of key molecules will only take place in the presence of special proteins, known as enzymes, which allow the **reactions** to **occur**. Proteins are also the **major structural** molecules in the cell, providing, for example, the forces for cell movement, receptors at the cell surface, and the adhesive **links** between cells. Proteins also give different cells their special character. For example, the protein haemoglobin carries oxygen in the red blood cells, and insulin, another protein, is made in particular cells in the pancreas.

The wide variety of proteins in the cells are all **coded** for by the genes in the nucleus. While proteins themselves are synthesized in the cytoplasm, whether or not a protein is made is dependent on whether or not the gene that contains the information for that protein is active (**Chapter 5**). The only **function** of genes is to determine which proteins are made, **thereby** determining which **chemical reactions** take place and which **structures** will be present in the cell. In this way, genes control cell behaviour.

Cell behaviour can thus provide the **crucial link** between genes and animal **structure** and form. If we can understand how cells behave during development so as to make arms and brains we can then begin to ask how genes control the behaviour of the cells and so **establish** the **link**. Cells thus provide the key to understanding development because their behaviour brings about embryonic development and is controlled by gene activity. In very general terms there are, in development, three kinds of genes - those that control spatial organization, those that control change in form, and those that control cell **differentiation**.

Alternatives to the Concept of a Body Clock

Another **major** problem that we must consider is the possibility that the continuing rhythmicity is not due to the body clock. Two **alternative** explanations, and our **comments** on them, follow.

1. The rhythm is **responding** to an **external** influence that has not been controlled in the experimental **protocol**.

The problem is to decide what such an influence might be. The influences upon humans of the planets, moon, and **factors** such as magnetic fields, atmospheric pressure, and cosmic rays have been imagined by some, including lovers, astrologers and those who, in the past, have diagnosed types of "lunacy". Unfortunately, when such influences are considered as explanations of the results of free-running experiments, the following problems have never been satisfactorily dealt with.

- Why do **individuals** have free-running rhythms that differ in length? Even though the average value is 25 hours **individuals** show values generally within the **range** 24-26 hours. (As suggested in **Chapter 1**, "larks" tend to be at the lower end of the **range** and "owls" towards the top of it.)
- Where are the sense organs that pick up such **external factors**? There is **evidence** for a magnetic sense in some animals, including humans. However,

its **role** in influencing these rhythms - let alone actually being responsible for them - is not at all **established**. Sense organs for lunar and planetary influences, for atmospheric pressure and cosmic rays are as yet purely **hypothetical**.

2. The results are due to a regular **structuring** of an **individual's** life-style; they are a reflection of the regularity of our habits rather than of some body clock.

There is much to be said for such a **theory**. There is no doubt that **individuals** tend to **structure** their day around routines of meals, personal hygiene, leisure, work, etc. There are, however, some problems with this **theory**.

- It is not clear how the **duration** of sleep could be controlled as regularly as is observed to be the case. Even though it might be argued that a regular life-style **implies** a regular degree of fatigue and so will **require** a regular amount of sleep, in practice, such a degree of regularity is not **achieved**. **Individuals** go to bed later or earlier than average on certain occasions, as can be seen by close **inspection** of Fig. 2.2. For example, an **individual** might go to bed later than usual on one occasion because a piece of work or some leisure time activity took longer than **normal**. It is likely that this will make him more tired than usual and so we might guess that he will sleep longer. This would result in his rhythms running more slowly when he was interested and more quickly when he was bored (because he would go to bed earlier due to the lack of something interesting to do and so **require** less sleep). This idea - that longer activity spans would be followed by longer sleeps and vice versa - does not find experimental support. The **reverse** is seen: long "daytimes" tend to be followed by shorter sleeps and vice versa. This is a result that is much easier to account for if we suggest that a body clock is responsible for the alternation between sleep and activity. Such a clock will wake an **individual** when a certain stage of the sleep/wake **cycle** is reached; if he goes to bed late then that stage will be reached after a shorter period of sleep than usual. Such is the experience of most of us when we go to bed late: we might sleep slightly later than usual but rarely long enough to **compensate** completely for the late night. Our body clock has woken us for the next day after only a **minimal** opportunity for extra sleep.
- When all results from the free-running experiments are considered, the sleep/wake **cycle** is about 25 hours. If it were due to some "memory" of our life-style then we would **predict** that about half the population would show a value less than 24 hours and the free-running **periods** of **individuals** would be **distributed** fairly symmetrically about an average value of 24 hours.

We have **stressed** the regularity that is observed in free-running experiments and **interpreted** it as **evidence** for the body clock. However, we should add that, particularly when experiments lasting several months are performed, certain irregularities do creep into the results. Occasionally sleep is missed, or is twice as long as usual. Sometimes **volunteers** **alternate** between **normal** and long sleeps (lasting 16 rather than 8 hours, for example) or even appear to adopt a sleep/wake **cycle** that lasts about 50 rather than 25 hours. In such **circumstances**, rhythms of food intake also can become irregular with missed or extra meals during the course of a single "day". However, the rhythm of body temperature generally **retains** its

regular 25 hour period. These results do not **require** us to dispense with the idea of an **internal** body clock, if only because they appear very rarely in experiments lasting only a week or so. (By **contrast**, the 25-hour rhythms are regularly seen). Instead the results suggest that the system **requires** an occasional rhythmic **input** from the outside world to run smoothly. The **alternatives** to an **internal** body clock (planetary influences, cosmic rays, etc.) do not offer a ready explanation of these irregularities.

Charles Darwin

Darwin, Charles Robert (1809-1882), was a British scientist, who laid the **foundation** of modern **evolutionary theory** with his **concept** of the development of all forms of life through the slow-working **process** of natural **selection**. His work has been of **major** influence on the life and earth sciences and on modern thought in general.

Born in Shrewsbury, Shropshire, on February 12, 1809, Darwin was the fifth child of a wealthy and sophisticated family. His maternal grandfather was the successful china and pottery entrepreneur Josiah Wedgwood; his paternal grandfather was the well-known 18th-century doctor, poet, and savant Erasmus Darwin. His father was a successful provincial physician with a **dominant** personality; his mother died when Charles was only eight, after which time he was looked after by his elder sisters. Known as a rather ordinary student, Darwin left Shrewsbury School in 1825 and went to the University of Edinburgh to study medicine. Finding himself squeamish at the sight of human blood and suffering, Darwin left Edinburgh and went to the University of Cambridge, in preparation for a life as a Church of England clergyman, which he thought would best allow him to **pursue** his increasing interest in natural history. At Cambridge he came under the influence of two figures: Adam Sedgwick, a geologist, and John Stevens Henslow, a botanist. Henslow not only helped build Darwin's self-confidence but also taught his student to be a meticulous and painstaking observer of natural **phenomena** and collector of specimens. After graduating from Cambridge in 1831, the 22-year-old Darwin was taken aboard the English **survey** ship HMS Beagle, largely on Henslow's recommendation, as an unpaid naturalist on a scientific expedition round the world. This voyage, which began on December 27, 1831, determined Darwin's whole future career.

Voyage of the Beagle

The Beagle, under the command of Captain Robert Fitzroy, a strict disciplinarian of aristocratic stock and **fundamentalist** religious beliefs, was originally **scheduled** to spend a year or two **primarily charting** the coastal waters of South America. In the event, it was gone for five years and circumnavigated the **globe**. Almost four of those years were spent on the east and west coasts of South America, and Darwin was able to leave the ship for two extended **periods** on the mainland. In September 1835 the Beagle headed west for Australia, returning to England **via** the Cape of Good Hope. Darwin's **job** as naturalist gave him the opportunity to observe a variety of geological formations in different continents and islands along the way, as well as a vast array of fossils and living organisms. In his geological observations, Darwin was most impressed by the effect that natural forces have on shaping the Earth's surface.

At the time, most geologists adhered to the **so-called catastrophe theory** that the Earth had experienced a **succession** of **creations** of animal and plant life, and that

each **creation** had been destroyed by a sudden catastrophe, such as an upheaval or convulsion of the Earth's surface. According to one prominent **version** of this **theory**, the most recent catastrophe was the Flood of Noah, as recorded in the Bible. It wiped away all land animals except those taken into the ark (plants and fishes presented a problem); the rest were **visible** only as fossils. According to the catastrophists, species of plants and animals were **individually created** and immutable, that is, unchangeable for all time.

The catastrophist viewpoint (but not the immutability of species) was **challenged** by the British geologist Sir Charles Lyell in his three-**volume** work **Principles of Geology** (1830-1833). Lyell **maintained** that the Earth's surface is **undergoing constant** change, the result of natural forces operating **uniformly** since the **Creation** (which he argued was millions of years ago).

Darwin was given the first **volume** of Lyell's work just before he left England, and the **subsequent volumes** were sent to him in South America. Lyell's uniformitarian **principles** provided him with exactly the **framework** he needed for his own geological observations. Lyell argued that active geological change was still going on apace, and Darwin was especially impressed with an earthquake he experienced while in Chile that actually raised the coastline by several feet. Beyond that, however, he realized that some of his own observations on the local relationships between fossils and living plants and animals cast doubt on Lyell's vague views on the special **creation** of new species. Darwin noted that some fossils of supposedly extinct species in a particular geographical **area** closely resembled living species of the same **region**. In the Galápagos Islands, 1,000 km off the coast of Ecuador, he also observed that each island supported its own form of tortoise, mocking bird, and finch; the various forms were closely related but differed in **structure** and eating habits from island to island. These observations raised the question, for Darwin, of possible **links** between **distinct** but **similar** species.

Theories of Natural Selection

When Darwin returned to England in 1836, he was a **mature** scientist. His letters and packages of specimens sent to Sedgwick, Henslow, and others during his voyage had **established** his reputation at home. He immediately threw himself into the work of preparing his share of an extensive report of the scientific discoveries made during the Beagle voyage, and **editing** his own travel diary for **publication**. Darwin's **Journal of Researches** (1839) **achieved** popular as well as scientific acclaim, and it was followed in 1844 and 1846 by further **volumes** on volcanic islands and on the geology of South America.

None of this **published** work by Darwin **challenged** the **assumption** that biological species are immutable. However, in July 1837 Darwin opened a private notebook entitled "Transmutation of Species", in which he recorded observations and speculations bearing on the question (which he **subsequently** called "that mystery of mysteries"). His thinking on how organisms **evolve** was brought into sharp **focus** in September 1838, when he read **An Essay on the Principle of Population** (originally **published** in 1798) by the British **economist** Thomas Robert Malthus. Malthus observed that all biological species, including human beings, possess a far greater reproductive **capacity** than can actually be realised. For human beings, there was

always a **potential** disparity between the means of subsistence and the number of mouths to feed. Human population growth was thus limited by dire checks, such as famine, disease, and war.

Darwin immediately saw the **relevance** of Malthus's work for his own thinking: if all the offspring of a plant or animal cannot **survive** to reproductive **maturity**, there must be biological reasons why those that **survive** do so. This **constant** press, which he called natural **selection**, was the motor of biological change over time. In 1838, 1842, and 1844 he produced increasingly elaborate private **versions** of his **evolutionary theory**; the latter is **virtually** a précis of the famous book that he **eventually published** in 1859.

In the meantime, Darwin had married, in 1839, his first cousin, Emma Wedgwood, and they soon afterwards left London for a small **estate**, Down House, in Downe, Kent. His father had left him independently wealthy. At Down, he and his wife had ten children, three of whom died in infancy. By then, too, Darwin was beginning to suffer from an illness that was to plague him intermittently for the rest of his life. It produced shaking, nausea, dry retching, and great prostration. It left him, by his own testimony, unable to work for days and weeks on end, although his **output** of scientific books and **correspondence** continued to be prodigious. The **source** of his illness will probably never be completely unravelled, although it possibly had a large psychosomatic **component**. It also relieved him of many social, **professional**, and **domestic** obligations, thus **enabling** him to **concentrate** on what mattered most to him: his work.

In 1856, after eight years of **sustained** work on fossil and living barnacles (**published** in two large **volumes**), Darwin at last began work on a **volume** that he intended to call Natural **Selection**. It was interrupted in 1858, when Alfred Russel Wallace, a young naturalist then working in Malaysia, sent Darwin his own **brief** sketch of **evolution** through natural **selection**. Lyell, who had been privy to Darwin's own **evolutionary** thinking, arranged for a joint presentation of Wallace's sketch and a **brief** essay by Darwin at a meeting of the Linnean Society in London. Darwin was then stimulated to write *On the Origin of Species by Means of Natural Selection*. It sold out on the first day of **publication** in November 1859 and remains one of the greatest scientific treatises ever written. It went through five further **editions** in Darwin's lifetime.

Darwin's was by no means the first treatise to argue for the change of biological species over time. His grandfather, Erasmus Darwin, had developed his own **evolutionary** ideas in a **series** of **medical** writings and poems. The French naturalist Jean-Baptiste Lamarck, in his *Philosophie Zoologique* (1809), expounded a **comprehensive** **evolutionary** synthesis, based on the commonly held **notion** that characteristics **acquired** in an organism's lifetime could be passed on to the offspring. He famously argued that the giraffe's long neck was the result of **generations** of stretching to reach leaves higher in the trees. This form of inheritance was described as "Lamarckian". In 1844 the Scottish **publisher** Robert Chambers anonymously **published** his own **evolutionary** synthesis, entitled *Vestiges of the Natural History of Creation*. Darwin knew all these works, and in later **editions** of the *Origin* provided a historical introduction. Their influence on him was general rather than particular, however, as **revealed** by the differences in his **theory**.

Darwin's theory of evolution by natural selection is essentially that, because of the population pressure as described by Malthus, the young born to any species compete intensely for survival. Those young that survive to reproduce tend to embody favourable natural variations (however slight the advantage may be) - the process of natural selection - and these variations are passed on by heredity. Darwin recognized that his understanding of the mechanisms of heredity was limited, but he insisted that as long as inherited variation does occur, his theory would work. Therefore, some members of each generation will be able to adapt themselves to changing environmental conditions (changes in food supply, predators, or climate, for example), and this gradual and continuous process of adaptation is the source of the evolution of species. Within Darwin's vast conceptual scheme, extinct and present-day species of plants and animals were represented as a kind of "tree of life", in which closely related modern organisms are descended from common ancestors. Moreover, he provided additional support for the older concept that the Earth itself is not static but evolving.

In a deliberate attempt to make his ideas more acceptable, Darwin did not discuss human evolution in the Origin, confining himself to a single sentence: "Light will be thrown on the origin of man and his history". Nevertheless, his private notebooks make it clear that he recognized from the beginning that human beings were also part of the evolutionary process. He elaborated his views on human evolution in two later works, but the popular idea that he argued that human beings are descended from apes is false: within his scheme, human beings and other primates, such as modern apes and monkeys, are all descended from common, more primitive ancestors.

Reactions to the Theory

Darwin was extremely anxious about how his theory would be received, but, a shy man, he declined to debate his work publicly. Thomas Henry Huxley ("Darwin's Bulldog") became his most ardent spokesman. Reaction to the Origin was immediate. Some biologists argued that, since there was no laboratory proof of Darwin's theories, it must remain a hypothesis. Others criticized Darwin's concept of variation, pointing out that he could explain neither the origin of variations nor how they were passed between generations. This particular scientific objection was not answered until the birth of modern genetics in the early 20th century. Still others believed that natural selection was not sufficiently powerful to produce the changes Darwin attributed to it. In fact, Darwin's work convinced many scientists of the fact of biological evolution, but his theories were doubted by many until the early 20th century. The most publicized attacks on Darwin's ideas, however, came not from scientists but from religious opponents (or scientists acting out of religious belief). The thought that living things had evolved by natural processes denied the special creation of humankind and seemed to place humanity on a plane with the animals; both of these ideas were serious challenges to orthodox theological opinion.

Huxley himself (who coined the word "agnostic" to describe his own religious opinions) was never afraid of a tussle with the theologians, most famously in 1860 with Samuel Wilberforce, Bishop of Oxford. The idea of man descended from apes was already prominent by then, and Wilberforce patronizingly asked Huxley "Was it through his grandfather or his grandmother that he claimed his descent from a monkey?" Huxley replied that he would rather be related to an ape than to a man of

intelligence who used his eloquence to obscure the "real point at **issue**". Darwin himself was cagey about expressing himself publicly on religious matters, partly from timidity, partly to avoid causing pain to his devout wife Emma. We know from his letters and private notebooks that he gradually lost his own faith and can be said to have vacillated between atheism and agnosticism.

Later Years

Darwin kept **revising successive editions** of the Origin, to account for various scientific criticisms that were raised. In addition, he produced a **series** of monographs that elaborated different **aspects** of matters discussed in the Origin. The **Variation of Animals and Plants Under Domestication** (1868) **expanded** the **analogy** between "artificial" and natural **selection**, pointing out that animal and plant breeders could produce **significant** new **variations** simply by **selectively** breeding offspring. "How much more powerful than man," he insisted, "is Nature herself." The **Descent of Man** (1871) tackled the emotive **issue** of human **evolution** (which he had avoided in the Origin), and also developed a **theory** of **sexual selection** as another **mechanism** of organic change, **complementing** natural **selection**. The **Expression of the Emotions in Man and Animals** (1872) was essentially an essay in comparative **psychology**, drawing on Darwin's close observations of the early development of his own children.

Darwin was also a gifted botanist who used his own gardens at Down to great effect. In the last two **decades** of his life he wrote five botanical books, describing a wide **range** of observational and experimental work. It included the **role** of insects on cross-fertilisation; the **adaptations** of climbing plants such as ivy; the intriguing sensitive plants that **respond** to touch and are sometimes insectivorous (such as the Venus flytrap); and the important **function** of the humble earthworm in breaking down leaves and turning earth into fertile soil.

By the time he died on April 19, 1882, Darwin was a world-famous scientist. He had been given many with honours and awards, such as fellowship of the Royal Society, and honorary membership in many scientific **academies**. **Despite** the **controversial** nature of many of his ideas, the scientific **establishment** recognised his worth and he was buried in Westminster Abbey.

Darwin's Legacy

Although Darwin was not the first **evolutionist**, modern **evolutionary** biology begins with him. He was the first to marshal enough scientific **evidence** to **convince** his fellow scientists that biological species can change over time by natural means. However, the **principal mechanism** he proposed - natural **selection** - was not properly **appreciated** until the 20th century, when the work of biologists such as John Burdon Haldane, Sewell Wright, and Julian Huxley (T. H. Huxley's grandson) combined Mendelian genetics and population **dynamics** to produce what was called Neo-Darwinism. This synthesis remains the basis of much **contemporary research** in **evolutionary** biology.

During Darwin's lifetime, his **vision** of struggle as a brute fact of biological life was more widely accepted. The English social **theorist** Herbert Spencer coined the phrase "**survival** of the fittest" as an **alternative** to Darwin's less-loaded "natural **selection**",

and social Darwinism (more accurately called "social Spencerianism") became the basis of much social and economic thought. In particular, evolutionary ideas were used to explain many social phenomena and to justify the dominant capitalistic and imperialist ideology of the age. As evolution and development became fundamental features of the modern world-view, few areas of human life and endeavour escaped an evolutionary analysis, although in many cases it has been misunderstood or misapplied.

Natural Selection

Natural selection chooses the "fittest" but the fittest what? For Darwin the answer was clear: the fittest individual organisms. Fitness, for Darwin, meant whatever qualities assisted an organism to survive and reproduce. Components of fitness were qualities like fast running legs, keen eyes, abundant, high quality milk. "Fitness" later became a technical term used by mathematical geneticists to mean "whatever is favoured by natural selection". As a trivial consequence of this, it became possible to argue that "survival of the fittest" is a tautology.

Notwithstanding Darwin's emphasis on individual survival and reproduction, other evolutionists have sometimes thought of natural selection as choosing among larger units: groups of individuals, or species. Restraint in aggression, for instance, has been explained as resulting from natural selection between species: those species whose individual members tore each other limb from limb went extinct. At least in this simple, naive form, such "group selectionism" is now discredited. The 1960s and 1970s saw a reversion among theorists, away from group selectionism, back to the Neo-Darwinian rigour of the 1930s. Evolutionary change comes about through gene substitutions in gene pools and these ordinarily result from differences in genetic effects on individual survival and reproduction. Subtle and indirect ways in which genes might influence their survival were also recognized. For example, worker ants are sterile, but they can still affect the representation of copies of their genes in the gene pool, by favouring the reproduction of their close relatives, such as their mother or their reproductive sisters. In a notable theoretical advance, W. D. Hamilton proposed "inclusive fitness" as a generalization of "Darwinian fitness" which took account of such indirect, kinship effects. The phrase "kin selection" is helpfully used to distinguish this important theory from the discredited "group selection" which it superficially, and misleadingly, sometimes seems to resemble.

Malaria: Discovery by Committee

Perhaps the best known of all recent antimalarial drugs is chloroquine. As antimalarial drugs were desperately needed during the war, it is startling to realize that chloroquine was first synthesized several years before the war and recognized at that time as having antimalarial activity. A delightfully frank account of its development shows some of the less scientific problems of discovery.

In 1934, H. Andersag, a chemist at the Bayer Laboratories in Elberfeld, prepared a compound which was first known as Resochin. It might be described as a simplified mepacrine, although it belonged to a substantially different chemical class. For 10 years few people knew anything about it. Some limited laboratory and clinical tests undertaken at Bayer led to the belief that it was slightly too toxic to be acceptable. A

closely related substance, which was given the name Sontochin, was also laid aside. Under cartel agreements, both the Winthrop Chemical Company in the United States and, later, the French firm of Specia were informed about Resochin and Sontochin. By this time, 1940, the German army had overrun France, and in Europe the normal assessment of new drugs was made subordinate to military needs.

In the USA, the need for research into antimalarial drugs had naturally been foreseen. A program on the synthesis of new antimalarial drugs was initiated at the National Institutes of Health in 1939 and formed the basis of a war program organized by the Committee on Medical Research of the Office of Scientific Research and Development, National Research Council. The program involved scientists from the universities and industry, private individuals, the US Army, the Navy and the Public Health Service, and included liaison with Great Britain and Australia. It was coordinated by a group of conferences, subcommittees, and, from November 1943, by the Board for the Co-ordination of Malarial Studies. The overall search for new antimalarial agents involved the screening of some 16,000 compounds, most of them for both suppressive and prophylactic activity against several avian malarias, plus a thorough study of the toxicology and pharmacology of many of the preparations in lower animals. Finally the appraisal was undertaken of some 80 compounds against the malarias of man.

A great deal of useful information was assembled. Some people will regard such a massive exercise in organization with awe. To others it may seem like a recipe for disaster rather than for successful research. It seems that the machinery did not work very well in discovering chloroquine. Under cartel agreements, the identity and properties both of Sontochin and of Resochin had been disclosed to the Winthrop Chemical Company. The reports created sufficient interest for Sontochin to be synthesized and tested by the American company, and it was found to be active against malaria in canaries. Resochin was not pursued at that time, but both compounds were duly registered for purposes of patenting. The information very properly reached the files of the survey for antimalarial compounds under the Survey Number SN-183 and was available to various conferences, committees, and subcommittees on the Co-ordination of Malarial Studies. History does not record what the members of these committees thought about it, or whether they had time to read their papers.

Meanwhile, P. Decourt, a French clinical consultant to Specia, took samples of the drug to Tunisia for human trials. There he was helped by Jean Schneider, later a professor in the medical faculty at Paris. Schneider's trials were interrupted by the Allied invasion of North Africa in November 1942, and after the capture of Tunis, Schneider turned over his promising results and his remaining samples of Sontochin to the US Army.

In due course some of the drug reached the United States. Its chemical composition was determined at the Rockefeller Institute in New York and found to be identical with the material synthesized at the Winthrop laboratories 3 years earlier. According to Coatney, this discovery created havoc bordering on hysteria. "We had dropped the ball and in doing so had lost valuable time in the search for a reliable synthetic antimalarial". Naturally the lapse had to be covered up. The compound was given a new number and the biological data declared secret.

Further trials on Sontochin, now SN-6911, confirmed its **considerable** effectiveness, and also **generated** several ideas which resulted in the synthesis of a **compound** which was named SN-7618. It was made, but it was also found to be known already and to have been patented in the USA, along with Sontochin, by Winthrop. It was, in fact, a different salt of the same base as the original Bayer Resochin, and after much comparison with other related **compounds** it became **established** and was recognized formally in February 1946 under the name chloroquine. It had been synthesized and first tested in animals about 12 years earlier, and **rejected**, or **ignored**, twice. It has become the drug of choice for the American armed forces and for the World Health Organization, and has **survived** against the threat of resistant strains for a surprisingly long time.

Since this time much progress has been made in understanding the biology of plasmodia and new antimalarial drugs have been discovered. Primaquine, **chemically** in the same family as the pre-war German drug patnaquin, **emerged** as the most notable success of the great US wartime **project**. Daraprim (pyritnethatnine), a very different substance, **evolved** some years later from **research** of more general **significance**, to which we shall return in the next **chapter**. There are also more recent drugs and a **radically** different **approach**, based on advances immunology, is leading towards the development of vaccines. Much has been done to control mosquitoes too, but they, like the malaria parasites, have **adapted** to **survive** in the face of new enemies. The great hope of eradicating malaria has faded: new battles must be fought and new weapons devised if even the present level of control is to be **maintained**.

Causes of Cancer

A number of **factors** produce cancer in a **proportion** of **exposed individuals**. Among these **factors** are heredity, viruses, ionising radiation, **chemicals**, and **alterations** in the immune system. For a long time these various **factors** seemed to work in different ways, but now **researchers** are studying how they might **interact** in a multifactorial, **sequential process** resulting in malignancy. Basically, cancer is a genetic **process**. Gene **abnormalities** can be inherited or they can be **induced** in a body cell by a virus, or by damage from an outside **source**. Probably a **series** of **sequential** mutations **eventually** leads to a single cell that is malignant and proliferates as a clone. Originally it was thought that a malignant clone was completely **abnormal**, and that the only way to cure cancer was to rid the body of all the **abnormal** cells. **Considerable evidence** now **indicates** that the problem may be a loss of the ability of the cell to **differentiate** into its **final, functioning** state, perhaps because of the inability to produce a necessary **factor**.

Heredity Factors

It is **estimated** that no more than 20 per cent of cancers are based on inheritance. Several types of cancer, however, do run in families. Breast cancer is an example. Cancer of the colon is more common in families that tend towards polyps in the colon. A type of retinoblastoma has been **demonstrated** to **occur** only when a **specific** gene is deleted. These genes, called tumour-suppressor genes or antioncogenes,

normally act to prevent cellular replication. Their deletion prevents the normal check on abnormal multiplication of cells, that is, "removing the brakes". In some hereditary disorders, the chromosomes exhibit a high frequency of breakage; such diseases carry a high risk of cancer.

Viral Factors

Viruses are the cause of many cancers in animals. In humans the Epstein-Barr virus is associated with Burkitt's lymphoma and lymphoepitheliomas, the hepatitis virus with hepatocarcinoma, and a papilloma virus with carcinoma of the cervix. These viruses associated with human tumours are DNA viruses. The HTLV virus that produces a T-cell leukaemia is an RNA virus, or retrovirus, as are most of the viruses associated with animal tumours. In the presence of an enzyme called reverse transcriptase, they induce the infected cell to make DNA copies of the virus's genes, which can be incorporated into the cell genome (the full complement of DNA). Such viruses may contain a gene, called a viral oncogene, capable of transforming normal cells into malignant ones. Research indicates that each viral oncogene has a counterpart in the normal human cell called a proto-oncogene, or cellular oncogene. Oncogene gene products (i.e., proteins for which they code) have been identified as growth factors (or proteins necessary for the action of growth factors), which stimulate the growth of tumour cells.

Radiation Factors

Ionising radiation is a potent cause of cancer. Radiation induces changes in DNA, including chromosome breaks and transpositions, in which the broken-off ends of two chromosomes are exchanged. It acts as an initiator of carcinogenesis, inducing a change that progresses to cancer after a latent period of years. This delay provides opportunity for exposure to other factors.

Chemical Factors

The process by which chemical agents cause cancer has been extensively studied. Some chemicals act as initiators. Only a single exposure is required, but cancer does not follow until a long latent period has occurred and after exposure to another agent that acts as a promoter. Initiators produce irreversible changes in DNA. Promoters do not change DNA, but they do increase synthesis of DNA and stimulate expression of genes. They have no effect if given before the initiator, only if given after the initiator and given repeatedly over a period of time. For example, tobacco smoke contains many chemical initiators and promoters. The promoter action of cigarettes is very important, and if smoking is stopped, the risk of lung cancer falls rapidly. Alcohol is another important promoter; chronic abuse greatly increases the risk of cancers known to be induced by other agents, such as lung cancer in smokers. Carcinogenetic chemicals also produce chromosome breaks and translocations.

Immune-System Factors

The immune system appears to be able to recognize some forms of malignant cell and stimulate the production of cells able to destroy them. An important factor in the development of cancer may be a disease or other damaging event leading to a state

of immune deficiency. Such states are a **consequence** of AIDS (Acquired Immune Deficiency Syndrome), inherited immune deficiency diseases, and the **administration** of immunosuppressive drugs.

Environmental Factors

It is **estimated** that about 80 per cent of cancers may be caused by **environmental factors**. The best-established cause is tobacco smoke, actively or **passively** inhaled, which is responsible for about 30 per cent of all deaths from cancer. Dietary **factors** may account for about 40 per cent, but the causative relationship is not as clear, and the responsible **constituents** of the diet are not clearly **defined**. Obesity is a **risk factor** for a number of cancers, especially cancers of the breast, colon, uterus, and prostate. Dietary fat and low dietary fibre are associated with **high incidence** of colon cancer. Dietary fat and obesity, like alcohol, appear to act as **promoters**.

The Oncogene Factor

The common **component** that unites these seemingly disparate **mechanisms** may be the oncogene. Oncogenic viruses may **insert** their genes at many places in the animal genome. A viral oncogene that is **inserted** in connection with a cellular oncogene influences the expression of the oncogene and **induces** cancer. Radiation and carcinogenetic **chemicals** produce DNA damage, mutations, and chromosome changes, and oncogenes are often **located** on the chromosome near the fragile **site** or breakpoint.

A malignancy appears to be the result of a **series** of mishaps beginning with an **abnormal** gene or a somatic mutation (a mutation of a **normal** body tissue cell), probably more than one, followed by a **promoting** activity that stimulates the expression of one or more oncogenes, or **inhibits** the effects of one or more antioncogenes, thus leading to the **release** of growth **factors**. Perhaps the earlier event leads to the loss of production of metabolites necessary for the **normal differentiation** of the cell. The stimulation of growth **factors** then causes the clone of **undifferentiated** cells to proliferate, and a defect in the immune system permits the **abnormal** cells to escape destruction by the **normal** surveillance **mechanism**.

Attempted Suicide

Although the **proportion** of deliberate self-poisoning or self-injury patients who **require** psychiatric inpatient care is fairly small, this group is of special importance because it includes those most likely to have serious psychiatric disorders, those at special risk of suicide or further attempts, and some patients who **pose** very difficult management problems. A case has been made for **brief** admission of patients who may not be suffering from psychiatric disorders, but who are in a state of particularly severe crisis. Clearly, the decision to admit a patient to hospital must be taken only after very careful consideration.

When a patient is admitted to a psychiatric inpatient unit the clinical **team** should avoid the temptation to **commence** **specific** treatments immediately, especially those of a **physical** nature. Better management is likely to result from a **period** of careful observation and **assessment**, with **considerable** support being provided at this time

through frequent **contact** with nursing and other ward staff. A simple problem-orientated **method of assessment** can **facilitate** both management and **communication** between staff members. In units which employ a multidisciplinary **approach**, each patient might be **allocated** one member of staff (a "**primary** therapist") who has the main responsibility for dealing with the patient's problems. This should avoid **conflicting** advice or **approaches**. Above all else, it is important that psychiatric inpatient care is based on a carefully **coordinated policy**, especially for patients at particular risk of suicide. If a suicide should **occur** in hospital it is recommended that attention is paid to dealing with the resultant feelings both of patients and staff.

(*Attempted suicide* by Keith Hawton and Jose Catalan)

Indications for Psychiatric Inpatient Care

The types of patients likely to **require** psychiatric inpatient treatment were discussed in **Chapter 4**. To **summarise**, broadly speaking there are three main **categories** of such patients.

1. Those with serious psychiatric disorders, especially **depression** with serious suicidal ideation or **significant** impairment of **insight**. Also patients with schizophrenia, organic states, and some suffering from alcoholism.
2. Those at risk of suicide. The characteristics of such patients were described **previously** (p. 66). This group includes "failed suicides". It **overlaps** to a large extent with the first **category**.
3. Patients who **require** a **short period of removal** from **stress**. These include patients whose coping **resources** are temporarily exhausted, those who **require** further **assessment**, and patients for whom the mobilization of additional help is necessary before they can begin to cope with their difficulties.

The following case example is of a patient who was admitted to a psychiatric hospital because of reasons which placed her in both **categories** (1) and (2).

Margaret, a 58-year-old housewife, was admitted deeply unconscious to a general hospital after having taken a very large overdose of a mixture of tranquillisers, antidepressants, and paracetamol, together with half a bottle of vodka. She spent 5 days in the **intensive** care unit before **recovery**. On the day of the overdose, after her husband and daughter had gone to work, she had finished writing a suicide note which she had started a week before. After leaving the letter in a drawer she had gone to a nearby town and booked in at a hotel. Having asked that she should not be disturbed she had taken the overdose in her room. When her husband and daughter returned home they had been distressed at not finding Margaret. **Eventually**, they discovered the suicide note, which mentioned the name of the hotel. The police were **contacted** and they managed to find her.

During the **assessment** interview Margaret claimed she took the overdose intending to go to sleep and never wake up again. She was evasive when asked if she still felt like killing herself. However, she admitted that she had felt very miserable for 3 or 4 months. Recently, she had started thinking the future was hopeless and that she was no longer able to look after her husband and daughter properly. Her thoughts

seemed slow and she complained of lack of energy and difficulty in staying asleep at night.

The therapist judged that Margaret had made a very serious attempt to kill herself, that she was severely depressed and a continuing suicide risk, Although Margaret felt that nothing could be done to help her she agreed to be admitted to a psychiatric unit.

For a few patients, compulsory admission to a psychiatric inpatient unit under an order of the Mental Health Act will be deemed necessary. Description of the types of patients for whom this might be indicated, and guidance on how to proceed were provided in Chapter 4 (p. 75). In addition, a summary of those sections of the Act concerned with admission of patients to hospital, or detention of patients already in hospital, which are relevant for attempted suicide patients was provided in an Appendix to that chapter.

Aerospace Medicine

Aerospace Medicine is the branch of preventive medicine that is concerned with the physiological and psychological stresses on the human body in flight. The study of effects within the earth's atmosphere is also called aviation medicine; beyond this atmosphere the study of effects is also called space medicine.

Aviation Medicine

Specialists in aviation medicine study the reactions of human beings to the stresses of air travel. They are concerned with the proper screening of candidates for flight training, the maintenance of maximum efficiency among aircrews, and with clinically oriented research into the effects of flight on the body. They also cooperate actively with aeronautical engineers in the development of safe aircraft.

History

Aviation medicine is rooted in the early 18th-century physiological studies of balloonists, some of whom were also physicians. In 1784, a year after the first balloon flight by the French physicist Jean Pilâtre de Rozier, a Boston physician, John Jeffries, made the first study of upper-air composition from a balloon. The first comprehensive studies of health effects in air flight were made by the French physician Paul Bert, who published his research on the effects of altered air pressure and composition on humans in 1878 under the title *La pression barometrique*. In 1894 the Viennese physiologist Herman Von Schrötter designed an oxygen mask with which the meteorologist Artur Berson set an altitude record of 9,150 m. With the advent of aircraft, the first standards for military pilots were established in 1912. Significant work in this area was directed by the physician Theodore Lyster, an American pioneer in aviation medicine. Technical advances included the first pressurised suit, designed and worn by the American aviator Wiley Post in 1934, and the first antigravity suit, designed by W. R. Franks in Great Britain in 1942. In an effort to help design better restraint systems for military jet aircraft, the United States flight surgeon John Stapp conducted a series of tests on a rocket-powered sledge,

culminating on December 10, 1954, when Colonel Stapp **underwent** deceleration from a velocity of 286 m/sec in 1.4 sec.

Physiological Considerations

Aviation medicine is concerned **primarily** with the effects on human beings of high speed and high altitude, and **involves** the study of such **factors** as acceleration and deceleration, atmospheric pressure, and decompression. In **civil**-aviation medicine, an additional concern is passenger airsickness.

High Speed

In itself, high speed does not produce harmful symptoms. What can be dangerous are high acceleration or deceleration forces; these are expressed as multiples of the earth's gravity at sea level, or gs. In pulling out of a dive, for example, a pilot may be subjected to an inertial force as high as 9 g. If a force of 4 to 6 g is **sustained** for more than a few seconds, the resulting symptoms **range** from **visual** impairment to total blackout. Protection is provided by a specially **designed** outfit, called an anti-g suit, which supplies pressure to the abdomen and legs, thus counteracting the tendency for blood to **accumulate** in those **areas**. Proper support of the head is essential during extreme deceleration in order to avoid swelling of the sinuses and severe headaches. While facing backwards in a seated position, properly supported human test subjects have been able to tolerate a deceleration force of 50 g without severe **injury**.

Oxygen Supply

A critical consideration in aircraft travel is the continuing physiological **requirement** for oxygen. The only oxygen stored by the body is that in the bloodstream. Although muscles can **function temporarily** without oxygen, the buildup of toxic products soon limits activity. Brain and eye tissues are the most sensitive to oxygen deficiency.

The earth's atmosphere, which contains 21 per cent of oxygen by **volume**, is under a **normal** sea-level pressure of 760 tons. The barometric pressure up to about 4,575 m is **sufficient** to **sustain** human life. Above this altitude the air must be artificially pressurised to meet the respiratory needs of human beings.

High-altitude **military** aircraft are provided with oxygen **equipment**, and **military** personnel are **required** to use it at all times when **participating** in flight above 3,050 m. **Military** craft that can fly above 10,675 m usually also have cockpits under pressure. Positive-pressure breathing **equipment** is also used in all other aircraft **capable** of flight above 10,675 m. Full or partial pressure suits with additional oxygen **equipment** are **required** in **military** aircraft **capable** of flight above 16,775 m.

Commercial carriers provide oxygen systems and pressurised cabins in accordance with **civil** air **regulations**. An airliner flying at 6,710 m, for example, must **maintain** a "cabin altitude" of 1,830 m.

Altitude Sickness

This physiological condition results from a state of acute oxygen deficiency, known **medically** as hypoxia, at high altitudes. Ascending from the lower atmosphere, called the troposphere, the atmosphere is thin enough at 3,900 m to produce symptoms of hypoxia, or oxygen hunger. At the lower limit of the stratosphere, about 10,675 m, **normal** inhalation of pure oxygen no longer **maintains** an **adequate** saturation of oxygen in the blood.

Hypoxia produces a variety of **reactions** in the body. Mild intoxication and stimulation of the nervous system are followed by progressive loss of attention and judgement until unconsciousness **occurs**. Respiration and pulse rate increase, and the systemic oxygen content is reduced. Prolonged lack of oxygen may cause damage to the brain.

Aeroembolism

Because of the reduction of barometric pressure at altitudes above 9,150 m, the body tissues can no longer **retain** atmospheric nitrogen in solution. As a result, **liberated** gas bubbles, as well as ruptured fat cells, may enter the circulatory system and form obstructions, or emboli, in the blood vessels. This condition, known **medically** as aeroembolism and popularly as the bends, leads to confusion, paralysis, or neurocirculatory **collapse**. The most characteristic symptoms of the bends are pain in the large joints resulting from pressure of the gas on tendons and nerves, together with spasm of the blood vessels. Preflight inhalation of pure oxygen to **eliminate** nitrogen from the system has proved valuable as a preventive measure. Rapid decompression, resulting from accidental failure at high altitudes of the pressure within the cabin, causes **major** damage to the heart and other organs by the ram effect of gases formed in the body cavities.

Airsickness

Airsickness is produced by a disturbance of the labyrinthine **mechanism** of the inner ear, although psychogenic **factors** such as apprehension can also play a part. Motion sickness can be prevented by taking drugs containing scopolamine or some antihistamines before flying.

Time Change

As **transport** planes became faster, pilots and passengers were able to travel across many time zones in less than a day. The resulting disturbance in the body's "biological clock" or circadian ("about a day") rhythm can produce disorientation and reduce **concentration** and efficiency. This condition is popularly known as jet lag. While troublesome to passengers, the problem is more acute for pilots, who may have to fly another **assignment** in a short time. Concern has been expressed about the possible effect of this situation on air safety, although no air accident has yet been clearly **identified** as jet-lag-**induced**.

Space Medicine

Specialists in space medicine - a discipline also known as bioastronautics - study the human **factors involved** in flight outside the atmosphere. Most of the **potential**

dangers in space travel (such as acceleration and deceleration forces, the need for an artificial atmosphere, and noise and vibration) are similar to those encountered in atmospheric flight, and can be compensated for in similar ways. Space-medicine scientists, however, must consider two additional problems-weightlessness and the increased radiation outside the atmosphere.

History

The first information about human performance during space travel was gathered in Germany in the 1940s under the direction of Hubertus Strughold. Both the United States and the former Union of Soviet Socialist Republics (USSR) conducted rocket tests with animals from 1948. In 1957 the USSR put a dog into the earth's orbit, and the United States used a monkey for tests in 1958. The tests suggested that few biological dangers existed in space flight. This was confirmed when human space flight began on April 12, 1961, with the launching of the Soviet cosmonaut Yury Gagarin into orbit.

The United States followed with the Mercury-Redstone suborbital flights, and then the orbital Mercury and Gemini flights, the Apollo moon landings, the experimental orbital vehicle Skylab, and Space Shuttle flights. Then, in the 1980s, when Soviet cosmonauts began setting records for time spent in the gravity-free or "microgravity" environment, the effects of long-term weightlessness began to be viewed as a serious medical problem.

Physiological Findings

Few serious biological effects were noted during the early years of space flight. Even the 21-day quarantine of astronauts returning from the Apollo moon mission was subsequently abandoned, because no infectious agents were identified. The body functions that were monitored (often with specially designed miniature instruments) included heart rate, pulse, body temperature, blood pressure, respiration, speech and mental alertness, and brain waves. Few changes occurred. Changes in hormones and in concentrations of salts in the blood did take place, but these were not detrimental. Eating in weightlessness was accomplished by packaging food in containers that could be squeezed directly into the mouth, and special systems were designed for collection of fluid and solid wastes. The lack of a natural time cycle in space was compensated for by keeping the astronauts' schedules synchronised with earth time.

Psychological changes were anticipated because of the close confinement of a few individuals in a small space with limited activity. Few psychological problems were noted, however, perhaps because the astronauts were chosen for their emotional stability and high motivation, and because they were assigned enough tasks to keep them almost constantly busy. Irradiation was also found to have little effect. Short orbital flights produced exposures about equal to one medical X-ray - about the same as suborbital flight. The crew on the longer Skylab flight sustained many times this dose. Space flights are planned to avoid periods when solar flares are expected to occur, as these can emit dangerous levels of gamma radiation.

However, although it was **assumed** that gravity is necessary for **normal** growth, the magnitude of physiological changes **induced** by extended **periods** in a microgravity **environment** came as something of a surprise. Serious **medical** problems, including loss of bone matter and muscle strength, were observed to result from long-term weightlessness, as during the 237-day mission of three cosmonauts aboard a Salyut space station in 1984. Moreover, atrophy of certain muscles, particularly those of the heart, was seen to be especially dangerous because of its effect on the **functioning** of the entire cardiovascular system. The blood itself was found to be **affected**, with a measurable decrease in the number of oxygen-carrying red blood cells.

On a seven-day **Challenger** Space Shuttle mission in 1985, these effects were studied in an experiment using 24 rats and 2 monkeys. Post-flight examination **revealed** not only the expected loss of bone and muscle strength but a decrease in **release** of growth hormone as well.

These findings are taken into consideration now whenever plans are made for crewed space flight. The busy work **schedules** of astronauts in space are **designed** to include regular exercise **periods**, **thereby maintaining** muscle tone. And plans for the operation of permanently crewed space stations now include provisions for changing crews on a regular basis, so as not to subject astronauts to weightlessness for **indefinite periods** of time.

The Immune System

The body defends itself against foreign proteins and infectious microorganisms by means of a **complex** dual system that depends on recognizing a **portion** of the surface pattern of the invader. The two parts of the system are termed cellular immunity, in which lymphocytes are the effective agent, and humoral immunity, based on the action of antibody molecules.

When lymphocytes recognise a foreign molecular pattern (termed an antigen), some **release** antibodies in great numbers; others store the memory of the pattern for future **release** of antibodies should the molecule reappear. Antibodies **attach** themselves to the antigen and in that way mark them for destruction by other substances in the body's defence arsenal. These are **primarily** complement, a **complex** of enzymes that make holes in foreign cells, and phagocytes, cells that engulf and digest foreign matter. They are drawn to the **area** by **chemical** substances **released** by activated lymphocytes.

Lymphocytes, which resemble blood plasma in composition, are manufactured in the bone marrow and multiply in the thymus and spleen. They circulate in the bloodstream, penetrating the walls of the blood capillaries to reach the cells of the tissues. From there they **migrate** to an independent network of capillaries that is comparable to and almost as extensive as that of the blood's circulatory system. The capillaries join to form larger and larger vessels that **eventually link** up with the bloodstream through the jugular and subclavian veins; valves in the lymphatic vessels **ensure** flow in one direction. Nodes at **various** points in the lymphatic network act as stations for the collection and manufacture of lymphocytes; they may become enlarged during an infectious disease. In anatomy, the network of lymphatic vessels and the lymph nodes are together called the lymphatic system; its **function** as the vehicle of the immune system was not recognized until the 1960s.

The Concept of Number

The long struggle forward in children's thinking comes out very clearly in the development of their number ideas - the part of Piaget's work which is now best known in this country. It offers a striking illustration both of the nature of his discoveries and of the basic pattern of mental growth. We can watch how the child starts from a level of utter confusion, without a notion of what number really means, even though he may be able to count up to ten or twenty; a level where number is completely mixed up with size, shape, and arrangement, or constantly shifts according to the way it is subdivided or added up. And we can see how, on an average two years later, children declare of their own accord that a number *must* stay the same, whatever you do with it, so long as you do not actually add to it or take away from it; or that whatever you have done with it, you can always reverse this and get back to where you started from; or that you can always show it to be the same by counting; and so on.

The following are a few examples of the ways in which Piaget's experiments bring out this pattern of growth:

1. Each child was presented with two vessels of equivalent shape and size containing equal quantities of coloured liquid. Then the contents of one of them was poured into (a) two similar but smaller vessels, (b) several such, (c) a tall but narrow vessel, (d) a broad but shallow one. In each case the child was asked whether the quantity of liquid was still the same as in the untouched vessel.

Piaget found that at a first stage, around 4-5 years, children took it for granted that the quantity of liquid was now *different* - either more because the level was higher, or more because there were more glasses, or less because the new vessel was narrower, or less because the levels in the two or more glasses were lower. In other words, there was no idea of a constant quantity, independent of its changing forms; if its appearance changed, the quantity changed and could become either more or less according to what aspect of the new appearance caught the child's eye. At a second stage, at about 5½-6, children had reached a transitional phase, in which they wavered uncertainly between the visual appearance and the dawning idea of conservation in their minds. Thus the quantity of liquid might be regarded as still the same when it was poured into two smaller glasses, but as greater when it was poured into three. Or as remaining the same if the difference in level or cross-section in the new vessel was small, but not if it was larger. Or the child might try to allow for the relation between cross-section and level, and experiment uncertainly without reaching any clear conclusion. In the third stage, 6½-8, children give the correct answers right away, either by reference to the height-width relation, or by pointing out that the quantity has not been changed: 'It's only been poured out.'

2. As a check on these results, Piaget carried out a similar set of experiments, with beads instead of liquids. In this way something closer to counting could be introduced (e.g. the child putting beads into a container one by one as the experimenter did the same into another vessel). Also he could be asked to imagine that the beads inside each vessel were arranged into the familiar shape of a necklace. The outcome was entirely the same. At the first stage, the children thought that the quantity of beads would be either more or less, according as the level looked higher, or the width

greater, or there were more vessels, and this happened even when a child had put one bead into his vessel for each one that the experimenter placed in his. At stage 2 there is a struggle in the child's mind as before. This may show itself for example by his first going wrong when comparing levels between a wider and a taller vessel; then correcting himself if asked to think in terms of the necklaces ; but when the beads are spread over two or more containers, still thinking that the necklace will be longer. At stage 3 once more the children reply correctly and cannot be shaken, however the questions or the experiments may be varied.

(The Growth of Understanding in the Young Child, by Nathan Isaacs.)

Carbohydrate and Fibre

There are many different kinds of carbohydrate. **Complex** carbohydrate, or starch as many people term it, **occurs** in plant products such as bread, rice, spaghetti, flour, breakfast cereals (and cereals generally), potatoes, and in many vegetables. As well as starch, carbohydrate can **occur** naturally as simple sugars. For example, there is a sugar called lactose that is naturally present in milk; fruit sugar (fructose) and glucose **occur** together in many fruits. Generally speaking, where carbohydrate is taken in any of these forms, it is useful and is also **accompanied** by other nutrients. Meals for everybody, including slimmers, should contain such foods. Not only are such foods very nutritious, they also contain fibre. Generally it is recommended that there is more fibre in the diet to keep the gut working smoothly and efficiently. Fibre is the unabsorbed part of the food, a type of **complex** carbohydrate found in plant cell walls. To **maintain** fibre intake at an **adequate** level, it is best to have carbohydrate foods in "whole" form. For example, eat the skins on jacket potatoes; use wholemeal flour in cooking; buy brown, wholemeal bread; use brown rice and brown spaghetti; take breakfast cereals that are not over-**processed**, such as Weetabix, Shredded Wheat, porridge oats, and sugar-free muesli. Plenty of fresh fruits and vegetables are also important. Dried fruits are especially high in fibre, as are pulses.

It is necessary, even if you are trying to lose weight, to **maintain adequate** carbohydrate and fibre levels. At each meal try to have at least one form of good carbohydrate such as we have mentioned above. Better still, have one form of **complex** carbohydrate (something starchy like rice or bread or pasta) **plus** a piece of fresh fruit. Be careful not to **accompany** your chosen carbohydrate with large quantities of fat. If you are eating carrots and potatoes with your meal, do not add a knob of butter or margarine. If you have chosen bread to make up sandwiches, use only the thinnest scrape of fat (preferably a polyunsaturated margarine or nothing at all). If you want potatoes with your meal, cook them more often as boiled or jacket potatoes rather than as chips. If you must have chips do them thick cut, as they absorb less fat that way. As you can see, the main mistake people make with carbohydrate is to use too much fat with it.

Another difficulty with carbohydrate food is that it is often over-**refined**. Sugar, the kind you buy in bags, is a highly **refined** form of sweetness, totally lacking in protein, minerals, vitamins, and fibre. Everyone, whether on a slimming diet or not, should reduce this kind of sugar to an absolute **minimum**. It can be surprisingly difficult to avoid, too, because it is added to so many foods and drinks. Biscuits, cakes, most fizzy drinks, squashes and fruit juices, sweets, chocolates, ice-cream, and jam all

contain vast quantities of sugar. Savoury foods such as pickles, sauces, tinned vegetables, gravies, soups, and ready-made frozen meals often have sugar added. Read the **labels** on the foods you buy and you will be surprised at the number of hidden **sources** of **refined** sugar.

You can see why it is easy to be muddled about carbohydrate. Some diets have put all carbohydrate in the "bad" **category**. This is a great pity. The thing to avoid or at least cut down on is **refined** sugar and the products that contain it. You will be more successful in this endeavour if you make sure you are not excessively hungry because of an over-restrictive diet. If your standard way of eating (or your slimming diet) includes a mix of proteins, **complex** carbohydrate, and fresh fruits at each meal, you are much less likely to eat large amounts of **refined** sugar or the products that contain it.

*(Get Slim and Stay Slim: The **Psychology** of Weight Control, by Jennifer J. Ashcroft and J. Barrie Ashcroft)*

Affluence and Inequality

I

When **social commentators** in the 1950s and early 1960s postulated a progressive **transformation** of capitalism into 'post-capitalism', the centrepiece of that diagnosis was an **assumption** that **economic** inequalities were steadily **diminishing**. Other important **assumptions** were built into the more sophisticated **versions** of the **thesis**. The nature of power, it was said, had changed drastically through its detachment from private property, and through the **emergence** of a **complex network** of pressures and interests resulting in diffusion of influence over the shape of society into many hands. Increasing social mobility was taken to be unfreezing fixed positions which **individuals** and families had **previously occupied** over their lifetimes, and to be forging new ties of personal acquaintance, experience and **identity** between the different strata of the population. But the touchstone of the 'affluent society' was a postulated reduction of **economic** inequalities to little more than frills. Capitalism, so it was at least **implicitly acknowledged**, had not in the past matched its **creation** of wealth by a fair and tolerable distribution of wealth. It was now doing so, through a more or less silent **process** of **transformation** from within.

Two sets of changes were thought to be at work, closely related to each other. First, and most simply, inequalities of **income**, property and **security** of life were **assumed** to be growing steadily smaller, and less **significant** in their **impact**. Second, so the argument ran, such **economic** inequalities as remained were much less class-tied than they had been before. They arose now far less from ownership and non-ownership of capital and from pressures of the **labour** market - from the relations of production - than from conditions unrelated, or only loosely related, to class. Residual poverty was seen as the product of old age, **physical** and **mental** handicap, high fertility, social incompetence - also, it was added later, of **discrimination** against women, against coloured people, against other **minorities**. As such it was remediable by some combination of improved **welfare** measures and socio-cultural therapy. No **radical** changes in the **economic foundations** of society would be needed. In so far as they might have seemed necessary earlier, such changes had now **occurred** or were

occurring - quietly, almost surreptitiously, without fuss. Capitalism, in its new 'post-capitalist' form, was fulfilling the promise which it had long withheld.

The **evidence** adduced for this **erosion** of **economic** inequalities was very sketchy, and would have been highly vulnerable to criticism in a **period** less coloured than the 1950s by socio-political complacency. But there were at least some signs from the **decade** before which might seem to give support to the **thesis**. Explanations, on the other hand, were usually quite rudimentary. Some **relied on assumptions** about the **consequences** of taxation and **welfare** measures. In fact, attempts to measure the real **impact** of public **policy** on **distribution** were rare and little known, but already then underlined the need for caution in **assuming** that state action was spreading wealth much more evenly. Other explanations looked to changes in industrial and **occupational structure** - to a relative **contraction** in the numbers of unskilled and casual workers and to a concomitant **expansion** in the numbers of non-**manual** workers, in particular. There was **inferred** from these changes, on their own or in conjunction with crude **data** on money **incomes**, a **transformation** of the **structure** of **jobs** and **incomes** from the shape of a pyramid or cone to to the shape of a diamond or lozenge, bulging affluently in the middle. This kind of geometric **distribution** was **dramatic**, but both **inaccurate** and misleading. It was **inaccurate** because it **attributed** to the shape of **income** **distribution** in the post-war years a degree of simplicity and novelty which it did not have, while **ignoring** the continuing pyramidal shape of property ownership. It was misleading beyond that because it exaggerated the changes in **occupational structure**, and **misinterpreted** their **significance**, in ways that we shall discuss later.

In general, explanations of the postulated **process** of **economic** equalisation did not go beyond **assumptions** of these kinds, and **brief** references to reduction of unemployment and of earnings differentials by skill as well as by **sex** and age. Nor did they need to. For the **thesis** was borne less by **evidence** and by **explicit** argument than by faith. A **theory** of **automatic** progress has a long history in both popular and **academic** thought. It received fresh support in the 1950s - as a prognosis for the future, not as a characterisation of the past - both because some real, though quite limited, changes had **occurred** during the **previous decade**; and above all because the socio-political climate was hostile to the **implications** of any diagnosis that those changes had run their course.

II

Such as they were, these changes had indeed run their course by the early 1950's. But the point was obscured not only by the **reluctance** of most **commentators** to look at the signs; not only by the fact that the signs in any case were **complex** and took time to read; but also by a **conceptual** confusion so elementary that its **persistence** as a **feature** of the **debate** about capitalism and 'post-capitalism' seems wilful. No clear **distinction** was drawn between the question of absolute levels of living and **security** - the 'average' conditions of life - and the question of **distribution**, the **range** of inequality around the average. 'Affluence' reflected in rising **overall** levels of living for the population at large was, and still often is, **equated** ipso facto with a reduction of relative inequalities. If that **equation** were correct, then there would be nothing new by itself in the **erosion** of inequality alleged to mark the **transition** from capitalism to 'post-capitalism'. For increasing average 'affluence' has been a long-standing **trend** in

Britain and other industrial capitalist societies - intermittent, it is true, and slower for many decades in Britain than in countries which industrialised later; but in the long run so far a pronounced upward trend nevertheless.

To take just a few estimates, net national income per head of population in the United Kingdom has been calculated as more than doubling in real terms between the early 1920s and the middle 1960s. The trend was uneven. It had been downward in the preceding period around World War I; it was more or less flat during the depression years around 1930; it turned down again between the early and the late 1940s. But the long-term trend was upward both before and after World War II. By the early 1940s the index of per capita national income stood about 50 per cent above its level twenty years before; by 1965 it was some 50 to 60 per cent higher than in the early 1950s. The rates of increase during the periods of fastest expansion were much the same - 16 or 17 per cent over five years - both pre-war and post-war: from the early 1930s to the early 1940s, and again from the 1950s. Industrial productivity and real gross wages have been estimated for the United Kingdom as growing by an annual average of about 2 per cent per head over the period from 1871 to 1895; as stagnating with even some decline in real wages, from 1895 to 1913; as rising again, by an average of about 1 per cent from the early 1920s to 1938, and by more than 2 per cent a year from 1949 to 1960. Comparisons with corresponding estimates for the U.S.A., Sweden, Germany and France show the U.K. lagging behind these other countries in the two decades before World War I, and again in the years after World War II; it was behind the others for which data are available during the inter-war years, too, in terms of growth of industrial productivity, though not in terms of growth of real wages. The 1960s were marked by rising unemployment and increasingly uneven rates of economic growth. But the overall trend in real gross incomes from employment was still upwards. After discounting for price increases, average wage and salary earnings in the U.K. rose by about 3 per cent per year, or even slightly more, over the period 1960-70.

The issue here is not the slower rate of growth in output and real incomes in Britain by comparison with a number of other industrial capitalist countries for much of the time since the 1890s, relevant though the variety of explanations suggested for that are to other questions concerning the nature of British capitalism and its class structure. Nor is the point to argue that long-run economic growth - slow or fast - is an inherent and necessarily continuing feature of capitalism. To make that assumption would be to beg the questions raised by recent signs of a possibly deep-rooted economic crisis - by a conjunction of uneven growth rates, high unemployment and accelerating inflation with falling rates of profit, from the 1960s, long after Keynesian techniques of economic management were presumed to have mastered the major tendencies to recurrent stagnation characteristic of earlier capitalism. The point for the moment is a much simpler one. Increases in average levels of living are in no way a new phenomenon. The rates of increase which have prevailed since World War II have long historical precedents. Indeed the kinds of figures quoted earlier exaggerate recent trends of growth in disposable income - the real value of earnings in hand - because they are gross measures taken without regard to the effects of direct taxation. As more and more earners have been brought within the range of income tax, and as effective rates of direct taxation have been raised in the lower reaches of the range especially, net earnings have risen progressively slower than gross earnings. Those of male manual workers, for example, rose by an average of

only about 1 per cent a year in the 1960s compared with about 2 per cent a year in the earlier **period** after World War II, although the rate of growth in gross earnings was faster in the 1960s than before.

There is, therefore, no magic or novelty **attaching** to the rising 'affluence' of the post-World War II epoch. It may of course be argued - it has certainly often been **implied** - that there is some **qualitative** difference between recent and earlier increases in real **income**: that prosperity in the 1950s and 1960s has raised the condition of the **bulk** of the population over some threshold between 'poverty' and 'affluence', above which inequalities of condition relate in the main only to inessentials. That argument, however, raises a **series** of questions about the **criteria** by which, and on whose judgement, 'essentials' are to be distinguished from 'frills'; we shall discuss these later. The argument does not **dispose** of the fact that **generations** of ordinary earners before the 1950s had experienced substantial improvements in their conditions in absolute terms. Merely to note the fact of such improvements, then and now, throws no light whatsoever on the critical question of **trends** in the **range** of relative inequality around the rising average.

III

It has now, by the early 1970s, become almost part of **conventional** wisdom to dismiss the faith of the 1950s in a progressive **erosion** of **economic** inequalities as either nonsense or at least glibly over-optimistic. The recognition of reality which that implies is welcome. But the very **assurance** with which this dismissal tends to be expressed carries at least two dangers with it.

The first is the risk of adopting a vulgar **version** of the **theory** 'plus ça change, plus c'est la même chose'. Such a **theory**, **projecting** the experience of the 1950s and 1960s backwards without qualification, is blind to those **periods** in which special **circumstances** have produced some genuine **shifts** in **distribution**. As we shall show, **shifts** of that kind have been moderate in extent, and the product of exceptional conjunctions of events. But they have given an impetus to reformist social **policies** which goes well beyond their actual **achievements**: they have helped to create illusions that **evolutionary** adaptations of policy are **sufficient** to spread income, wealth and **security** much more evenly within a continuing capitalist **framework**. The exceptional and limited character of such **shifts** in **distribution** has to be shown in order to dispel those illusions. That in turn entails recognition of their historical reality - not their dismissal by a crude **theory** that nothing ever changes.

The second danger arises from the way in which the rediscovery of inequality in the 1960s replaced the rival faith of earlier post-war years. It was the social turbulence of the 1960s which opened many eyes to the **persistence** of inequality, much more than an **accumulation** of factual **evidence**. Facts to question and refute the complacency of the 1950s were **available** well before they were generally used for that purpose. But they did not come into public and **professional** consciousness until mounting unrest - of different kinds and from a variety of **sources** - pointed to a partial dissolution of that '**consensus**' about the **established** order which had been widely taken for **granted** in the 1950s. So the 1960s saw a change in fashions of social observation and **commentary**. But fashions can change again. Resistance to changes of fashion **requires**, among other things, a solid knowledge of facts. It is for this reason, not

least, that a fairly detailed examination of the record with regard to **trends** in **economic** equality is essential, even though the **outcome** now - unlike ten years ago - is not likely to be much of a surprise.

(John Westergaard and Henrietta Resler: *Class In A Capitalist Society*)

The Travelling Salesman

The travelling salesman appeared late in the 19th century in Europe and in the United States. The early itinerant peddler carried his goods on his back or on his horse, working his way from a port city through the hinterlands. With the coming of the railway and the **assurance** given to sellers by new credit-reporting systems, salespeople with their sample cases moved across the land. Persuasive skill was less important in those days of unsatisfied demand, and orders were readily **forthcoming**. By 1900, however, with the increasing supply of manufactured goods, buyers became more **discriminating** in their **purchases**. Greater attention was given to training the sales force and to providing buyer **incentives**. The growth of industrialization and urban living led to the development of merchandising as a **major** business endeavour. The use of sales **promotion** practices has experienced steady growth in the 20th century.

Stocks

Stock, in business and **finance**, refers to certificates representing shares of ownership in a **corporation**. When **individuals** or organizations **purchase** shares in a company, they receive stock certificates **indicating** the number of shares they have **acquired**. Such certificates entitle them to shares in the profits of the company, which are paid out at **intervals**, in the form of dividends. Besides a claim on company profits, stockholders are entitled to share in the sale of the company if it is dissolved. They may also vote in person or by proxy for **corporation** officers, **inspect** the accounts of the company at reasonable times, vote at stockholders' meetings, and, when the company **issues** new stock, have **priority** to buy a certain number of shares before they are offered for public sale. Because stocks are generally negotiable, stockholders have the right to **assign** or **transfer** their shares to another **individual**. Unlike a **sole** proprietor or **partner** in a business, a stockholder is not liable for the debts of the **corporation** in which he or she has **invested**. The most the stockholder can lose if the company fails is the amount of her or his **investment**. According to the New York Stock Exchange, about 47 million people in the U.S. owned stocks in publicly held **corporations** in 1985.

The Business Cycle

The Business **Cycle** is a term used in **economics** to designate changes in the **economy**. Ever since the Industrial **Revolution**, the level of business activity in industrialised capitalist countries has veered from high to low, taking the **economy** with it.

Phases of the Business Cycle

The timing of a cycle is not predictable, but its phases seem to be. Many economists cite four phases - prosperity, liquidation, depression, and recovery - using the terms originally developed by the American economist Wesley Mitchell, who devoted his career to studying business cycles.

During a period of prosperity a rise in production becomes evident. Employment, wages, and profits increase correspondingly. Business executives express their optimism through investment to expand production. As the upswing continues, however, obstacles begin to occur that impede further expansion. For example, production costs increase; shortages of raw materials may further hamper production; interest rates rise; prices rise; and consumers react to increased prices by buying less. As consumption starts to lag behind production, inventories accumulate, causing a price decline. Manufacturers begin to retrench; workers are laid off. Such factors lead to a period of liquidation. Business executives become pessimistic as prices and profits drop. Money is hoarded, not invested. Production cutbacks and factory shutdowns occur. Unemployment becomes widespread. A depression is in progress.

Recovery from a depression may be initiated by several factors, including a resurgence in consumer demand, the exhaustion of inventories, or government action to stimulate the economy. Although generally slow and uneven at the start, recovery soon gathers momentum. Prices rise more rapidly than costs. Employment increases, providing some additional purchasing power. Investment in capital-goods industries expands. As optimism pervades the economy, the desire to speculate on new business ventures returns. A new cycle is under way.

In fact, business cycles do not always behave as neatly as the model just given, and no two cycles are alike. Business cycles vary considerably in severity and duration. Major and minor cycles can occur, with varying spans.

The most severe and widespread of all economic depressions occurred in the 1930s. The Great Depression affected the United States first but quickly spread to Western Europe. From 1933 to 1937 the United States began to recover from the depression, but the economy declined again from 1937 to 1938, before regaining its normal level. This decline was called a recession, a term that is now used in preference to liquidation. Real economic recovery was not evident until early 1941.

Special Cycles

Apart from the traditional business cycle, specialised cycles sometimes occur in particular industries. The building construction trade, for example, is believed to have cycles ranging from 16 to 20 years in length. Prolonged building slumps made two of the most severe American depressions worse. On the other hand, an upswing in building construction has often helped to stimulate recovery from a depression.

Some economists believe that a long-range cycle, lasting for about half a century, also occurs. Studies of economic trends during the 19th and early part of the 20th centuries were made by the Russian economist Nikolai Kondratieff. He examined the behaviour of wages, raw materials, production and consumption, exports, imports, and other economic quantities in Great Britain and France. The data he collected and

analysed seemed to establish the existence of long-range cycles. His "waves" of expansion and contraction fell into three periods averaging 50 years each: 1792-1850, 1850-1896, and 1896-1940. Such studies, however, are not conclusive.

Causes of Cycles

Economists did not try to determine the causes of business cycles until the increasing severity of economic depressions became a major concern in the late 19th and early 20th centuries. Two external factors that have been suggested as possible causes are sunspots and psychological trends. The sunspot theory of the British economist William Jevons was once widely accepted. According to Jevons, sunspots affect meteorological conditions. That is, during periods of sunspots, weather conditions are often more severe. Jevons felt that sunspots affected the quantity and quality of harvested crops; thus, they affected the economy.

A psychological theory of business cycles, formulated by the British economist Arthur Pigou, states that the optimism or pessimism of business leaders may influence an economic trend. Some politicians have clearly subscribed to this theory. During the early years of the Great Depression, for instance, President Herbert Hoover tried to appear publicly optimistic about the inherent vigour of the American economy, thus hoping to stimulate an upsurge.

Several economic theories of the causes of business cycles have been developed. According to the underconsumption theory, identified particularly with the British economist John Hobson, inequality of income causes economic declines. The market becomes glutted with goods because the poor cannot afford to buy, and the rich cannot consume all they can afford. Consequently, the rich accumulate savings that are not reinvested in production, because of insufficient demand for goods. This savings accumulation disrupts economic equilibrium and begins a cycle of production cutbacks.

The Austrian-American economist Joseph Schumpeter, a proponent of the innovation theory, related upswings of the business cycle to new inventions, which stimulate investment in capital-goods industries. Because new inventions are developed unevenly, business conditions must alternately be expansive and recessive.

The Austrian-born economists Friedrich von Hayek and Ludwig von Mises subscribed to the overinvestment theory. They suggested that instability is the logical consequence of expanding production to the point where less efficient resources are drawn upon. Production costs then rise, and, if these costs cannot be passed on to the consumer, the producer cuts back production and lays off workers.

A monetary theory of business cycles stresses the importance of the money supply in the economic system. Since many businesses must borrow money to operate or expand production, the availability and cost of money influence their decisions. Sir Ralph George Hawtrey suggested that changes in interest rates determine whether executives decrease or increase their capital investments, thus affecting the cycle.

Accelerator and Multiplier Effects

Basic to all theories of business-cycle fluctuations and their causes is the relationship between investment and consumption. New investments have what is called a multiplier effect: that is, investment money paid to wage earners and suppliers becomes income to them and then, in turn, becomes income to others as the wage earners or suppliers spend most of their earnings. An expanding ripple effect is thus set into motion.

Similarly, an increasing level of income spent by consumers has an accelerating influence on investment. Higher demand creates greater incentive to increase investment in production, in order to meet that demand. Both of these factors also can work in a negative way, with reduced investment greatly diminishing aggregate income, and reduced consumer demand reducing the amount of investment spending.

Regulating the Cycle

Since the Great Depression, devices have been built into most economies to help prevent severe business declines. For instance, unemployment insurance provides most workers with some income when they are laid off. Social security and pensions paid by many organisations furnish some income to the increasing number of retired people. Although not as powerful as they once were, trade unions remain an obstacle against the cumulative wage drop that aggravated previous depressions. Schemes to support crop prices (such as the European Common Agricultural Policy) shield farmers from disastrous loss of income.

The government can also attempt direct intervention to counter a recession. There are three major techniques available: monetary policy, fiscal policy, and incomes policy. Economists differ sharply in their choice of technique.

Monetary policy is preferred by some economists, including the American Milton Friedman and other advocates of monetarism, and is followed by most conservative governments. Monetary policy involves controlling, via the central bank, the money supply and interest rates. These determine the availability and costs of loans to businesses. Tightening the money supply theoretically helps to counteract inflation; loosening the supply helps recovery from a recession. When inflation and recession occur simultaneously - a phenomenon often called stagflation - it is difficult to know which monetary policy to apply.

Considered more effective by American economist John Kenneth Galbraith are fiscal measures, such as increased taxation of the wealthy, and an incomes policy, which seeks to hold wages and prices down to a level that reflects productivity growth. This latter policy has not had much success in the post-World War II period.

Banking

Banking is transactions carried on by any individual or firm engaged in providing financial services to consumers, businesses, or government enterprises. In the broadest sense, banking consists of safeguarding and transfer of funds, lending or facilitating loans, guaranteeing creditworthiness, and exchange of money. These services are provided by such institutions as commercial banks, central banks,

savings banks, trust companies, finance companies, life insurance agencies, and merchant banks or other institutions engaged in investment banking. A narrower and more common definition of banking is the acceptance, transfer, and, most important, creation of deposits. This includes such depository institutions as central banks, commercial banks, savings and loan associations, building societies, and mutual savings banks. All countries subject banking to government regulation and supervision, normally implemented by central banking authorities.

Aspects of Banking

The most basic role of banking, safeguarding funds, is done through vaults, safes, and secure facilities which physically store money. These physical deposits are in most cases insured against theft, and in most cases against the bank being unable to repay the funds. In some banks, the service is extended to safety deposit boxes for valuables. Interest given on savings accounts, a percentage return on the bank's investments with the money, gives an additional incentive to save. Transfer of funds can be handled through negotiable instruments, cheques, or direct transfers performed electronically. Credit cards and account debit cards, electronic cash tills, computer on-line banking, and other services provided by banks extend their usefulness by offering customers additional ways of gaining access to and using their funds. Automated clearing houses perform similar services for business customers by handling regular payments, such as wages, for a company banking with the bank. Longer-term schemes for providing regular income on savings are often offered through trust funds or other investment schemes.

Loans to bank customers are drawn on the funds deposited with the bank and yield interest which provides the profits for the banking industry and the interest on savings accounts. These loans may take the form of mortgages or other sophisticated policies. Banks may guarantee credit for customers who wish to obtain loans from other institutions. They also provide foreign exchange facilities for individual customers, as well as handling large international money transfers.

Early Banking

Many banking functions such as safeguarding funds, lending, guaranteeing loans, and exchanging money can be traced to the early days of recorded history. In medieval times, the Knights Templar, an international military and religious order, not only stored valuables and granted loans but also arranged for the transfer of funds from one country to another. The great banking families of the Renaissance, such as the Medici in Florence (Italy), were involved in lending money and financing international trade. The first modern banks were established in the 17th century, notably the Riksbank in Sweden (1656) and the Bank of England (1694).

17th-century English goldsmiths provided the model for contemporary banking. Gold stored with these artisans for safekeeping and was expected to be returned to the owners on demand. The goldsmiths soon discovered that the amount of gold actually removed by owners was only a fraction of the total stored. Thus, they could temporarily lend out some of this gold to others, obtaining a promissory note for principal and interest. In time, paper certificates redeemable in gold coin were

circulated instead of gold. Consequently, the total value of these banknotes in circulation exceeded the value of the gold that was exchangeable for the notes.

Two characteristics of this fractional-reserve banking remain the basis for present-day operations. First, the banking system's monetary liabilities exceed its reserves. This feature was responsible in part for Western industrialisation, and it still remains important for economic expansion. The excessive creation of money, however, may lead to inflation. Second, liabilities of the banks (deposits and borrowed money) are more liquid - that is, more readily convertible to cash - than are the assets (loans and investments) included on the banks' balance sheets. This characteristic enables consumers, businesses, and governments to finance activities that otherwise would be deferred or cancelled; however, it underlies banking's recurrent liquidity crises. When depositors en masse request payment, the inability of the banking system to respond because it lacks sufficient liquidity means that banks must either renege on their promises to pay or pay until they fail. A key role of the central bank in most countries is to regulate the commercial banking sector to minimise the likelihood of a run on a bank which could undermine the entire banking system. The central bank will often stand prepared to act as "lender of last resort" to the banking system, to provide the necessary liquidity in the event of a widespread withdrawal of funds. This does not equal a permanent safety net to save any bank from collapse, as was demonstrated by the Bank of England's refusal to rescue the failed investment bank Barings in 1995.

Banking in Britain

Since the 17th century Britain has been known for its prominence in banking. London still remains a major financial centre, and virtually all the world's leading commercial banks are represented.

Aside from the Bank of England, which was incorporated, early English banks were privately owned rather than stock-issuing firms. Bank failures were not uncommon; so in the early 19th century, joint-stock banks, with a larger capital base, were encouraged as a means of stabilising the industry. By 1833 these corporate banks were permitted to accept and transfer deposits in London, although they were prohibited from issuing banknotes, a monopoly prerogative of the Bank of England. Corporate banking flourished after legislation in 1858 approved limited liability for joint-stock companies. The banking system, however, failed to preserve a large number of institutions; at the turn of this century, a wave of bank mergers reduced both the number of private and joint-stock banks.

The present structure of British commercial banking was substantially in place by the 1930s, with the Bank of England, then privately owned, at the apex, and 11 London clearing banks ranked below. Two changes have occurred since then: The Bank of England was nationalised in 1946 by the postwar Labour government; and in 1968 a merger among the largest five clearing banks left the industry in the hands of four (Barclays, Lloyds, Midland, and National Westminster). Financial liberalisation in the 1980s has resulted in the growth of building societies, which in many ways now carry out similar functions to the traditional "clearing banks".

The larger clearing banks, with their national branch networks, still play a critical role in the British banking system. They are the key links in the transfer of business payments through the checking system, as well as the primary source of short-term business finance. Moreover, through their ownership and control over subsidiaries, the big British banks influence other financial markets dealing with consumer and housing finance, merchant banking, factoring, and leasing. The major banks responded to competition from building societies by offering new services and competitive terms.

A restructuring in the banking industry took place in the late 1970s. The Banking Act of 1979 formalised Bank of England's control over the British banking system, previously supervised on an informal basis. Only institutions approved by the Bank of England as "recognised banks" or "licensed deposit-taking institutions" are permitted to accept deposits from the public. The act also extended Bank of England control over the new financial intermediaries that have flourished since 1960.

London has become the centre of the Eurodollar market; participants include financial institutions from all over the world. This market, which began in the late 1950s and has since grown dramatically, borrows and lends dollars and other currencies outside the currency's home country (for example, franc accounts held in any country other than France).

Banking in the United States

The United States banking system differs radically from such countries as Canada, Britain, and Germany, where a handful of organisations dominate banking. In the past, geographical constraints on expansion prevented banks from moving beyond their state or even beyond their county. Thus, many small bankers were protected from competition. The result is a national network of almost 12,000 commercial banks. More recently most states as well as the federal government have loosened the regulation of banks, especially in the area of mergers and acquisitions. Many banks have grown by taking over other banks inside and outside their home states. The largest banks account for the bulk of banking activity. Fewer than 5 per cent of the banks in the United States are responsible for more than 40 per cent of all deposits; 85 per cent of the banks hold less than one fifth of total deposits. The Federal Reserve System, composed of 12 Federal Reserve Banks and 25 Federal Reserve Districts throughout the United States, is the central bank, banker to the US government, and supervisor of the nation's banking industry.

The US banking system is distinguished by a tradition of thrift institutions established to remedy the commercial sector's historic neglect of the non-business consumer market. Savings and loan associations (SLAs) which first appeared in the 1830s, were patterned after cooperative movements in Scotland and England. Dealing mostly in residential real estate mortgages, and particularly in home mortgage loans, SLAs exist primarily to support home ownership. In the late 1980s the failures of many SLAs caused the government to overhaul the industry and place it under federal supervision. American savings banks, established with similar intentions, invest the deposits of customers in stocks and bonds, especially government bonds, and also provide mortgage services. Credit unions likewise invest money on behalf of members.

While government **regulation** of commercial banking since the mid-1930s has led to a low failure rate and preserved a substantial amount of competition in some markets, local monopolies have also been **implicitly** encouraged. Moreover, stringent **regulations** have caused some bankers to **devote considerable resources** to circumventing government controls. Rethinking of the **role** of government **regulation** in the **economy** in general may lead towards even further **liberalisation** of controls over the banking system.

Banking in Continental Europe

Major central banks in the European Union are France's Banque de France, Germany's Bundesbank, and the Bank of Italy. Major commercial banks include Germany's Deutsche Bank A.G., Dresdner Bank A.G., and Commerzbank A.G., and France's nationalised Banque Nationale de Paris, Crédit Lyonnais, and Société Générale. **Significant structural** differences distinguish the banking system of continental Europe from that of many other developed nations. The main differences are in ownership, **scope**, and **concentration** of activities.

One distinguishing **aspect** of European banking, especially in the Latin countries, is the **role** of the state. **Virtually** all banking **institutions** in the United States, Canada, and Britain, are privately owned. In France and Italy, however, the government either owns the **major** commercial banks or the **majority** of their stock. The **role** of the government in banking is therefore **significant**, and often **controversial**. France's Crédit Lyonnais was the subject of **considerable** criticism in the early 1990s because of the government **assistance** extended to it to cover its heavy trading losses. European banks engage in some activities **prohibited** elsewhere, such as the placement and **acquisition** of common stock. Commercial banks in Europe tend to be highly business **orientated** and limit their lending to shorter-term loans. Long-term loans are handled by bank affiliates. The share of the deposits and loans handled by the **major** European banks tends to be particularly large. This stems from the absence of **restrictions** on branching, leading the large European banks to **maintain** extensive **networks** of branches in their home countries. The absence of an antitrust **tradition** also accounts for the greater degree of **concentration**.

Germany's Bundesbank has become the **dominant** central bank in the European Union, thanks mainly to its success in controlling inflation and Germany's **economic** strength. Its **constitution** leaves it notably independent from government interference. There is a broad **consensus** that it will serve as the basis for any European central bank in the event of full European Monetary Union. However, the Bundesbank itself has in the past been conspicuously lukewarm about the **prospect**, **apparently** fearing the effect of association with other national **economies** on its own sound record on inflation.

Banking in Switzerland

Switzerland is renowned as a centre for world banking because of its political **neutrality**, its **financial stability**, and the national **tradition** of confidentiality in banking, dating from a law of 1934 which made it an offence for banks to disclose details about their customers without express authorisation. **Subsequent legislative** changes and international agreements have not overly compromised this secrecy, especially

with regard to noncriminal tax evasion. Private banking is one of the country's principal sources of income.

The semiprivate Swiss National Bank, Switzerland's central bank, is owned jointly through shares held by the cantons, other banks, and the public. Swiss commercial banking is dominated by the "Big Four": the Union Bank of Switzerland, the Swiss Bank Corporation, Cr dit Suisse, and Swiss Volksbank. Numerous smaller banks and branches of foreign banks also operate in Switzerland. There are also 28 canton banks, funded and controlled by their respective cantons.

Banking in Japan

As one of the world's richest countries, Japan has a banking sector with considerable influence on the world economy as a whole. The Bank of Japan is the national central bank, and controls the banking system; it has less constitutional autonomy than in many other developed countries. Several government banks and institutions supplement the commercial banking sector: the Japan Export-Import Bank handles large credits for international trade; the Housing Loan Corporation assists the provision of company housing; and the Agriculture, Forestry, and Fisheries Finance Corporation advances loans for equipment purchase. The Japan Development Bank supports industrial finance, assisted by the private Industrial Bank of Japan, Long-Term Credit Bank of Japan, and Nippon Credit Bank Ltd. Some private banks such as Dai-ichi Kangyo Bank (the world's largest bank) are tied closely to the government through government investment; the Bank of Tokyo specialises in foreign exchange. Commercial banks such as the Mitsubishi Bank, the Mitsu Bank, and the Sumitomo Bank are often relics of the great prewar commercial and industrial conglomerations, the so-called zaibatsu, and maintain close ties with their associated businesses and financial institutions. Small-scale cooperatives and credit associations, grouped on a prefectural basis, are important in providing banking services for farmers and small businesses. Japan's mutual loans and savings banks all converted into full commercial banks after reform in 1989. The state Postal Savings System is also an important channel for domestic savings. Reform of Japanese banking laws in the mid 1990s freed banks to operate in the international securities trade frequented by Japan's highly successful financial houses. Reciprocal opportunities were also opened for securities houses to offer banking services. The banking sector is expected to expand its business in the long term as a result of these changes.

Banking in Canada

The Bank of Canada is the national central bank. Canada has numerous chartered commercial banks. In 1980 Canadian banks were reorganised into two bands: "Schedule I", with shareholdings by any individual limited to 10 per cent; and "Schedule II", either foreign-owned or in private hands. Further legislation in 1992 freed banks, trust companies, and insurance companies to diversify into each other's areas of interest, and opened ownership of Schedule II banks to nonbanking institutions. Trust and mortgage loan companies, provincial savings banks, and credit unions are also important components of the banking system.

Banking in Australia

The Reserve Bank of Australia, established in 1911, is the national central bank. The components of the Commonwealth Banking Corporation, including the Commonwealth Trading Bank and the Commonwealth Savings Bank (Australia's largest savings bank), are also government owned. Large commercial banks in Australia are normally referred to as trading banks: major examples include the Australia and New Zealand Banking Group, the Commonwealth Bank of Australia, the National Australia Bank, and the Westpac Banking Corporation. Building societies are also common. Banking reform in the 1980s similar to that enacted in Britain freed many building societies to become banks or offer banking services, and also opened the domestic market to more foreign competition.

Banking in New Zealand

The Reserve Bank of New Zealand is the national central bank. The Post Office Savings Bank (the largest saving bank), the Reserve Bank, and the Bank of New Zealand (largest of the commercial banks) are owned and operated by the government. Commercial banks are called trading banks as in Australia: the Australia and New Zealand Banking Group and the Westpac Banking Corporation are both also represented in Australia. Trustee savings banks are also prevalent. The government lends money at low interest to farmers, home builders, and small businessmen through the State Advances Corporation.

Banking in Singapore

As one of the world's major financial centres and a regional economic giant, Singapore has an internationally significant banking regime. Central banking functions are exercised by the Monetary Authority of Singapore, though issuing of currency is conducted by a separate government body. The domestic commercial banking industry in Singapore consists of some 13 local banks and is dominated by the leading houses. The Post Office Savings Bank serves as the national savings bank. There are also numerous merchant banks. Singapore is also host to numerous foreign banks, divided according to the type of licence they are granted: full, restricted, or "offshore". The Singaporean government operates a compulsory savings scheme for employees, the Central Provident Fund. Singapore's banking industry continues to grow and mature with the development of the nation's economy.

Banking in Hong Kong

Nominally under British jurisdiction and banking law until 1997, Hong Kong is important as a banking centre in proportion to its position as one of Asia's major economic axes. The Office of the Commissioner of Banking supervises banking in Hong Kong, in conjunction with the Hong Kong Monetary Authority (established 1993). There are three banks of issue in the dependency: the Hong Kong and Shanghai Banking Corporation, the Standard Chartered Bank, and the Bank of China. Numerous locally incorporated commercial banks operate alongside branches of foreign banks; there are also many banks operating under restricted licences and numerous deposit-taking companies.

Banking in India

The central bank of India is the Reserve Bank: most large commercial banks were nationalised in 1969, with more being nationalised in 1980. The Department of Banking at the Ministry of Finance controls all banking. The State Bank of India, the largest commercial bank, handles some of the Reserve Bank's roles. The other nationalised banks share the commercial market with nonnationalised and foreign banks. Some of them offer merchant banking services, though there are no independent merchant banks in India. Cooperatives and credit societies are an important supplement to the private banking industry, especially in rural areas. It remains to be seen whether India's process of economic liberalisation will spread to the banking sector.

Banking in Developing Countries

The type of national economic system that characterises developing countries plays a crucial role in determining the nature of the banking system. In capitalist countries a system of private enterprise in banking prevails; in a number of socialist countries (for example, Egypt and Sudan) all banks have been nationalised. Other countries have patterned themselves after the liberal socialism of Europe; in Peru and Kenya, for instance, government-owned and privately owned banks coexist. In many countries, the banking system developed under colonialism, with banks owned by institutions in the parent country. In some, such as Zambia and Cameroon, this heritage continued, although modified, after decolonisation. In other nations, such as Nigeria and Saudi Arabia, the rise of nationalism led to mandates for majority ownership by the indigenous population.

Banks in developing countries are similar to their counterparts in developed nations. Commercial banks accept and transfer deposits and are active lenders, especially for short-term purposes. Other financial intermediaries, particularly government-owned development banks, arrange long-term loans. Banks are often used to finance government expenditures. The banking system may also play a major role in financing exports.

In the poorer countries, an extensive but primitive nonmonetary sector usually continues to exist. It is the special task of the banking community to encourage the use of money and instil banking habits among the population.

Role of Central Banking

The foremost monetary institution in a free market economy is the central bank. These are usually government-owned institutions, but even in countries where they are owned by the nation's banks (such as the United States and Italy), the responsibility of the central bank is to the national interest.

Most central banks perform the following functions: they serve as the government's banker, act as the banker of the banking system, regulate the monetary system for both domestic and international policy goals, and issue the nation's currency. As banker to the government, the central bank collects and disburses government income and receipts, manages the issue and redemption of government debt, advises the government on all matters pertaining to financial activities, and makes loans to the government. As banker to the nation's banks, the central bank holds and

transfers banks' deposits, supervises their operations, acts as a lender of last resort, and provides technical and advisory services. Monetary policy for both domestic and foreign purposes is implemented and, in many countries, decided by the national banking authorities, using a variety of direct and indirect controls over the financial institutions. Coins and notes that circulate as the national currency are usually the liability of the central bank.

The ability of the central bank to control the money supply and thus the pace of economic growth is responsible for a major economic policy debate. Some economists believe that monetary control is extremely effective in the short run and can be used to influence economic activity. Nevertheless, some hold that discretionary monetary policy should not be used because, in the long run, central banks have been unable to control the economy effectively. Another group of economists believes that the short-term impact of monetary control is less powerful, but that the central banking authorities can play a useful role in mitigating the excesses of inflation and depression. A newer school of economists claims that monetary policy cannot affect systematically the pace of national economic activity. All agree that problems related to the supply side of the economy, such as fuel shortages, cannot be resolved by central-bank action.

International Banking

The expansion of trade in recent decades has been paralleled by the growth of multinational banking. Banks have historically financed international trade, but the notable recent development has been the expansion of branches and subsidiaries that are physically located in other countries, as well as the increased volume of loans to borrowers internationally. For example, in 1960 only eight US banks had foreign offices; by 1987, 153 US banks had a total of 902 foreign branches. Similarly, in 1973, fewer than 90 foreign banks had offices in the United States; by 1987, 266 foreign banks operated 664 offices in the United States. Most are business-orientated banks, but some have also engaged in retail banking.

The growth of the Eurodollar market has forced major banks to operate branches worldwide. The world's banking system played a key role in the recycling of petrodollars, arising from the surpluses of the oil-exporting countries and the deficits of the oil-importing nations. This activity, while it smoothed international financial arrangements, is currently proving awkward as foreign debtors find it more difficult to repay outstanding loans.

Globalisation

For good or ill, globalisation has become the economic buzz-word of the 1990s. National economies are undoubtedly becoming steadily more integrated as cross-border flows of trade, investment and financial capital increase. Consumers are buying more foreign goods, a growing number of firms now operate across national borders, and savers are investing more than ever before in far-flung places.

Whether all of this is for good or ill is a topic of heated debate. One, positive view is that globalisation is an unmixed blessing, with the potential to boost productivity and living standards everywhere. This is because a globally integrated economy can lead

to a better division of labour between countries, allowing low-wage countries to specialise in labour-intensive tasks while high-wage countries use workers in more productive ways. It will allow firms to exploit bigger economies of scale. And with globalisation, capital can be shifted to whatever country offers the most productive investment opportunities, not trapped at home financing projects with poor returns.

Critics of globalisation take a gloomier view. They predict that increased competition from low-wage developing countries will destroy jobs and push down wages in today's rich economies. There will be a "race to the bottom" as countries reduce wages, taxes, welfare benefits and environmental controls to make themselves more "competitive". Pressure to compete will erode the ability of governments to set their own economic policies. The critics also worry about the increased power of financial markets to cause economic havoc, as in the European currency crises of 1992 and 1993, Mexico in 1994-95 and South-East Asia in 1997. Despite much loose talk about the "new" global economy, today's international economic integration is not unprecedented. The 50 years before the first world war saw large cross-border flows of goods, capital and people. That period of globalisation, like the present one, was driven by reductions in trade barriers and by sharp falls in transport costs, thanks to the development of railways and steamships. The present surge of globalisation is in a way a resumption of that previous trend.

That earlier attempt at globalisation terminated abruptly with the first world war, after which the world moved into a period of fierce trade protectionism and tight restrictions on capital movement. During the early 1930s, America sharply increased its tariffs, and other countries retaliated, making the Great Depression even greater. The volume of world trade fell sharply. International capital flows virtually dried up in the inter-war period as governments imposed capital controls to try to insulate their economies from the impact of a global slump.

2 Early Motivation theories

2.1

These approaches can be categorised under three headings.

Satisfaction theories. The assumption here is that a satisfied worker is a productive worker.

Incentive theories. The assumption of these theories is based on the principle of reinforcement, what might crudely be called the 'carrot' approach. Individuals will work harder given specific reward or encouragement for good performance.

Intrinsic theories. Man is not an animal, say these theorists. He will work best if given a worthwhile job and allowed to get on with it. The reward will come from the satisfaction in the work itself.

2.2 Satisfaction theories

There is very little evidence that a satisfied worker actually works harder. However there is strong support for the suggestion that a satisfied worker tends to stay in the

same organisation. There is also **evidence** that satisfaction correlates **positively** with **mental** health. This suggests that paying attention to conditions of work and worker morale will reduce staff turnover and absenteeism but will not necessarily increase **individual** productivity. Herzberg's findings suggest a reason for this.

Under this heading can be grouped those **theories** that hold that people work best when they like their leader, or are satisfied with their work group.

It has been suggested that where satisfaction does correlate with productivity, it may be the productivity that caused the satisfaction rather than the other way round.

2.3 Incentive theories

Incentive theories suggest that the **individual** will increase his efforts in order to **obtain** a desired reward.

Although based on the general **principle** of **reinforcement**, most of the studies in this area have **concentrated** on 'pay' or 'money' as a **motivator**. To some extent this **concentration** is **justifiable** in that money acts as a 'stand in' for many other rewards such as **status** and independence. This situation may, however, be more true of America, where most of the studies were done, than of Europe.

Incentive theories undoubtedly *can* work if:

- a. The **individual** **perceives** the increased reward to be worth the extra effort;
- b. The performance can be measured and clearly **attributed** to the **individual**;
- c. The **individual** wants that particular kind of reward;
- d. The increased performance will not become the new **minimum** standard.

These **theories** often work well for the owner-manager or, at the worker level, in unit or small-batch manufacturing. If, however, any of the first three conditions does not apply, the **individual** will tend to see the reward as an improvement to the general climate of work and will **react** as under *Satisfaction theories*. Condition (d) of course, if **violated**, will only **create** a serious credibility gap.

2.4 Intrinsic theories

These **theories** **derive** their *raison d'être* from some general **assumptions** about human needs along lines originally **advocated** by Maslow. Maslow **categorised** human needs as follows:

- Self-actualisation needs;
- Esteem needs;
- Belonging and love needs;
- Safety needs;
- Physiological needs.

He postulates that needs are only **motivators** when they are unsatisfied. He further suggests that these needs work, roughly, in the kind of **hierarchy** **implied** by the listing above. The lower-order needs (physiological and safety) are **dominant** until satisfied,

whereupon the higher-order needs come into operation. There is considerable intuitive support for this conceptualisation. If you are starving, your needs for esteem or status will be unimportant; only food matters. When adequately warm, further heat will not motivate you, i.e. the need does not operate as a motivator. Unfortunately the research evidence does not support the idea that needs become less powerful as they are satisfied, except at the very primitive level. Aldefer, who has simplified Maslow's needs down to three categories - the need for existence, the need to relate to others and the need for personal growth - is at pains to point out that each of us may have different levels of each kind.

The assumption of the intrinsic theorists (e.g. McGregor and Likert) is that the higher-order needs are more prevalent in modern men and women than we give them credit for. In particular that we can gain a lot of satisfaction from the job itself, provided that it is our job, i.e. we have some degree of freedom in determining what the job is and how we will do it. This approach would say that involvement or participation will in general tend to increase motivation, provided that it is genuine participation. Rewards tend to lie in the task itself or in the individual's relations with the group. The ideal is to create conditions where effective performance is a goal in itself rather than a means to a further goal. The manager is a colleague, consultant and resource, rather than a boss.

These theories are appealing but there is evidence to suggest that they do not work too well when:

The technology prevents the individual from having control over his or her job design, i.e. at shop-floor level in process, mass or large batch production;

The individual does not have strong needs for self-actualisation, or alternatively likes authoritarian masters.

One would expect therefore to find these intrinsic theories working best where individuals of intelligence and independence were working on challenging problems, e.g. in R and D laboratories or in some consulting firms. The evidence supports this supposition.

2.5 Underlying assumptions

These theories all stem from some underlying assumptions about people. To a large extent unproven, they tend to represent the dominant mood or climate of opinion at that time. Schein has classified them as follows, and it is interesting to note that the categories follow each other in a sort of historical procession, starting from the time of the industrial revolution.

The rational-economic assumption. We are primarily motivated by economic needs. We are essentially passive animals to be manipulated, motivated and controlled by the organisation. Our feelings are essentially irrational; organisations must be so organised that these feelings and unpredictable traits are controlled (McGregor's Theory X Assumptions). But, fortunately, not all of us are like this. There are those who are self-motivated, self-controlling and in charge of their emotions. This group must assume responsibility for the management of the others.

The social assumption. We are essentially social animals and gain our basic sense of identity from relationships with others. As a result of the necessary rationalisation of work much of the meaning has gone out of work itself and must be sought in the social relationships of the job. Management is only effective to the extent that it can mobilise and rely on these social relationships. Issues of leadership style and group behaviour are therefore of great importance.

The self-actualising assumption. We are primarily self-motivated and self-controlled. We seek to be mature on the job and are capable of being so. External controls and pressures are likely to be seen as reducing our autonomy and therefore will affect our motivation. Given a chance, people will voluntarily integrate their own goals with those of the organisation.

The complex assumption. Schein comes down in favour of what he calls 'complex man'. People are variable. We have many motives which have at any one time a hierarchy, but the particular hierarchy may change from time to time and situation to situation. We do not necessarily have to find fulfilment of all our needs in any one situation. We can respond to a variety of managerial strategies. Whether we will or not, will depend upon our view of their appropriateness to the situation and to our needs.

The psychological assumption. This is a category suggested by Levinson, following Jacques and Zaleznik. A person is a complex, unfolding, maturing organism who passes through physiological and psychological stages of development. We evolve an ego ideal towards which we strive. The most powerful motivating force in us, over and above such basic drives as hunger, sexuality, aggression, is the need to bring ourselves closer to our ideal. The greater the gap between our perception of ourselves in reality and our ego ideal the more angry we are with ourselves and the more guilt we feel. Work is part of our identity, our ego ideal, and opportunities must be provided for us to work towards our ego ideal in work if we are to be 'motivated'.

2.6

The kind of theory that we subscribe to will colour all our views about management and people in organisations. Satisfaction and incentive theories, assumptions that people are rational-economic, will lead to a bargaining approach, to preoccupation with the extrinsic conditions of work, money and fringe benefits. Believers in intrinsic theories, in self-actualising or psychological theories, will be more concerned with creating opportunities for individuals to develop and realise their talents, with providing the right climate for work and the right type of work.

At this point it might be helpful to the reader to pause and reflect upon his or her assumptions about people and the appropriate theory of motivation. For we are now going to complicate the whole issue, to pour more variables into the mix than are assumed even by Schein's complex assumption or Levinson's psychological one. Working from a basic model of a person's decision-making process we shall proceed piecemeal towards a better and fuller understanding of how people answer the three questions posed at the beginning of this chapter. The resulting picture will be complicated and intricate. This is only in line with the intricacies of reality, but for most operational purposes psychological reality is too complex. We are reduced to

thinking in stereotypes or over-simplifications in order to get anything done and to avoid the paralysis of analysis. This process of reduction is, however, a better base for action if we understand the underlying complexity and if we confront our other prejudices, assumptions and stereotypes along the way.

(Understanding organisations by Charles Handy)

Trading in Other Securities

Exchanges trade in all forms of securities. While the general operations of exchanges apply to all securities trading, there are some differences. In particular, trades in nonstock securities are often managed by financial intermediaries other than brokers.

Bonds

Bonds provide a way for companies to borrow money. People who invest in bonds are lending money to a company in return for yearly interest payments. Bonds are traded separately from stocks on exchanges. Most bonds are bought in large quantities by institutional investors - large investors such as banks, pension funds, or mutual funds.

Options

Options are traded on many U.S. stock exchanges, as well as over the counter. Options writers offer investors the rights to buy or sell - at fixed prices and over fixed time periods - specified numbers of shares or amounts of financial or real assets. Writers give call options to people who want options to buy. A call option is the right to buy shares or amounts at a fixed price, within a fixed time span. Conversely, writers give put options to people who want options to sell. A put option is the right to sell shares or amounts at a fixed price, within a fixed time span. Buyers may or may not opt to buy, or sellers to sell, and they may profit or lose on their transactions, depending on how the market moves. In any case, options traders must pay premiums to writers for making contracts. Traders must also pay commissions to brokers for buying and selling stocks on exchanges. Options trading is also handled by options clearing corporations, which are owned by exchanges.

Futures

Futures contracts are also traded on certain U.S. exchanges, most of which deal in commodities such as foods or textiles. Futures trading works somewhat like options trading, but buyers and sellers instead agree to sales or purchases at fixed prices on fixed dates. After contracts are made, the choice to buy or sell is not optional. Futures contracts are then traded on the exchanges. Commodities brokers handle this trading.

Futures and options traders often judge markets trends by monitoring compiled indexes and averages of stocks, usually organized by industry or market ranking. Among the most closely watched U.S. indexes are the Dow Jones averages and Standard & Poor's.

Interest

Interest is payment made for the use of another person's money; in **economics**, it is regarded more **specifically** as a payment made for capital. **Economists** also consider interest as the reward for thrift; that is, payment offered to people to encourage them to save and to make their savings **available** to others.

Interest is usually paid only on the **principal**, that is, on the **sum** of money loaned, and it is called simple interest. In some cases, interest is paid not only on the **principal** but also on the cumulative total of past interest payments. This **procedure** is known as **compounding** the interest, and the amount so paid is called **compound** interest. The rate of interest is expressed as a **percentage** of the **principal** paid for its use for a given time, usually a year. Thus, a loan of \$100 at 10 **percent** per annum earns interest of \$10 a year. The current, or market, rate of interest is determined **primarily** by the relation between the supply of money and the demands of borrowers. When the supply of money **available** for **investment** increases faster than the **requirements** of borrowers, interest rates tend to fall. **Conversely**, interest rates generally rise when the demand for **investment funds** grows faster than the **available** supply of **funds** to meet that demand. Business executives will not borrow money at an interest rate that **exceeds** the return they expect the use of the money to yield.

During the Middle Ages and before, the payment and receiving of interest was questioned on moral grounds. The position of the Christian church, as **defined** by the Italian theologian Thomas Aquinas, condoned interest on loans for business purposes, because the money was used to produce new wealth, but adjudged it sinful to pay or receive interest on loans made for **purchase** of **consumer** goods. Under modern capitalism, the payment of interest for all types of loans is considered proper and even desirable because interest charges serve as a means to **allocate** the limited **funds available** for loan to **projects** in which they will be most profitable and most productive. **Consumers** are protected from **contracting** loans at excessive interest rates. In the U.S., some states have statutes providing ceilings on interest.

Inflation and Deflation

Inflation and deflation, in **economics**, are terms used to describe, respectively, a **decline** or an increase in the value of money, in relation to the goods and services it will buy.

Inflation is the pervasive and **sustained** rise in the **aggregate** level of prices measured by an **index** of the cost of various goods and services. Repetitive price increases erode the **purchasing** power of money and other **financial** assets with fixed values, creating serious **economic** distortions and uncertainty. Inflation results when actual **economic** pressures and **anticipation** of future developments cause the demand for goods and services to **exceed** the supply **available** at existing prices or when **available** output is **restricted** by faltering productivity and marketplace **constraints**. Sustained price increases were historically directly **linked** to wars, poor harvests, political upheavals, or other **unique** events.

Deflation **involves** a **sustained** decline in the **aggregate** level of prices, such as **occurred** during the Great **Depression** of the 1930s; it is usually associated with a

prolonged erosion of economic activity and high unemployment. Widespread price declines have become rare, however, and inflation is now the dominant variable affecting public and private economic planning.

Kinds of Inflation

When the upward trend of prices is gradual and irregular, averaging only a few percentage points each year, such creeping inflation is not considered a serious threat to economic and social progress. It may even stimulate economic activity: The illusion of personal income growth beyond actual productivity may encourage consumption; housing investment may increase in anticipation of future price appreciation; business investment in plants and equipment may accelerate as prices rise more rapidly than costs; and personal, business, and government borrowers realise that loans will be repaid with money that has potentially less purchasing power.

A greater concern is the growing pattern of chronic inflation characterised by much higher price increases, at annual rates of 10 to 30 percent in some industrial nations and even 100 percent or more in a few developing countries. Chronic inflation tends to become permanent and ratchets upward to even higher levels as economic distortions and negative expectations accumulate. To accommodate chronic inflation, normal economic activities are disrupted: Consumers buy goods and services to avoid even higher prices; real estate speculation increases; businesses concentrate on short-term investments; incentives to acquire savings, insurance policies, pensions, and long-term bonds are reduced because inflation erodes their future purchasing power; governments rapidly expand spending in anticipation of inflated revenues; and exporting nations suffer competitive trade disadvantages forcing them to turn to protectionism and arbitrary currency controls.

In the most extreme form, chronic price increases become hyperinflation, causing the entire economic system to break down. The hyperinflation that occurred in Germany following World War I, for example, caused the volume of currency in circulation to expand more than 7 billion times and prices to jump 10 billion times during a 16-month period before November 1923. Other hyperinflations occurred in the United States and France in the late 1700s; in the USSR and Austria after World War I; in Hungary, China, and Greece after World War II; and in a few developing nations in recent years. During a hyperinflation the growth of money and credit becomes explosive, destroying any links to real assets and forcing a reliance on complex barter arrangements. As governments try to pay for increased spending programs by rapidly expanding the money supply, the inflationary financing of budget deficits disrupts economic, social, and political stability.

History

Examples of inflation and deflation have occurred throughout history, but detailed records are not available to measure trends before the Middle Ages. Economic historians have identified the 16th to early 17th centuries in Europe as a period of long-term inflation, although the average annual rate of 1 to 2 percent was modest by modern standards. Major changes occurred during the American Revolution, when prices in the U.S. rose an average of 8.5 percent per month, and during the French

Revolution, when prices in France rose at a rate of 10 percent per month. These relatively brief flurries were followed by long periods of alternating international inflations and deflations linked to specific political and economic events.

The U.S. reported average annual price changes as follows: 1790 to 1815, up 3.3 percent; 1815 to 1850, down 2.3 percent; 1850 to 1873, up 5.3 percent; 1873 to 1896, down 1.8 percent; 1896 to 1920, up 4.2 percent; and 1920 to 1934, down 3.9 percent. This extended history indicates a recurring sequence of inflations, linked to wartime periods, followed by long periods of price stability or deflation. Consumer prices accelerated during the World War II era, rising at an annual average rate of 7.0 percent from 1940 to 1948, and then stabilised from 1948 to 1965, when the annual increases averaged only 1.6 percent, including a peak of 5.9 percent in 1951 during the Korean War.

In the mid-1960s a chronic inflationary trend began in most industrial nations. From 1965 to 1978 American consumer prices increased at an average annual rate of 5.7 percent, including a peak of 12.2 percent in 1974. This ominous shift was followed by consumer price gains of 13.3 percent in 1979 and 12.4 percent in 1980. Several other industrial nations suffered a similar acceleration of price increases, but some countries, such as West Germany (now part of the united Federal Republic of Germany), avoided chronic inflation. Given the integrated status of most nations in the world economy, these disparate results reflected the relative effectiveness of national economic policies.

This unfavorable inflationary trend was reversed in most industrial nations during the mid-1980s. Austere government fiscal and monetary policies begun in the early part of the decade combined with sharp declines in world oil and commodity prices to return the average inflation rate to about 4 percent.

Causes

Demand-pull inflation occurs when aggregate demand exceeds existing supplies, forcing price increases and pulling up wages, materials, and operating and financing costs. Cost-push inflation occurs when prices rise to cover total expenses and preserve profit margins. A pervasive cost-price spiral eventually develops as groups and institutions respond to each new round of increases. Deflation occurs when the spiral effects are reversed.

To explain why the basic supply and demand elements change, economists have suggested three substantive theories: the available quantity of money; the aggregate level of incomes; and supply-side productivity and cost variables. Monetarists believe that changes in price levels reflect fluctuating volumes of money available, usually defined as currency and demand deposits. They argue that, to create stable prices, the money supply should increase at a stable rate commensurate with the economy's real output capacity. Critics of this theory claim that changes in the money supply are a response to, rather than the cause of, price-level adjustments.

The aggregate level of income theory is based on the work of the British economist John Maynard Keynes, published during the 1930s. According to this approach, changes in the national income determine consumption and investment rates; thus,

government fiscal spending and tax policies should be used to maintain full output and employment levels. The money supply, then, should be adjusted to finance the desired level of economic growth while avoiding financial crises and high interest rates that discourage consumption and investment. Government spending and tax policies can be used to offset inflation and deflation by adjusting supply and demand according to this theory. In the U.S., however, the growth of government spending plus "off-budget" outlays (expenditures for a variety of programs not included in the federal budget) and government credit programs have been more rapid than the potential real growth rate since the mid-1960s.

The third theory concentrates on supply-side elements that are related to the significant erosion of productivity. These elements include the long-term pace of capital investment and technological development; changes in the composition and age of the labour force; the shift away from manufacturing activities; the rapid proliferation of government regulations; the diversion of capital investment into nonproductive uses; the growing scarcity of certain raw materials; social and political developments that have reduced work incentives; and various economic shocks such as international monetary and trade problems, large oil price increases, and sporadic worldwide crop disasters. These supply-side issues may be important in developing monetary and fiscal policies.

Effects

The specific effects of inflation and deflation are mixed and fluctuate over time. Deflation is typically caused by depressed economic output and unemployment. Lower prices may eventually encourage improvements in consumption, investment, and foreign trade, but only if the fundamental causes of the original deterioration are corrected.

Inflation initially increases business profits, as wages and other costs lag behind price increases, leading to more capital investment and payments of dividends and interest. Personal spending may increase because of "buy now, it will cost more later" attitudes; potential real estate price appreciation may attract buyers. Domestic inflation may temporarily improve the balance of trade if the same volume of exports can be sold at higher prices. Government spending rises because many programs are explicitly, or informally, indexed to inflation rates to preserve the real value of government services and transfers of income. Officials may also anticipate paying larger budgets with tax revenues from inflated incomes.

Despite these temporary gains, however, inflation eventually disrupts normal economic activities, particularly if the pace fluctuates. Interest rates typically include the anticipated pace of inflation that increases business costs, discourages consumer spending, and depresses the value of stocks and bonds. Higher mortgage interest rates and rapidly escalating prices for homes discourage housing construction. Inflation erodes the real purchasing power of current incomes and accumulated financial assets, resulting in reduced consumption, particularly if consumers are unable, or unwilling, to draw on their savings and increase personal debts. Business investment suffers as overall economic activity declines, and profits are restricted as employees demand immediate relief from chronic inflation through automatic cost-of-living escalator clauses. Most raw materials and operating costs respond quickly to

inflationary signals. Higher export prices eventually restrict foreign sales, creating deficits in trade and services and international currency-exchange problems. Inflation is a major element in the prevailing pattern of booms and recessions that cause unwanted price and employment distortions and widespread economic uncertainty.

The impact of inflation on individuals depends on many variables. People with relatively fixed incomes, particularly those in low-income groups, suffer during accelerating inflation, while those with flexible bargaining power may keep pace with or even benefit from inflation. Those dependent on assets with fixed nominal values, such as savings accounts, pensions, insurance policies, and long-term debt instruments, suffer erosion of real wealth; other assets with flexible values, such as real estate, art, raw materials, and durable goods, may keep pace with or exceed the average inflation rate. Workers in the private sector strive for cost-of-living adjustments in wage contracts. Borrowers usually benefit while lenders suffer, because mortgage, personal, business, and government loans are paid with money that loses purchasing power over time and interest rates tend to lag behind the average rate of price increases. A pervasive "inflationary psychology" eventually dominates private and public economic decisions.

Stabilisation Measures

Any serious antiinflation effort will be difficult, risky, and prolonged because restraint tends to reduce real output and employment before benefits become apparent, whereas fiscal and monetary stimulus typically increases economic activity before prices accelerate. This pattern of economic and political risks and incentives explains the dominance of expansion policies.

Stabilisation efforts try to offset the distorting effects of inflation and deflation by restoring normal economic activity. To be effective, such initiatives must be sustained rather than merely occasional fine-tuning actions that often exaggerate existing cyclical changes. The fundamental requirement is stable expansion of money and credit commensurate with real growth and financial market needs. Over extended periods the Federal Reserve System can influence the availability and cost of money and credit by controlling the financial reserves that are required and by other regulatory procedures. Monetary restraint during cyclical expansions reduces inflation pressures; an accommodative policy during cyclical recessions helps finance recovery. Monetary officials, however, cannot unilaterally create economic stability if private consumption and investment cause inflation or deflation pressures or if other public policies are contradictory. Government spending and tax policies must be consistent with monetary actions so as to achieve stability and prevent exaggerated swings in economic policies.

Since the mid-1960s the rapid growth of federal budget spending plus even greater percentage increases in off-budget outlays and a multitude of federal lending programs have exceeded the tax revenues almost every year, creating large government deficit borrowing requirements. Pressures to provide money and credit required for private consumption and investment and for financing the chronic budget deficits and government loan programs have led to a rapid expansion of the money supply with resulting inflation problems. Effective stabilisation efforts will require a better balance and a more sustained application of both monetary and fiscal policies.

Important supply-side actions are also **required** to fight inflation and avoid the **economic** stagnation effects of deflation. Among the **initiatives** that have been recommended are the **reversal** of the serious deterioration of national productivity by increasing **incentives** for savings and **investment**; enlarged spending for the development and application of **technology**; improvement of management **techniques** and **labour** efficiency through education and training; **expanded** efforts to conserve valuable raw materials and develop new **sources**; and reduction of unnecessary government **regulation**.

Some **analysts** have recommended the use of various income **policies** to fight inflation. Such **policies range** from mandatory government **guidelines** for wages, prices, rents, and interest rates, through tax **incentives** and **disincentives**, to simple **voluntary** standards suggested by the government. **Advocates** claim that government **intervention** would **supplement** basic monetary and fiscal actions, but critics point to the ineffectiveness of past control programs in the United States and other industrial nations and also question the desirability of increasing government control over private **economic** decisions. Future **stabilisation** **policy initiatives** will likely **concentrate** on **coordinating** monetary and fiscal **policies** and increasing supply-side efforts to **restore** productivity and develop new **technology**.

Retailing Strategy

To be successful, a retailer must distinguish itself from other retailers and develop a **strategy** for satisfying the needs and preferences of a **specific consumer** group. This **strategy**, called a retail mix, **involves** careful consideration of (1) the product to sell, (2) the quantity at which to make the product **available**, (3) the location at which to sell the product, (4) the time to make the product **available**, (5) the pricing of the product, and (6) the appeal that can be **generated** to attract the **consumer's** interest.

The Product

Retailers strive to offer products that appeal to the tastes of the **consumer**, are of good quality, and **function** properly. Sometimes the product must also provide **psychological** and emotional **benefits**, such as prestige or convenience. For example, an expensive watch with a well-known, **visible** brand name may give its owner a sense of prestige.

Quantity

Unlike wholesalers, who sell goods in quantities that often are too large to be useful for **individuals** or families, retailers sell products in small quantities that are more convenient for **consumers**. For example, wholesalers may sell jeans to retail stores in lots (units) of a dozen pairs each. Retailers then sell **consumers** jeans by the **individual** pair.

Location

A retailer's location must be convenient. In **locating** retail stores, retailers consider the market or town in which they want to **establish** themselves, the part of town to be in, and the actual **site** of their store. In some cases, no store is **involved** because the

right location for shopping for a product is the **consumer's** home or place of business. These retailers without stores, known as nonstore retailers, act as direct marketers by **contacting** customers directly through mail, the Internet, television, telephone, or other means.

Timing

Retailers must make their products **available** at times when **consumers** are willing and able to buy them. Retailers **identify consumer** buying patterns and **adjust** such things as store hours, inventory levels, and promotional programs to **accommodate consumers**. Retailers also **identify** special times that **generate** opportunities to sell merchandise, such as holidays, changing seasons, and special occasions, such as weddings and school graduations.

Pricing

Retailers use different pricing **strategies** to attract different **consumers**. For example, some stores use low or discount prices to attract economy-minded **consumers**, while some stores set higher prices to convey an upscale **image**.

Appeal

Retailers work hard at **creating** an **image** of their store or product that customers find appealing. Retailers use such promotional **techniques** as advertising and public relations to **create awareness** and build interest in their products. These **techniques** also attract customers to the retailer's store, provide valuable information about the retailer, and persuade customers to buy.

Common and Preferred Stock

The rights and **benefits** of a stockholder vary according to the type of stock held.

The two main stock **categories** are called common and preferred. **Financial** loss or gain can be greater with common stock than with preferred stock. Holders of common stock have residual equity in a **corporation**; that is, they have the last claim on the earnings and assets of a company, and may receive dividends only at the **discretion** of the company's board of directors and after all other claims on profits have been satisfied. For example, if the company is dissolved, stockholders share in what is left only after all other claims have been settled. Dividends and equity **conferred** by common stocks have no fixed dollar value; holders of such stock, therefore, **benefit** more from a company's prosperity or lose more from a company's adversity than do holders of preferred stocks.

If a stock has preferred dividends, the owner is entitled to receive a fixed dividend rate before any dividends are **distributed** to other stockholders; if a stock has preferred assets, the stockholder receives a share of the **proceeds** from the dissolution of a company before holders of nonpreferred stock do. Some stocks have both preferred dividends and preferred assets. Stock with first preference in the **distribution** of dividends or assets is called first preferred or sometimes preferred A, the next is called second preferred or preferred B, and so on.

Although holders of preferred stock may have to forego a dividend during a **period** of little or no profit, this is not true for two types of preferred stock. One is cumulative preferred stock, which entitles the owner to cumulation of past-due and unpaid dividends; the other is protected preferred. When the latter is **issued**, the **corporation**, after paying the preferred-stock dividends, places a **specified portion** of its earnings into a reserve, or sinking, **fund** in order to **guarantee** payment of preferred-stock dividends.

Two other stock **categories** are redeemable stock and **convertible** stock. The former is preferred stock **issued** with the stipulation that the **corporation** has the right to repurchase it. The latter stock endows the stockholder with the **option** of exchanging preferred stock for common stock under **specific** conditions, such as when the common stock reaches a certain price, or when the preferred stock has been held for a particular time.

Although most stockholders have the right to vote at their meetings, thus **participating** in **corporate** management, some stocks **specifically prohibit** this. Although such nonvoting stocks may be among any of those **previously** mentioned, at least one kind of stock **issued** by a **corporation** must be endowed with the voting privilege. Voting stock may not be changed to nonvoting stock without the stockholder's **consent**. **So-called** vetoing stock is between voting and nonvoting stock; its holders may vote only on **specific** questions. Before voting by proxy was permitted, independent stockholders influenced the management of a company. After it was authorized, however, company managers and directors holding a stock **minority obtained** enough proxies from absentee stockholders to outvote any opposition, thus perpetuating their control.

Company Structure

Most organizations have a **hierarchical** or pyramidal **structure**, with one person or a group of people at the top, and an increasing number of people below them at each **successive** level. There is a clear line or chain of command running down the pyramid. All the people in the organization know what decisions they are able to make, who their superior (or boss) is (to whom they report), and who their immediate **subordinates** are (to whom they can give **instructions**).

Some people in an organization have **colleagues** who help them: for example, there might be an **Assistant** to the Marketing Manager. This is known as a staff position: its holder has no line **authority**, and is not **integrated** into the chain of command, unlike, for example, the **Assistant Marketing Manager**, who is number two in the marketing department.

Yet the activities of most companies are too complicated to be organized in a single **hierarchy** of **layers**. Shortly before the first world war, the French industrialist Henry Fayol organized his coal-mining business according to the **functions** that it had to carry out. He is generally **credited** with inventing **functional** organization. Today, most large manufacturing organizations have a **functional structure**, including (among others) production, **finance**, marketing, sales, and personnel or staff departments. This means, for example, that the production and marketing departments cannot take **financial** decisions without **consulting** the **finance** department.

Functional organization is efficient, but there are two standard criticisms. Firstly, people are usually more concerned with the success of their department than that of the company, so there are permanent battles between, for example, **finance** and marketing, or marketing and production, which have **incompatible goals**. Secondly, separating **functions** is unlikely to encourage **innovation**.

Yet for a large organization manufacturing a **range** of products, having a single production department is generally inefficient. **Consequently**, most large companies are decentralized, following the model of Alfred Sloan, who divided General Motors into separate operating divisions in 1920. Each division had its own engineering, production and sales departments, made a different **category** of car (but with some **overlap**, to encourage **internal** competition), and was expected to make a profit.

Businesses that cannot be divided into autonomous divisions with their own markets can **simulate** decentralization, setting up divisions that deal with each other using **internally determined transfer** prices. Many banks, for example, have **established** commercial, **corporate**, private banking, international and **investment** divisions.

An **inherent** problem of **hierarchies** is that people at lower levels are unable to make important decisions, but have to pass on responsibility to their boss. One solution to this is matrix management, in which people report to more than one superior. For example, a product manager with an idea might be able to deal directly with managers responsible for a certain market segment and for a geographical **region**, as well as the managers responsible for the **traditional functions** of **finance**, sales and production. This is one way of keeping **authority** at lower levels, but it is not necessarily a very efficient one. Thomas Peters and Robert Waterman, in their well-known book *In Search of Excellence*, insist on the necessity of pushing **authority** and autonomy down the line, but they argue that one **element** - probably the product - must have **priority**; four-dimensional matrices are far too **complex**.

A further possibility is to have wholly autonomous, **temporary** groups or **teams** that are responsible for an entire **project**, and are split up as soon as it is successfully completed. **Teams** are often not very good for decision-making, and they run the risk of relational problems, unless they are small and have a lot of self-discipline. In fact they still **require** a **definite** leader, on whom their success probably depends.

Recruitment and Selection

When there is a vacancy in a company, it is the **job** of the Personnel Manager and his department to manage the recruitment of a new employee. One way an organization can find staff for **job** vacancies is to recruit in-company. Management can inform people of new appointments by means of the firm's notice board or news bulletin. Another possibility is to ask for recommendations from departmental managers and supervisors. If it is necessary to recruit outside the company, the personnel department may use commercial and government employment offices or **consultants**. It may prefer to put its own advertisement in a newspaper or magazine.

It is usual for an advertisement to give a short description of the **job**, conditions of work and salary, and to invite introductory letters from applicants. After studying these, management decides who receives an application form.

In order to **assess** the applications, managers can work from a personnel **specification** such as Rodger's Seven-Point Plan. They do not choose applicants who do not have a good profile. For this reason, it is important that the application form requests clear information about such things as the applicant's age, education, qualifications and work experience. It must also ask for references from other employers or people who know the applicant well. This information helps management to make a **final** decision on the number of applicants they can short-list for interview.

The staff who hold an interview together are called an interview '**panel**'. It is important that they know what information they need to get from the applicants. This comes from a careful reading of **job** descriptions, personnel **specifications**, and applications. To help the **panel** in their **selection**, some companies use an interview **assessment** form. This is used by the **panel** during the interview when each applicant is checked under the same point on the form.

Many employers say that the success of a good business begins in the Personnel Manager's office.

The Problem of Production

One of the most fateful **errors** of our age is the belief that 'the problem of production' has been solved. Not only is this belief firmly held by people remote from production and therefore **professionally** unacquainted with the facts - it is held by **virtually** all the **experts**, the captains of industry, the **economic** managers in the governments of the world, the **academic** and not-so-**academic economists**, not to mention the **economic** journalists. They may disagree on many things but they all agree that the problem of production has been solved; that mankind has at last come of age. For the rich countries, they say, the most important task now is 'education for leisure' and, for the poor countries, the '**transfer** of **technology**'.

That things are not going as well as they ought to be going must be due to human wickedness. We must therefore **construct** a political system so perfect that human wickedness disappears and everybody behaves well, no matter how much wickedness there may be in him or her. In fact, it is widely held that everybody is born good; if one turns into a criminal or an **exploiter**, this is the fault of 'the system'. No doubt 'the system' is in many ways bad and must be changed. One of the main reasons why it is bad and why it can still **survive** in spite of its badness, is this **erroneous** view that the 'problem of production' has been solved. As this **error** pervades all present-day systems there is at present not much to choose between them.

The arising of this **error**, so egregious and so firmly rooted, is closely connected with the **philosophical**, not to say religious, changes during the last three or four centuries in man's **attitude** to nature. I should perhaps say: western man's **attitude** to nature, but since the whole world is now in a **process** of westernisation, the more generalised statement appears to be **justified**. Modern man does not experience himself as a part of nature but as an outside force destined to **dominate** and conquer it. He even talks of a battle with nature, forgetting that, if he won the battle, he would find himself on the losing side. Until quite recently, the battle seemed to go well enough to give him

the illusion of unlimited powers, but not so well as to bring the possibility of total victory into view. This has now come into view, and many people, albeit only a minority, are beginning to realise what this means for the continued existence of humanity.

The illusion of unlimited powers, nourished by astonishing scientific and technological achievements, has produced the concurrent illusion of having solved the problem of production. The latter illusion is based on the failure to distinguish between income and capital where this distinction matters most. Every economist and businessman is familiar with the distinction, and applies it conscientiously and with considerable subtlety to all economic affairs - except where it really matters: namely, the irreplaceable capital which man has not made, but simply found, and without which he can do nothing.

A businessman would not consider a firm to have solved its problems of production and to have achieved viability if he saw that it was rapidly consuming its capital. How, then, could we overlook this vital fact when it comes to that very big firm, the economy of Spaceship Earth and, in particular, the economies of its rich passengers?

One reason for overlooking this vital fact is that we are estranged from reality and inclined to treat as valueless everything that we have not made ourselves. Even the great Dr. Marx fell into this devastating error when he formulated the so-called 'labour theory of value'. Now, we have indeed laboured to make some of the capital which today helps us to produce - a large fund of scientific, technological, and other knowledge; an elaborate physical infrastructure; innumerable types of sophisticated capital equipment, etc. - but all this is but a small part of the total capital we are using. Far larger is the capital provided by nature and not by man - and we do not even recognise it as such. This larger part is now being used up at an alarming rate, and that is why it is an absurd and suicidal error to believe, and act on the belief, that the problem of production has been solved.

Let us take a closer look at this 'natural capital'. First of all, and most obviously, there are the fossil fuels. None, I am sure, will deny that we are treating them as income items although they are undeniably capital items. If we treated them as capital items, we should be concerned with conservation; we should do everything in our power to try and minimise their current rate of use; we might be saying, for instance, that the money obtained from the realisation of these assets - these irreplaceable assets - must be placed into a special fund to be devoted exclusively to the evolution of production methods and patterns of living which do not depend on fossil fuels at all or depend on them only to a very slight extent. These and many other things we should be doing if we treated fossil fuels as capital and not as income. And we do not do any of them, but the exact contrary of every one of them: we are not in the least concerned with conservation; we are maximising, instead of minimising, the current rates of use; and, far from being interested in studying the possibilities of alternative methods of production and patterns of living - so as to get off the collision course on which we are moving with ever-increasing speed - we happily talk of unlimited progress along the beaten track, of 'education for leisure' in the rich countries, and of 'the transfer of technology' to the poor countries.

The liquidation of these capital assets is **proceeding** so rapidly that even in the allegedly richest country in the world, the United States of America, there are many worried men, right up to the White House, calling for the massive **conversion** of coal into oil and gas, demanding ever more gigantic efforts to search for and **exploit** the remaining treasures of the earth. Look at the figures that are being put forward under the heading 'World Fuel **Requirements** in the Year 2000'. If we are now using something like 7,000 million tons of coal **equivalent**, the need in twenty-eight years' time will be three times as large - around 20,000 million tons! What are twenty-eight years? Looking backwards, they take us roughly to the end of World War II, and, of course, since then fuel **consumption** has trebled; but the trebling **involved** an increase of less than 5,000 million tons of coal **equivalent**. Now we are calmly talking about an increase three times as large.

People ask: can it be done? And the answer comes back: it must be done and therefore it shall be done. One might say (with apologies to John Kenneth Galbraith) that it is a case of the blind leading the blind. But why cast aspersions? The question itself is wrong-headed, because it carries the **implicit assumption** that we are dealing with **income** and not with capital. What is so special about the year 2000? What about the year 2028, when little children running about today will be planning for their retirement? Another trebling by then? All these questions and answers are seen to be absurd the moment we realise that we are dealing with capital and not with **income**: fossil fuels are not made by men; they cannot be recycled. Once they are gone they are gone for ever.

But what - it will be asked - about the **income** fuels? Yes, indeed, what about them? Currently, they **contribute** (reckoned in calories) less than four per cent to the world total. In the foreseeable future they will have to **contribute** seventy, eighty, ninety per cent. To do something on a small scale is one thing: to do it on a gigantic scale is quite another, and to make an **impact** on the world fuel problem, **contributions** have to be truly gigantic. Who will say that the problem of production has been solved when it comes to **income** fuels **required** on a truly gigantic scale?

Fossil fuels are merely a part of the 'natural capital' which we steadfastly insist on treating as expendable, as if it were **income**, and by no means the most important part. If we squander our fossil fuels, we threaten **civilisation**; but if we squander the capital represented by living nature around us, we threaten life itself. People are waking up to this threat, and they demand that pollution must stop. They think of pollution as a rather nasty habit indulged in by careless or greedy people who, as it were, throw their rubbish over the fence into the neighbour's garden. A more **civilised** behaviour, they realise, would incur some extra cost, and therefore we need a faster rate of **economic** growth to be able to pay for it. From now on, they say, we should use at least some of the fruits of our ever-increasing productivity to improve 'the quality of life' and not merely to increase the quantity of **consumption**. All this is fair enough, but it touches only the outer fringe of the problem.

To get to the crux of the matter, we do well to ask why it is that all these terms - pollution, **environment**, ecology, etc. - have so *suddenly* come into prominence. After all, we have had an industrial system for quite some time, yet only five or ten years ago these words were **virtually** unknown. Is this a sudden fad, a silly fashion, or perhaps a sudden failure of nerve?

The explanation is not difficult to find. As with fossil fuels, we have indeed been living on the capital of living nature for some time, but at a fairly modest rate. It is only since the end of World War II that we have succeeded in increasing this rate to alarming proportions. In comparison with what is going on now and what has been going on, progressively, during the last quarter of a century, all the industrial activities of mankind up to, and including, World War II are as nothing. The next four or five years are likely to see more industrial production, taking the world as a whole, than all of mankind accomplished up to 1945. In other words, quite recently - so recently that most of us have hardly yet become conscious of it - there has been a unique quantitative jump in industrial production.

Partly as a cause and also as an effect, there has also been a unique qualitative jump. Our scientists and technologists have learned to compound substances unknown to nature. Against many of them, nature is virtually defenceless. There are no natural agents to attack and break them down. It is as if aborigines were suddenly attacked with machine-gun fire: their bows and arrows are of no avail. These substances, unknown to nature, owe their almost magical effectiveness precisely to nature's defencelessness - and that accounts also for their dangerous ecological impact. It is only in the last twenty years or so that they have made their appearance *in bulk*. Because they have no natural enemies, they tend to accumulate, and the long-term consequences of this accumulation are in many cases known to be extremely dangerous, and in other cases totally unpredictable.

In other words, the changes of the last twenty-five years, both in the quantity and in the quality of man's industrial processes, have produced an entirely new situation - a situation resulting not from our failures but from what we thought were our greatest successes. And this has come so suddenly that we hardly noticed the fact that we were very rapidly using up a certain kind of irreplaceable capital asset, namely the tolerance margins which benign nature always provides.

Now let me return to the question of 'income fuels' with which I had previously dealt in a somewhat cavalier manner. No-one is suggesting that the world-wide industrial system which is being envisaged to operate in the year 2000, a generation ahead, would be sustained primarily by water or wind power. Now we are told that we are moving rapidly into the nuclear age. Of course, this has been the story for quite some time, for over twenty years, and yet, the contribution of nuclear energy to man's total fuel and energy requirements is still minute. In 1970, it amounted to 2.7 per cent in Britain; 0.6 per cent in the European Community; and 0.3 per cent in the United States, to mention only the countries that have gone the furthest. Perhaps we can assume that nature's tolerance margins will be able to cope with such small impositions, although there are many people even today who are deeply worried, and Dr. Edward D. David, President Nixon's Science Adviser, talking about the storage of radioactive wastes, says that 'one has a queasy feeling about something that has to stay underground and be pretty well sealed off for 25,000 years before it is harmless'.

However that may be, the point I am making is a very simple one: the proposition to replace thousands of millions of tons of fossil fuels, every year, by nuclear energy means to 'solve' the fuel problem by creating an environmental and ecological problem of such a monstrous magnitude that Dr. David will not be the only one to

have 'a queasy feeling'. It means solving one problem by shifting it to another sphere - there to create an infinitely bigger problem.

Having said this, I am sure that I shall be confronted with another, even more daring proposition: namely, that future scientists and technologists will be able to devise safety rules and precautions of such perfection that the using, transporting, processing and storing of radioactive materials in ever-increasing quantities will be made entirely safe; also that it will be the task of politicians and social scientists to create a world society in which wars or civil disturbances can never happen. Again, it is a proposition to solve one problem simply by shifting it to another sphere, the sphere of everyday human behaviour. And this takes us to the third category of 'natural capital' which we are recklessly squandering because we treat it as if it were income: as if it were something we had made ourselves and could easily replace out of our much-vaunted and rapidly rising productivity.

Is it not evident that our current methods of production are already eating into the very substance of industrial man? To many people this is not at all evident. Now that we have solved the problem of production, they say, have we ever had it so good? Are we not better fed, better clothed, and better housed than ever before - and better educated? Of course we are: most, but by no means all, of us: in the rich countries. But this is not what I mean by 'substance'. The substance of man cannot be measured by Gross National Product. Perhaps it cannot be measured at all, except for certain symptoms of loss. However, this is not the place to go into the statistics of these symptoms, such as crime, drug addiction, vandalism, mental breakdown, rebellion, and so forth. Statistics never prove anything.

I started by saying that one of the most fateful errors of our age is the belief that the problem of production has been solved. This illusion, I suggested, is mainly due to our inability to recognise that the modern industrial system, with all its intellectual sophistication, consumes the very basis on which it has been erected. To use the language of the economist, it lives on irreplaceable capital which it cheerfully treats as income. I specified three categories of such capital: fossil fuels, the tolerance margins of nature, and the human substance. Even if some readers should refuse to accept all three parts of my argument, I suggest that any one of them suffices to make my case.

And what is my case? Simply that our most important task is to get off our present collision course. And who is there to tackle such a task? I think every one of us, whether old or young, powerful or powerless, rich or poor, influential or uninfluential. To talk about the future is useful only if it leads to action now. And what can we do now, while we are still in the position of 'never having had it so good'? To say the least - which is already very much - we must thoroughly understand the problem and begin to see the possibility of evolving a new life-style, with new methods of production and new patterns of consumption: a life-style designed for permanence. To give only three preliminary examples: in agriculture and horticulture, we can interest ourselves in the perfection of production methods which are biologically sound, build up soil fertility, and produce health, beauty and permanence. Productivity will then look after itself. In industry, we can interest ourselves in the evolution of small-scale technology, relatively non-violent technology, 'technology with a human face', so that people have a chance to enjoy themselves while they are

working, instead of working **solely** for their pay packet and hoping, usually forlornly, for enjoyment **solely** during their leisure time. In industry, again - and, surely, industry is the pace-setter of modern life - we can interest ourselves in new forms of **partnership** between management and men, even forms of common ownership.

We often hear it said that we are entering the era of 'the Learning Society'. Let us hope this is true. We still have to learn how to live peacefully, not only with our fellow men but also with nature and, above all, with those Higher Powers which have made nature and have made us; for, **assuredly**, we have not come about by accident and certainly have not made ourselves.

The **themes** which have been merely touched upon in this **chapter** will have to be further elaborated as we go along. Few people will be easily **convinced** that the **challenge** to man's future cannot be met by making **marginal adjustments** here or there, or, possibly, by changing the political system.

The following **chapter** is an attempt to look at the whole situation again, from the angle of peace and permanence. Now that man has **acquired** the **physical** means of self-obliteration, the question of peace **obviously** looms larger than ever before in human history. And how could peace be built without some **assurance** of permanence with regard to our **economic** life?

(Small is Beautiful by E F Schumacher)

History of Tourism

Tourism can be recognized as long as people have travelled; the narrative of Marco Polo in the 13th century; the "grand tour" of the British aristocracy to Europe in the 18th century; and the journeys of David Livingstone through Africa in the 19th century are all examples of early tourism. Thomas Cook is popularly regarded as the **founder** of inclusive tours with his use of a chartered train in 1841 to **transport** tourists from Loughborough to Leicester. Before the 1950s, tourism in Europe was mainly a **domestic** activity with some international travel between countries, mainly within continental Europe. In the **period of recovery** following World War II, a combination of **circumstances** provided an impetus to international travel. Among the important **contributing factors** were the growing number of people in employment, the increase in real **disposable incomes** and **available** leisure time, and changing social **attitudes** towards leisure and work. These **factors** combined to stimulate the latent demand for foreign travel and holidays. The **emergence** of specialist tour operators who organized inclusive holidays by **purchasing transport, accommodation**, and related services and selling these at a single price, brought foreign holidays within the price-range of a new and growing group of **consumers**. The "package" or "inclusive" tour democratized travel in Europe; foreign holidays were no longer the preserve of the affluent and socially élite classes.

Commercialism and Sport

It is becoming commonplace to think of sport as a "leisure industry". In recent years there have certainly been **dramatic** moves to open sport up to the forces of the market. The **maximum** wage and the retain-and-transfer system in football, and the

distinction between gentlemen and players in cricket has been scrapped. Tennis also abandoned the amateur and professional labels and simply called all competitors "players" from 1967. Most recently a change of heart on the part of the athletics authorities now enables top competitors to earn very large sums which are held in "trust funds". This technicality permits athletes to remain "amateurs". Only Rugby Union holds out against the commercial tide despite widespread speculation about covert payments to players. Cricket, the game of the British amateur *par excellence*, is now sponsored by tobacco firms and insurance companies whilst footballers advertise everything from double-glazing to Guinness on their shirts. The football league was recently sponsored by a Japanese camera manufacturer whose name had to be repeated when publishing or broadcasting results. A newspaper and now a bank have since taken over. In return for media coverage and the "clean" image of sport, sponsors are prepared to provide big injections of cash. This new rush to make profits from sport provides a contemporary context against which to measure the earlier degree of commercialisation. To what extent were large profits made from spectator sports and what kind of earnings and working conditions could a professional sportsman expect? What role have newspapers, the radio, and television played in sport? This leads us to the composition and behaviour of sports crowds, especially at football matches and the current debate about the reasons for hooliganism. How far are money and the media responsible for the misbehaviour of football supporters? Or is aggression leading to violence endemic in sport and sports spectators? competent, phlegmatic Englishman reading the *Oxford Book of Greek Verse* while organising supplies and technical support with a minimum of fuss. There was still hope for Britain if the old qualities of stoicism and the knack of handling "native" races could be combined with the scientific and management skills needed in the modern world.

Another sporting triumph followed hard upon the conquest of Everest and gave added reassurance to the nation, especially those steeped in the amateur spirit for whom the demolition of English professional football by Puskas and the Hungarians was not a matter for much regret. On 6 May 1954 at the small Iffley Road stadium in Oxford, Roger Bannister, a medical student at the University, broke The four-minute mile with the help of a couple of friends, Chris Brasher and Christopher Chataway. Despite the apparent informality of the occasion, this was no glorious undergraduate fluke. The sub-four-minute mile was a superbly planned and executed achievement. The record was broken by scientific training and pacing in which two first-class athletes sacrificed themselves to permit Bannister to break the record. A blend of the old virtues and the new, which the public seemed to understand and appreciate, united these two very different achievements. Bannister and Hunt gave the English hope for the future within the British Isles and more importantly in the wider post-imperial world. Not since a bony young Yorkshireman, Len Hutton, batted into a third day in August 1938 against Bradman's Australia to pass the Don's record score for a test match had the British known such transcendent moments of self-belief through sport. Hutton, later to become the first professional captain of England and knighted in 1956, joined the ranks of those who had to embody the hopes and expectations of an England creaking under the weight of its industrial and imperial past, but whose sense of destiny was still quite strong.

(Sport and the British: A Modern History by Richard Holt)

European Union (EU)

European supranational organization dedicated to increasing economic integration and strengthening cooperation among its member states. The European Union was established on November 1, 1993, when the Treaty on European Union, or Treaty of Maastricht, was ratified by the 12 members of the European Community (EC) - Belgium, Denmark, France, Germany, Great Britain, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, and Spain. Upon ratification of the treaty, the countries of the EC became members of the EU, and the EC became the policy-making body of the EU.

Under the Treaty on European Union, European citizenship was granted to citizens of each member state. Customs and immigration agreements were enhanced to allow European citizens greater freedom to live, work, or study in any of the member states, and border controls were relaxed. A goal of establishing a common European currency (European monetary union) was set for 1997.

Background

Prior to November 1993, the European Union was called the European Community. The EC was composed of what originally were three separate organizations: the European Coal and Steel Community (ECSC), created in 1951; and the European Economic Community (EEC, often referred to as the Common Market) and the European Atomic Energy Commission (Euratom), both set up in 1957. The three institutions merged in 1967, creating the EC and establishing headquarters in Brussels.

Organization

Decision-making in the EU is divided between supranational European institutions and the governments of the member states. The European Commission and the European Parliament are administered by the EU, and the Council of Ministers is composed of ministers from each of the member governments. The Court of Justice serves as the final arbiter in legal matters or disputes among EU institutions or between EU institutions and member states.

European Commission

The European Commission serves as the executive branch of the EU. It makes policy proposals and presents them to the Council of Ministers. The European Commission also represents the EU in economic relations with other countries or international organizations. The administrative role of the commission is to manage EC funds and programmes and to deliver aid to other countries.

Council of Ministers

The Council of Ministers, the main law-making body of the EU, is composed of cabinet ministers from the member governments. The council is aided by the Committee of Permanent Representatives, which is comprised of the permanent representatives (or ambassadors) of each member state.

European Council

Summit meetings among the top leaders of the member states are called at least once every six months by the country holding the presidency of the Council of Ministers. This meeting of heads of state and government is called the European Council. The summits were **instituted** on a regular basis in 1975. The European Council became an official part of the **EC structure** in 1987.

European Parliament

The European Parliament is the only body of the EU whose members are directly elected by the citizens of its member states. Formerly only a **consultative** body, the parliament gained new influence under the Treaty on European Union. The main body meets in Strasbourg, though most of its committee work is done in Brussels and the secretariat is based in Luxembourg. The 567 seats are allotted based on the population of each member state. In 1994 Germany had the largest representation, with 99 seats.

Individual committees of the European Parliament review **legislation** proposed by the European **Commission**. These committees often propose **amendments** to the **legislation** before **submitting** it to the Council of Ministers. The parliament may veto a proposal after it reaches the Council of Ministers if it disagrees with the council's position. The European Parliament also works with the Council of Ministers on the EU budget and can **reject** a budget plan if agreement cannot be reached within the council.

Committees

While the Treaty on European Union increased the political powers of the European Council, other bodies took on advisory **roles similar** to those once held by the parliament. The **Economic** and Social Committee is one of the most important of these bodies. Its 189 members are appointed to four-year terms by the Council of Ministers to represent employer and employee groups, as well as other interest groups. The committee has a strictly advisory **role**, but the Council of Ministers and the European **Commission** are obligated to **consult** the committee on many **legislative issues**. Another important group is the Committee of the **Regions**, **created** by the Treaty on European Union to bring the EU closer to its citizens and to give **regional** and local **authorities** a voice in government. The committee has 189 members that are **allocated** based on the population of each country. It has no **legislative** power, but must be **consulted** on matters relating to certain **economic** and social **issues**.

Court of Justice

The **final** arbiter in all matters of EU law is the Court of Justice. The court is composed of 13 judges who are appointed to six-year terms, with at least one judge from each member country. The court deals with disputes between member governments and EU **institutions** and among EU **institutions**, and with appeals against EC rulings or decisions. Courts of the member states often refer cases **involving** an unclear point of EU law to the Court of Justice. The court makes binding rulings on EU law to help guide the rulings of national courts. The rulings of the Court

of Justice set legal precedents and become part of the legal framework of each member state.

History

World War II devastated the economy of Europe. Some Europeans hoped that the reconstruction of western Europe would result in an agreement to create a unified European state. But the idea of a unified Europe was undermined by the beginning of the Cold War and lingering suspicions of West Germany (now part of the united Federal Republic of Germany). Two French statesmen - Jean Monnet and Robert Schuman - believed that France and Germany might put aside their long-running antagonism if given economic incentives for cooperation. In May 1950 Schuman proposed the creation of a common authority to regulate the coal and steel industry in West Germany and France; membership was also open to other western European countries. The proposal was welcomed by the West German government and by the governments of Belgium, Italy, Luxembourg, and the Netherlands. Along with France, the five countries signed the Treaty of Paris in 1951, and the European Coal and Steel Community (ECSC) was established in August 1952. The British government opposed the supranational nature of the planned ECSC and decided not to join.

In June 1955 the foreign ministers of the six nations in the ECSC agreed to examine the possibilities for further economic integration. This new effort resulted in the two Treaties of Rome of March 1957, which created the European Economic Community (EEC) and the European Atomic Energy Community (Euratom). The latter proved to be of little importance because each national government kept control of its nuclear power programmes.

European Economic Community

Economically, the EEC treaty mandated, over a 12-year period, the elimination of trade barriers among member nations, the development of a common tariff for imports from the rest of the world, and the creation of a common policy for managing and supporting agriculture. Politically, the treaty gave a greater role to national governments than had the earlier ECSC treaty, though it did provide for the EEC to become more supranational as economic integration progressed. In response to the EEC, Great Britain and six other non-EEC countries formed the European Free Trade Association (EFTA) in 1960. In 1961, with the EEC's apparent economic success, Great Britain began negotiations towards membership. In January 1963, however, the French president Charles de Gaulle vetoed British membership, particularly because of its close ties to the United States. De Gaulle vetoed British admittance a second time in 1967.

Creation of the EC

The basic economic features of the EEC treaty were gradually implemented, and the three communities (the EEC, the ECSC, and Euratom) merged in July 1967 under one set of institutions, the European Community. No progress was made on enlargement of the EC or on any other new proposals, however, until after De Gaulle

resigned as president of France in May 1969. The next French president, Georges Pompidou, was more open to new **initiatives** within the EC.

At Pompidou's suggestion, a summit meeting of the leaders of the member states was held in The Hague in December 1969. This summit paved the way for the **creation** of a permanent **financing** arrangement for the EC, the development of a **framework** for foreign-policy **cooperation** among the member nations, and the opening of membership negotiations with Great Britain, Ireland, Denmark, and Norway.

Expansion of the EC

In January 1972, after nearly two years of negotiations, treaties of accession were signed to admit the four applicant countries on January 1, 1973. Great Britain, Ireland, and Denmark joined as **scheduled**; however, in a national referendum, Norway voted against membership.

In Great Britain, opposition to EC membership continued. After the **Labour** party regained power in 1974, it carried out its election promise to renegotiate British membership conditions (particularly **financial** ones); the renegotiation resulted in only **marginal** changes, but it **created** a **period** of uncertainty within the EC. A divided **Labour** government endorsed continued EC membership and called a national referendum on the **issue** for June 1975. **Despite** strong opposition from some groups, the British people voted for continued membership.

In 1979 and 1980, the British government, claiming that the value of its **contributions** far **exceeded** the value of **benefits** received, again attempted to change its terms of membership. The **conflict** was **resolved** during the spring of 1980 when several members agreed to pay a greater share of the EC costs. In 1984 it was agreed that Great Britain would receive a partial rebate of its **annual** net **contributions** to the EC, beginning with a rebate of US\$800 million for that year.

Greece entered the EC in 1981 and, after eight years of negotiations, Spain and Portugal joined in 1986. Other important developments during the 1970s and 1980s included the **expansion** of EC **aid** to less developed countries (especially to former colonial possessions of the member states); the institution of the European Monetary System to provide some stability in the relationships among member **currencies**; and progress towards **removing internal** trade barriers and **establishing** a single market.

European Monetary System

In March 1979 the European Monetary System (EMS) was **established** as a first step towards **achieving** an **economic** and monetary union. **Initial** plans to reach complete EMU by 1980 proved overly optimistic; **currencies** of member states **fluctuated** against each other, and the devaluation of some **currencies** limited **economic** growth and led to high inflation. The EMS was proposed to **stabilise** exchange rates and curb inflation by limiting the **margin** of **fluctuation** for each member **currency** to a small **deviation** from a central rate. A common European **Currency** Unit (ECU) was introduced by which the central exchange rates could be set. The ECU was **comprised** of all the EU **currencies**, weighted according to the **economic** importance

of each country. When any **currency** reached the limit of the **margin of fluctuation**, set at 2.25 per cent, the central banks of the respective countries were obliged to **intervene** by selling off the stronger **currency** and buying the weaker one. The EMS also **required** member governments to take **appropriate economic policy** steps to prevent continued **deviation** from the central rate. The EMS helped lower inflation rates in the EC and eased the **economic shock** of **global currency fluctuations** during the 1980s. However, its **principal mechanism**, the Exchange Rate Mechanism (ERM), **collapsed** in September 1992 under **sustained** attack by **currency** speculators, **triggered** by high German interest rates following reunification. Italy and Great Britain were forced out of the ERM.

Towards a Single Market

The most **significant** development in the EC during the 1980s was the progress towards **implementing** a single European market. The campaign for the single market was led by Jacques Delors, a former French **finance** minister who became president of the European **Commission** in 1985. At a summit meeting in Milan, Italy, the **commission** proposed a seven-year timetable for **removing** nearly all the remaining trade barriers between member states. The European Council approved the plan, and the **goal** of **achieving** a single European market by December 31, 1993, accelerated reforms with the EC and increased **cooperation** and **integration** among member states. **Ultimately**, it led to the formation of the European Union.

One obstacle to full **economic integration** was the Common Agricultural **Policy** (CAP). During the 1980s the CAP accounted for about two-thirds of annual EC expenditures (**revenues** were gained from **levies** on imports and up to two per cent of the value-added tax collected by member states). The CAP encouraged the production of large surpluses of some **commodities** that the EC was **committed** to buy, resulting in **subsidies** to some countries at the expense of others. At an emergency summit meeting in 1988, EC leaders agreed on **mechanisms** to limit these payments; under the 1989 budget, agricultural **subsidies** **comprised** less than 60 per cent of total EC spending for the first time since the 1960s.

Single European Act

The fixed timetable for **achieving** the single market **exposed** the EC's need for greater power in order to **resolve** all the **issues** surrounding the **elimination** of trade barriers in time for the deadline. The Council of Ministers had to reach unanimous agreement on every decision, effectively giving any one member state veto power and thus slowing the political **process**.

The Single European Act, introduced in December 1985 and approved by all 12 members by July 1987, **established** the first **major** changes to EC **structure** since the already **established** Treaties of Rome of 1957. Among the changes was the introduction of the weighted **majority** system which helped speed up the **process** of **implementing** the single market. The Single European Act also made other important changes. The European Council, which had provided much of the impetus for the single market, was given formal **status**; the European Parliament was given greater voice and influence; and member states agreed to adopt common **policies** and standards on matters **ranging** from taxes and employment to health and the

environment. In addition, the Court of First Instance was established to hear appeals of EC rulings brought by individuals, organizations, or corporations; and each member state resolved to bring its economic and monetary policies in line with its neighbours, using the EMS as a model.

Changes in Europe and the EC

Supporters of an economic and monetary union argued that there could not be a single market as long as restrictions on money transfers and exchange premiums limited the free flow of capital. A three-stage plan for achieving EMU was suggested. At the same time, the commission proposed a social charter on human rights. Great Britain voiced opposition to both proposals, expressing concern that its sovereignty would be threatened if the power of the EC was expanded. However, Great Britain eventually joined the plan for EMU as changes swept throughout Europe causing the need for a swift and united response from the EC.

As Communism crumbled in eastern Europe, many of the former Communist countries looked to the EC for political and economic assistance. The EC agreed to military aid and association agreements with many of the countries, but ruled out immediate membership. An emergency summit in April 1990 made an exception for East Germany, allowing the country to be automatically incorporated into the EC upon completion of German reunification. At this same summit, West Germany and France proposed an intergovernmental conference (IGC) to pursue closer European unity in the wake of the rapid political upheaval. The British prime minister Margaret Thatcher opposed calls for increased unity, but in 1990 John Major became prime minister and adopted a more conciliatory approach towards the idea of European unity. The IGC, along with a similar conference working on a timetable for the EMU, began work on a series of agreements that became the Treaty on European Union.

Treaty on European Union

Representatives from each of the EC countries negotiated the Treaty on European Union in 1991, and in December the European Council met at Maastricht, the Netherlands, to consider a draft version. After intense bargaining among members, the final treaty was signed by the European Council on February 7, 1992. A provision of the treaty mandated that the voters of each member state had to approve the European Union by popular referendum; the treaty was ratified in October 1993. The European Union was established on November 1, when the treaty went into effect.

Outlook

The EU represents a desire for peace and cooperation among sovereign European states. With increased cooperation and growth, the EU may become a major economic unit. However, the long-term goal of a single federal European political state as envisioned by the original proponents of European economic cooperation has largely been rejected.

The number of member countries in the EU is expected to increase by the end of the decade. Turkey applied for membership in 1987; Austria in 1989; Cyprus and Malta in 1990; Sweden in 1991; and Switzerland, Finland, and Norway in 1992. Several

eastern European countries are also expected to apply for membership. Switzerland later withdrew its membership application to avoid violating its history of neutrality. In June 1994 Austrian voters overwhelmingly affirmed a referendum on EU membership and prepared to join in 1995. Finland, Austria, and Sweden joined the EU in 1995; after a referendum, Norway once again elected to remain outside.

Other potential EU applicants include members of the European Free Trade Association (EFTA). In 1991 the EC and EFTA completed an agreement to establish the European Economic Area, which would provide a single market for goods, services, and capital. The European Economic Area, which took effect on January 1, 1994, eliminated trade barriers between the EU and EFTA, each of which is the other's largest trading partner.

The Public Order Act

Despite its title, the Public Order Act creates some offences which apply whether the conduct takes place in a public or a private place. Of particular relevance here are those offences which involve violence or the threat of violence. The Act provides a "ladder" of offences, of which the most serious is riot (section 1). The essence of riot is the use of unlawful violence by two or more persons in a group of at least twelve persons who are using or threatening violence. The maximum penalty is ten years' imprisonment, compared with a maximum of five years for the lesser offence of violent disorder. The essence of violent disorder (section 2) is the use or threat of unlawful violence in a group of at least three persons who are using or threatening violence. Beneath violent disorder comes the crime of affray (section 3), now defined in terms of threatening or using unlawful violence towards another, and carrying a maximum of three years' imprisonment. Affray may be committed by one individual, and, like the other offences, it may be committed in a private place. The term "violence" includes conduct intended to cause physical harm and conduct which might cause harm (such as throwing a missile towards someone); and, for the two most serious offences of riot and violent disorder, "violence" bears an extended meaning which includes violent conduct towards property.

Is it necessary to have an extra ladder of offences so closely linked with the general ladder of offences of violence? One reason might be the unsatisfactory state of the law under the Offences against the Person Act 1861: that Act fails to provide both a clear and defensible gradation of offences and any general offences of threatening violence against another. The provisions of the Public Order Act are, however, usually justified on other grounds. One supposed justification is that these extra offences are needed to cope with "group offending", which causes fear in ordinary citizens, and extra difficulties for the police and for prosecutors (in obtaining persuasive evidence). Offences committed by groups may well occasion greater fear than offences committed by individuals, and it may also be true that groups have a tendency to do things which individuals might not do: there is a group bravado, a group pressure, which may lead to excesses. On the other hand, the criminal law already makes some provision for such cases. The law of conspiracy is aimed at group offending, but conviction depends on proof of some prior agreement. The law of complicity enables the conviction of people who aid and abet others to commit offences, and spreads a fairly wide net in doing so.

Causing Death

If causing death is to be regarded as the most serious harm that can be inflicted, it would seem to follow that the most blameworthy form of homicide should result in the highest sentences imposed by the courts. Indeed, many systems of criminal law impose a mandatory sentence for murder (or whatever the highest form of homicide is called in that system). In some jurisdictions this is a mandatory sentence of death. In others, such as those in the United Kingdom, it is the mandatory sentence of life imprisonment. Why should this penalty be mandatory, and not at the discretion of the court as in other offences? One argument in favour of the mandatory sentence of life imprisonment is that it amounts to a symbolic indication of the unique heinousness of murder. It places the offender under the State's control, as it were, for the remainder of his or her life. This is often linked with a supposed denunciatory effect - the idea that the mandatory life sentence denounces murder as emphatically as possible - and with a supposed general deterrent effect, in declaring that there is no mitigation of sentence available for this crime. It might also be argued that the mandatory life sentence makes a substantial contribution to public safety.

None of these arguments is notably strong, let alone conclusive. The mandatory penalty does indeed serve to mark out murder from other crimes, but whether the definition of murder is refined to capture the worst killings, and only the worst killings, remains to be discussed below. Whether the life sentence is regarded as a sufficient denunciation in society depends on the public's perception of what life imprisonment means: if it is widely believed that it results in an average of nine years' imprisonment, the effect will be somewhat blunted. The same applies to the general deterrent argument: its effectiveness depends on whether the penalty for murder affects the calculations of potential killers at all, and, if it does, whether life imprisonment is seen as significantly more or less severe than the alternative of a long, fixed-term sentence. As for public protection, this depends on executive decisions with regard to release; it fails to take into account whether it is necessary for public protection to keep "lifers" in for so long.

For practical purposes, the culpable causing of another person's death may fairly be regarded as the most serious offence in the criminal calendar. There is an argument that treason is a more serious offence, since it strikes at the very foundations of the State and its social organizations, but treason is so rare that it is surely permissible to treat homicide as the most serious form of crime. The reason for this is not difficult to find: the harm caused by many other crimes is remediable to a degree, whereas the harm caused by homicide is absolutely irremediable. Even in crimes of violence which leave some permanent physical disfigurement or psychological effects, the victim retains his or her life and, therefore, the possibility of further pleasures and achievements, whereas death is final. This finality makes it proper to regard death as the most serious harm that may be inflicted on another, and to regard a person who chooses to inflict that harm as the most culpable of offenders, in the absence of some excuse or justification.

Although many deaths arise from natural causes, and many others from illnesses and diseases, each year sees a large number of deaths caused by "accidents", and also a number caused by acts or omissions which amount to some form of homicide in English law. For 1987 the statistics show that there were some 20,000 accidental

deaths, of which some 7,000 occurred in the home, 6,000 at work, and 5,000 on the roads. By comparison, the number of deaths recorded as criminal homicide was 600, which includes all the murders and manslaughters. This figure is relatively small when compared with many American cities, but that is no cause for satisfaction. There are still awkward questions to be confronted. For example, are we satisfied that the 600 deaths recorded as homicide are in fact more culpable than all, or even most, of the deaths recorded as accidents? In other words, does English criminal law pick out the most heinous forms of killing as murders and manslaughters, or are the boundaries frozen by tradition? Another question is whether the criminal law ought not to be wider in its application to activities which carry some risk of causing death than in other spheres. Thus, even if it would be excessive to sweep large numbers of the deaths now recorded as "accidents" into the law of homicide, there may be sufficient justification for creating or enforcing offences designed to ensure safe conditions of work, safe goods, safe buildings, and so on. It was argued in Chapter 2 that the criminal law ought to spread its net wider where the potential harm is greater. It will be seen that English law does this up to a point, and in the process seems to accept social-defence arguments as reasons for departing from several of the principles set out in Chapter 3.

Requirements for Murder

In English criminal law there are now two alternative fault requirements for murder: an intent to kill, or an intent to cause grievous bodily harm. What do these requirements mean? Do they extend the definition of murder too far, or are they too narrow.

Intent to kill may be regarded as the most obvious and indisputable form of fault element for murder, but to some extent that depends on the meaning of "intent". This has been the subject of a number of House of Lords decisions, and yet the definition is still not clear and settled. Probably the most accurate statement would be that a person *intends* to kill if it is his or her purpose to kill by the act or omission charged, or if he or she foresees that death is practically certain to follow from that act or omission. In this way, both purpose and foresight of practical certainty are regarded as part of the definition of intent, although there are other statements suggesting that foresight of practical or "virtual" certainty is merely evidence from which intent may be inferred. How would this test be applied? In many cases the word "intent" is used without elaboration, but there are some for which a full explanation of the meaning of intention is necessary. A fairly typical set of facts is provided by Nedrick (1986), where D had a grudge against a woman and had threatened to "burn her out". One night he went to her house, poured paraffin through the letter-box and on to the front door, and set it alight. One of the woman's children died in the ensuing fire. When asked why he did it, D replied: "Just to wake her up and frighten her." A defence of this kind, a claim that the purpose was only to frighten and not to cause harm, requires the full definition to be put to the jury. The question is: granted that D's purpose was to frighten, did he nonetheless realize that it was practically certain that his act would cause death or grievous bodily harm to someone? The jury should answer this by drawing inferences from the evidence in the case and from the surrounding circumstances.

What about the **alternative element** in the **definition**, an intent to cause grievous bodily harm? This has **considerable** practical importance, since this is all that the prosecution has to prove in order to **obtain** a verdict of guilty of murder. It must be shown that the defendant intended (which, again, includes both purpose and **awareness** of practical certainty) to cause really serious **injury** to someone. The House of Lords **confirmed** this rule in *Cunningham* (1981): D struck his victim on the head a number of times with a chair, causing **injuries** from which the victim died a week later. D **maintained** throughout that he had not intended to kill, but there was **evidence** from which the jury could **infer** - and did **infer** - that he intended to cause grievous bodily harm. The House of Lords upheld D's conviction for murder: an intent to cause really serious **injury** is **sufficient** for murder, without any proof that the defendant intended, or even contemplated, the possibility that death would result.

Does the "grievous bodily harm" rule extend the **definition** of murder too far? If the point of distinguishing murder from manslaughter is to mark out the most heinous group of killings for the extra stigma of a murder conviction, it can be argued that the "grievous bodily harm" rule draws the line too low. In terms of **principle**, the rule **requires justification** because it departs from the **principle of correspondence**, namely that the fault **element** in a crime should relate to the **consequences prohibited** by that crime. By allowing an intent to cause grievous bodily harm to suffice for a murder conviction, the law is **violating** a general **principle**, turning the most serious of its offences into a **constructive** crime. Why should it be necessary to **"construct"** a murder conviction out of this lesser intent? There are arguments in favour of this: death is **final**, murder is the gravest crime, and there is no **significant** moral difference between someone who chooses to cause really serious **injury** and someone who sets out to kill. No one can **predict** whether a serious **injury** will result in death - that may depend on the victim's physique, on the speed of an ambulance, on the distance from the hospital, and on a **range** of other **medical** and **individual** matters. If one person chooses to cause serious **injury** to another, it should be **presumed** that he or she realizes that there is always a risk of death, and such cases show a **sufficiently** wanton disregard for life as to warrant the **label** "murder" if death results. The counter-arguments, which would uphold the **principle of correspondence**, are that breach of that **principle** is unnecessary when the amplitude of the crime of manslaughter lies beneath murder, and also that the **definition** of grievous bodily harm includes a number of **injuries** which are most unlikely to put the victim's life at risk. In the leading case of *Cunningham* Lord Edmund-Davies (dissenting) gave the example of breaking someone's arm: that is a really serious **injury**, but one which is unlikely to endanger the victim's life. So in practice the "grievous bodily harm" rule goes further than the arguments of its protagonists would support.

Would it be right, then, to **confine** the fault **element** in murder to an intent to kill? That would have the merit of simplicity, but would it strike the right note socially? There are powerful arguments in favour of saying that there are other killings where an intent to kill cannot be **established**, and yet where the moral or social culpability is equal to that in most intentional killings. Of course, one cannot be adamant about whether they merit the **label** "murder", because that is a question of drawing the line between murder and manslaughter, which is not susceptible of any **precise resolution**. It is hard to argue **conclusively** that the **category** of murder should be smaller or larger (unless the death penalty or a mandatory life sentence follows); it is a question of social judgment.

Let us briefly consider some of the possibilities. The fault element for many serious offences is intent or recklessness: why should this not suffice for murder? The question is whether all killings in which the defendant is aware of the risk of death are sufficiently serious to warrant the term "murder". One answer sometimes given is that they are not, because a driver who overtakes on a bend, knowingly taking the risk that there is a car travelling in the opposite direction, should not be labelled a murderer if a collision and death happen to ensue. This example assumes that a sympathy for motorists with overwhelm any tendency to logical analysis. One might ask whether motorists are ever justified in knowingly taking risks with other people's lives. Yet if the example is modified a little, so that the overtaking is on a country road at night and the risk is known to be slight, it becomes questionable whether the causing of death in these circumstances should be labelled in the same way as intentional killings. This is not to suggest that motorists should be treated differently. The point is rather that, even though knowingly taking risks with other people's lives is usually unjustifiable, taking a slight risk is less serious than intentionally causing death. In discussing the boundaries of murder, we are concerned with classification, not exculpation.

To classify all reckless killings as murder might be too broad, but the point remains that some reckless killings may be thought no less heinous than intentional killings. Can a satisfactory line be drawn here? One approach would be to draw the line by reference to the degree of probability. Murder is committed in those situations where D caused death by an act or omission which he knew had death as the probable or highly probable result. A version of this test of foresight of high probability is used in several other European countries; it was introduced into English law by the decision in Hyam v. DPP (1975), but abandoned in Moloney (1985) on grounds of uncertainty.

A second approach is to frame the law in such a way as to make it clear that the court should make a moral judgment on the gravity of the defendant's conduct. Section 210.2 of the Model Penal Code includes within murder those reckless killings which manifest "extreme indifference to the value of human life". Scots law treats as murder killings with "wicked recklessness", a phrase which directs the court's attention to the circumstances of the killing. Both the Model Penal Code test and the Scots test may be reduced to circularity, however, for when one asks how extreme or how wicked the recklessness should be, the only possible answer is: "wicked or extreme enough to justify the stigma of a murder conviction". Admittedly, the Model Penal Code does contain a list of circumstances which may amount to extreme indifference, which assists the courts and increases the predictability of verdicts in a way that Scots law does not, but the essence of both approaches is that there is no precise way of describing those non-intentional killings which are as heinous as intentional killings. Their protagonists argue that the law of murder is so important socially that derogation from the principle of maximum certainty should be allowed in favour of more accurate labelling by the courts; opponents argue that the principle of maximum certainty is needed here specifically to reduce the risk of verdicts based on discriminatory or irrelevant factors, such as distaste for the defendant's background, allegiance, or other activities.

A third, more precise formulation derives from the recommendations of the Criminal Law Revision Committee in 1980, namely, that a killing should be classified as murder in those situations where there is an intention to cause serious injury coupled

with awareness of the risk of death. Neither an intention to cause serious injury nor recklessness as to death should be sufficient on its own, but together they restrict one another, producing a test which both satisfies the criterion of certainty and marks out some heinous but non-intended killings.

A fourth approach, adopted by English law until 1957 and still in force in many American jurisdictions, is some form of felony murder rule: anyone who kills during the course of a felony (or, more restrictively, a serious crime of violence) or whilst resisting arrest should be convicted of murder. Thus stated, there is no reference to the defendant's intention or awareness of the risks: the fact that D has chosen to commit rape, robbery, or another serious offence, and has caused death thereby, is held to constitute sufficient moral grounds for placing the killing in the highest category. Plainly, this is a form of constructive criminal liability: the murder conviction is constructed out of the ingredients of a lesser offence. Presumably the justification is that D has already crossed a high moral/social threshold in choosing to commit such a serious offence, and should therefore be held liable for whatever consequences ensue, however unforeseeable they may be. The objections would be reduced if awareness of the risk of death was also required: in other words, if the test were the commission of a serious offence of violence plus recklessness as to death. The effect of that test would be to pick out those reckless killings which occurred when D had already manifested substantial moral and legal culpability, and to classify them as murder.

Four alternative approaches have been described, and many others could be listed. The point is that the traditional concepts of intention and recklessness do not, of themselves, appear to be sufficiently well focused to mark out those killings which are the most heinous. The law must resort to some kind of moral and social evaluation of conduct if it is to identify and separate out the most heinous killings. Many people might think that a person who causes death whilst using an unlawfully held firearm or explosives ought to be convicted of murder because there is, generally speaking, no excuse for using such dangerous equipment. Some of the people thus covered would be armed robbers, others would be terrorists. The armed robber might say that he had no intention of using the firearm, that he carried it with him simply to frighten the victim, and that it went off accidentally: if the jury believes that, should he be convicted of murder? The terrorist might say that he gave sufficient warning of the bomb for the area to be cleared, and that it was unforeseeable that a deaf person should remain on the premises and be killed in the explosion, which was intended only to cause damage. If the jury believes that, should he be convicted of murder? It is possible that juries would prefer to convict of murder in such cases so as to register their abhorrence of the defendant's activities in general. If so, this would suggest a social preference for regarding killings of these kinds as among the worst because of the circumstances in which they occur, rather than because of the defendant's awareness of the possible consequences. However, the Royal Commission on Capital Punishment, which reviewed the matter thoroughly in the early 1950s, and later law-reform committees have accorded preference to the "general principle" that "persons ought not to be punished for consequences of their acts which they did not intend or foresee". A conviction for manslaughter would be sufficient to mark the gravity of those cases in which D was not aware of the risk of death, and the court would have ample discretion in sentencing to reflect the blameworthiness of D's conduct. However, there would have to be clear parameters

of sentencing in order to avoid the intrusion of discriminatory or **irrelevant factors** at this stage.

To **summarise**: the existing English law classifies as murder those killings where there was an intent to kill or an intent to cause grievous bodily harm. The reason for distinguishing between murder and manslaughter must be to **identify** and to **label** the most heinous killings as murder, and it has been questioned whether English law succeeds in this. There are **issues** of general **principle** at stake, but it is also true to say that there can be no *absolutely right* place in which to draw the line. The **issue assumes** special **significance** when conviction for murder carries a mandatory penalty, particularly when that penalty is death.

Treason

Treason is a criminal offence **involving** the attempt, by overt acts, to overthrow the government to which the offender owes allegiance, or to betray the state to a foreign power.

Two **grades** of treason existed in early English law: high treason, which was directed against the Crown, and petty treason, which **consisted** of a crime against a subject, such as a wife killing her husband, or a servant murdering his master.

In early English statutes the more serious offences were compassing or imagining the death of the sovereign, adhering to the sovereign's enemies and giving them **aid** and comfort, and levying war against the sovereign. Statutes were changed from time to time between the reign of Edward III and that of Elizabeth I. After the **Restoration** the Stuart judges used "**constructive** treason" to discourage resistance to the Crown. They extended the offences to include words as well as deeds. In 1663, a writer was convicted of treason for writing an article suggesting that the king was accountable to the people.

Treason is a rare offence in modern law. In England it is usually **invoked** only in time of war, and the penalty is still death. In 1917, Roger Casement was executed for treason for attempting to gain German support for Irish independence during World War I; in 1946, William Joyce, who had broadcast from Germany throughout World War II and was known as "Lord Haw-Haw", was executed for treason. Joyce's conviction was **controversial** as many believed that he was not a British citizen, having been born in the United States, having no passport, and no intention to be a British citizen.

Crime, Deprivation and Morality

Criminologists have scarcely addressed, let alone answered, the broad questions of explaining **overall trends** in crime. Positivist **research** has **generated** much **data** about **specific** relationships between **individual** or social characteristics and the likelihood of conviction. **Radical approaches** have been characterized more by **theoretical** or programmatic work than by grounded accounts or changing crime patterns. Even the recent "New Left realism" does not address the broader questions of causation, though its leading exponent Jock Young (1986) has rightly **emphasised** the need to return aetiological questions to the foreground. But so far their explanation of rising

crime has largely **focused** on alleged deficiencies in police **strategy**, in particular on counter-productive militaristic tactics which exacerbate "public alienation" and therefore impede successful crime control (Kinsey *et al.*, 1986, pp. 40- 2). Admittedly the vicious **cycle** of police militarization and public alienation is seen to be kicked into play by the **economic** crumbling of the inner city, but thereafter the weight of the explanation is placed on **inadequate** (or over-heavy) policing. As will be **indicated** below, I do not feel that much (if any) of the explanation can lie at the door of the police station.

More plausible is the **analysis** developed in Dahrendorf's Hamlyn **Lectures** on "law and order" (Dahrendorf, 1985, 1987). In this the main **structural** precondition of growing crime is seen as the growth of an underclass. The social prerequisite of the long **trend** in the late nineteenth and early twentieth centuries towards lower crime and disorder, and greater police acceptance, was the historical **process** of working-class **incorporation**. Uneven and limited though this might have been, the gulf between Disraeli's two nations in the early and mid-nineteenth century became blurred and attenuated by the twentieth. The sharp end of routine policing always falls on the economically **marginal**, those who live out their lives in public places which routine police patrols **regulate**, and those who are not **integrated** into the mainstream **institutions** of **economic** and political life. **Incorporation** of the working class reduced the **adult** part of this residuum to a politically **insignificant**, atomistic, **albeit** cyclically **fluctuating** stratum. The main grist to the mill of policing was working-class youth, but the perennial **conflict** between youth and the police is one with ever-changing persona and is not the basis of political **conflict**.

This changed with the **re-emergence** of long-term **structural** unemployment, leading to the **de-incorporation** of increasing **sections** of the working class, "who are being **defined** out of the edifice of citizenship" (Dahrendorf, 1985, p. 98). The underclass in Dahrendorf's account is not simply the product of unemployment. It is the **consequence** of the **apparent structural inevitability** of its position: "The **majority** class does not need the unemployed to **maintain** and even increase its standard of living. The main point about this **category** - for lack of a better word we shall call it 'under class' - is that its destiny is **perceived** as hopeless." (Dahrendorf, 1985, pp. 101-7).

Now there are problems with the simple postulation of a **link** between unemployment, crime, and disorder, as Mrs Thatcher is only too ready to point out. There is an **enormous** literature of **research** on the relationship, which the late Steven Box (1987) has usefully **summarised** and reviewed in his very important last book, *Recession, Crime and Punishment*. Box **summarises** some fifty **research projects** on the relationship between unemployment and crime. Most are **aggregate** studies, looking at the correlation over time or across space between levels of crime and unemployment. He **sums** it up:

The relationship between overall unemployment and crime is **inconsistent**. On balance the weight of existing **research** supports there being a weak but none the less **significant** causal relationship. However, properly **targeted research** on young males, particularly those from disadvantaged **ethnic** groups, which considers both the **meaning** and **duration** of unemployment, has yet to be done. (pp. 96-7)

Much of this **debate** has been vitiated by the **assumption** that if unemployment is causally related to crime, this must be an **invariable law**: true at all times and places. But it is more plausible to suppose that the meaning of unemployment will **vary** according to a number of **factors**, e.g. its **duration**, social **assessments** of blame, **previous** experience of steady employment, **perception** of future **prospects**, comparison with other groups, etc. It would be too much, therefore, to expect that there would be a universal and invariant relation. Some support for the **link** between offending and **perceptions** of the justice of unemployment is suggested by the **research evidence** on the connections of **income inequality** and crime. All the fifteen studies of this reviewed by Box suggest a strong association (over time or cross-sectionally) between **economic inequality** and crime in general (though this is not true of five studies on homicide **specifically**) (Box, 1987, pp. 86-98). This plausibly supports the view that it is **relative deprivation** which is causally related to crime, and that in conditions where unemployment is **perceived** as unjust and hopeless by comparison with the lot of other groups, this will act as a precipitant of crime. Two recent studies, one American (Thornberry and Christenson, 1984) and one British (Farrington *et al.*, 1986), have both used a novel **methodology** to **establish** that at least in the present climate unemployment *is linked* to crime. They have looked at the **commission** of offences reported over time by a sample of youths in longitudinal **surveys**. What is shown is that crime-rates (especially for property offences) were higher during **periods** of unemployment than of employment. This suggests that holding **constant** other **variables**, the same youths **commit** more crimes while unemployed.

That there should be a **link** between (a) unemployment and (b) relative poverty, and crime is hardly surprising. Both exacerbate the **incentives** to **commit** offences and **erode** the social controls which would otherwise encourage **conformity** (relative fearfulness of sanctions, **perception** of the justice of the system, **involvement** in **conventional** activities and relationships, etc.). So it is clearly right to argue as Dahrendorf does that the **emergence** of an underclass **excluded** apparently permanently from **dominant economic** life is a potent condition of rising crime. This is all grist to the mill of orthodox social democratic **analyses** of crime.

But it cannot be the whole story. First, there is the problem of rising crime during the **so-called period** of affluence. It is this indeed which prompted the first "new realisms" in criminology: the right-wing realism of James Q. Wilson and his associates in the United States (Wilson, 1975); and the "**administrative realism**" **attributed** by Jock Young to our own Home Office **Research Unit** (Young, 1986). If the rate of crime increases when the adverse social conditions which have been **linked** to it are becoming ameliorated, the answer must lie elsewhere: either in the failure of the criminal justice system to deliver sanctions with **sufficient** certainty or positiveness (the "New Right" **analysis**), or in changes in the **availability** of criminal opportunities in the **environment** (**administrative** criminology).

Dahrendorf accepts both these as possible **contributions**, but encompasses them within a much broader idea: the growth of **anomia**, the failure of a social **structure** to instil **adequate commitment** to its **conventional** moral **codes**, as crystallized into the criminal law. This is more profoundly a matter of the deeper **cultural** instilling of **conformist** values than of the effective threat of *post hoc* sanctions by the criminal justice system. The idea of the failure of the agencies of socialization to instil

discipline and moral values because of the effects of post-war "funk" and permissiveness is a favourite stalking-horse of the right-wing populist criminology championed by Norman Tebbit and others (and in a more sophisticated version in Douglas Hurd's Tamworth and other speeches). The Government has eagerly seized on the "evidence" provided by the new affluent and rural as well as urban "lager lout" folk-devils to deny any link between inner-city deprivation and crime. Instead, the finger is pointed at a common moral malaise due to over-liberalization and erosion of discipline (Patten, 1988). Because of this pedigree, the opinions of the Left and of liberals have shied away from examination of the issue of morality in relation to crime. This is a great loss, because at root there is an integral relation between the ideas of crime and morality. Older Marxist criminologies (notably Bonger's) saw the link between economic conditions and crime precisely as lying in the culture of egoism which was stimulated by economic advance under capitalism (Bonger, 1916). This is more evident than ever in recent years with the amorally materialistic culture which has been encouraged by the present Government's economic and social policies. (Labour is beginning to pick up this theme: *Guardian*, 2 January 1989, p. 3.) But uncomfortable questions must also be raised about the less traditional and disciplinarian approaches to education, to family, and to other social institutions which Left and liberal opinion have championed. What values do we want to underpin social relations and criminal law? How can these be instilled? These problems are ones well recognized and analysed, though not answered, by, for example, Durkheim's discussion of anomie (Fenton *et al.*, 1983) and Dahrendorf's of anomia. As both emphasise, moral education cannot proceed effectively in an economically unjust society. This much is social democratic orthodoxy. But can less authoritarian forms of moral discipline be effective and if so, how are they to be achieved?

(*Crime and Policing* by Robert Reiner)

Martial Law

Martial Law is government by military authorities. Martial law derives its justification from the need, when civil authority is inadequate, to use military force to suppress insurrection, riot, or disorder, or to deal with public calamity. Inasmuch as martial law is called forth by necessity, the extent and degree to which it may be employed and may supersede civil authority are also measured by necessity.

Martial law is invoked when there is a state of war, or insurrection or rebellion amounting to a state of war. It is not clear whether this is truly a law, or merely the use of the amount of force necessary by the state (in England, the Crown) and its officers to restore order. The Bill of Rights in England forbids the declaration of martial law in time of peace.

Once the state of war is actually established, the courts cannot question military acts. In the case of a riot or disturbance, on the other hand, the courts can determine whether the amount of force used was excessive. It is customary whenever martial law or some variant of it has been applied, as in wartime, to pass an Act of Indemnity to protect any officer from legal attacks on their conduct during the period of martial law.

A less rigorous form of **suspension** of **normal procedures** is the declaration of a state of emergency, which is declared by proclamation. A state of emergency may be declared, for a **maximum** of a month, when the essentials of life for the population are threatened. It allows **regulations** to be made without an Act of Parliament, and **grants** certain powers to government ministers.

International Aspects

In wartime, a nation may **invoke** martial law over its own territory as part of the war effort; such action is **distinct** from **military occupation** by an invading power. Martial law may also be **invoked** in cases of severe **internal** dissension or disorder, either by an incumbent government **seeking to retain** power or by a new government after a coup d'état. Often in the case of a **military coup**, **military authorities** take over the state **administrative** and judicial apparatus, and **civil** and political liberties are **suspended**. Nations experiencing **significant periods** of martial law during the 1970s and 1980s included Chile, the Philippines, Poland, and Turkey.

Modern Developments in Law

In France, the development of the judicial system after the break-up of the Carolingian Empire was **similar** to that in England: Both **involved** the vesting of central **legal authority** in the Crown after a protracted struggle with feudal manorial courts. The essential **features** of the judicial system now in effect in France were **established** after the French **Revolution** of 1789 by the **Code** Napoleon. This system includes lower courts of wide jurisdiction, **intermediate** courts of appeal, a court to **resolve** jurisdictional **conflicts** among courts, and a supreme appellate tribunal called the Court of Cassation. Many European and Latin American judicial systems are modelled on that of France.

In the Islamic world, the Koran is the **source** of law; justice **traditionally** has been dispensed by specially trained priests in conjunction with the king, or sultan. In the 20th century, this system still prevails in such Islamic countries as Yemen and Saudi Arabia. In Turkey, however, executive, **legislative**, and judicial **functions** have been separated, and a judicial system **similar** to those of Western countries has **evolved**.

In other Middle Eastern and Asian countries that have **attained** independence since World War II, notably Sri Lanka, India, and Israel, the courts also operate **similarly** to those of the West, that is, as relatively independent **institutions** within a parliamentary **framework**.

In Communist countries, the judicial system was usually patterned after that of the USSR, which included a **hierarchy** of courts culminating in a supreme court. In the former Yugoslavia, however, all judges, even those of the highest tribunals, were elected, not appointed.

20th Century British History

This article **analyses** the **constitutional aspects** behind the formation of the first and second National Governments, examining in particular the **role** of the king in the

formation of the two governments - a **role** which, as will be seen, was rather more important than is usually thought.

The key to the formation of the first National Government lies in the parliamentary arithmetic facing the second **Labour** government as it **sought** to **implement** its programme of **economies** in August 1931. **Labour** was the largest party with 288 MPs; the Conservatives, who had gained more votes than **Labour** in the 1929 general election, were, **nevertheless**, only the second largest party with, by 1931, 262 MPs; and the **Liberals** had fifty-nine MPs. There were a further ten independents and five MPs who owed allegiance to Sir Oswald Mosley's short-lived New party, formed after Mosley's defection from **Labour** in February 1931.

It followed, therefore, that if the **Labour** Government was to **secure** acceptance of its **economic** package, it had to **secure** the support of MPs from either the **Liberal** or the Conservative party. This **obvious** feature of the parliamentary arithmetic is **ignored** by many writers on the 1931 crisis.

They consider, sometimes in fairly **abstract** terms, the kinds of **policies** which **Labour** might have adopted, without asking whether such **policies** had any chance of **securing** parliamentary support. A policy of Keynesian **expansion**, for example, whatever its merits, had no chance whatever of gaining **majority** support in the conditions of August 1931. Nor would adoption of a tariff obviate the need for **economies**, given that the Conservatives insisted upon severe retrenchment, whether combined with a tariff or not.

The **Labour** Cabinet was, it is clear, united in its view that the budget had to be balanced. What it could not agree on was how the budget was to be balanced; and it was this disagreement that led to the break-up of the government. It is sometimes said that the dissident **minority** in the Cabinet, led by Henderson, were not willing to accept cuts in unemployment **benefit**. That is not strictly true. They were willing to accept a cut in **transitional benefit** which would have had the effect of "throwing at least some of those receiving **transitional benefit** upon public **assistance**", while Henderson pressed hard for a "premium", a flat **deduction** of 1s. a week from all unemployment **benefits**. What the dissidents objected to was a cut in the standard rate of **benefit**. The whole Cabinet agreed that there should be a cut in the amount that the unemployed were receiving; where they disagreed was in whether this should include a cut in the standard rate of **benefit**.

The opposition parties, however, were unwilling to accept any programme of **economies** which did not **involve** a cut in the standard rate of **benefit**. As the **Labour** dissidents in the Cabinet recognised, they did not have the power - they were a **minority** in the Cabinet as well as in the Commons - to avoid such a cut; all that they could do was to ensure that it was not a **Labour** government which **imposed** it. Those **commentators** who blame **Labour** for not **pursuing** an **alternative** set of more socially just proposals in the conditions of August 1931 ought rather to blame the electorate for not giving **Labour** **sufficient** support to form a **majority** government in 1929. In a **minority** situation, some form of power-sharing - even if it did not necessarily **involve** coalition - was **inevitable**.

Parliamentary arithmetic dictated, therefore, that **Labour** would have to produce a package which was acceptable to at least one of the opposition parties. This the Cabinet was unable to **achieve**. The question then arose of what **alternative** government was **available**. Such a government had to be able to carry a programme of **economies** through the House of Commons: this immediately ruled out the possibility of a **Labour minority** government led by Henderson, as suggested by Moodie in an otherwise illuminating article. It was quite clear that Henderson, the leader of the dissident **minority** in the Cabinet, had no chance whatever of producing a programme which could **secure** the support of a Commons **majority**. If, therefore, the King had turned to Henderson after MacDonald had proffered his resignation, or had **sought** the views of **Labour** Privy Counsellors as suggested by Herbert Morrison, he could have been accused of wasting valuable time. In the existing conditions of **financial** crisis, it was essential for a government to be formed which could ensure a parliamentary **majority** in support of the **economy** measures so that they could pass the Commons. Without some grasp of this basic **requirement** it is impossible to understand what followed.

(20th Century British History by Vernon Bogdanor)

Time in History

In the life of politics the Greek language refers to the reign of justice by the term *aosmos*; but the life of nature is a *kosmos* too, and indeed this cosmic view of the universe begins with Anaximander's dictum. To him everything that happens in the natural world is **rational** through and through and subject to a **rigid norm**.

Emphasis on the **role** of time characterised the Pythagorean idea of the *kosmos*. According to Plutarch, when asked what Time (*Chronos*) was, Pythagoras (sixth century BC) replied that it was the "soul", or procreative **element**, of the universe. The extent to which Pythagoras and his followers may have been influenced by oriental ideas has long been a subject for argument. The Orphic idea of *Chronos*, which may have had an influence on Pythagoras, seems rather like the Iranian idea of *Zurvan akarana*. In particular, both were depicted as multi-headed winged serpents. **Similarly**, the dualism which played an important **role** in pythagorean **philosophy** appears to echo the Zoroastrian cosmic opposition of Ohrmazd and Ahriman, although these two ultimates were regarded as personal gods and not as **abstract principles** like the Pythagorean ten basic pairs of opposites, such as limit versus unlimited, good versus bad, male versus female, **odd** versus even. The most fruitful **feature** of Pythagorean teaching was the key idea that the essence of things is to be found in the **concept** of number, which was regarded as having spatial and also temporal **significance**. Numbers were represented figuratively by patterns **similar** to those still found on dominoes and dice. Although this led to Greek mathematics being **dominated** by geometry, time was no less an important **element** in early Pythagorean thought. Indeed, even spatial configurations were regarded as temporal by nature, as is **indicated** by the **role** of the *gnomon*. This was originally a timemeasuring instrument - a simple upright sundial. Later the same term was used to **denote** the geometrical figure that is formed when a smaller square is cut out of a larger square with two of its **adjacent** sides lying along two **adjacent** sides of the latter. **Eventually**, the term came to **denote** any number which, when added to a figurate number, **generates** the next higher number of the same shape (triangular numbers, square

numbers, pentagonal numbers, and so on). The **generation** of numbers was regarded by the early pythagoreans as an actual **physical** operation **occurring** in space and time, and the basic cosmogonical **process** was **identified** with the **generation** of numbers from the **initial** unit, the Monad, which may have been a sophisticated **version** of the earlier Orphic idea of the primeval World-egg.

It is well known that Pythagoras' belief in the **significance** of numbers was supported by his alleged discovery, with the **aid** of a stringed instrument, that the concordant **intervals** of the musical scale **correspond** to simple numerical **ratios**. This led many later Greek thinkers to regard musical **theory** as a branch of mathematics (together with geometry, arithmetic, and astronomy it **constituted** what **eventually** came to be called the *quadrivium*), although this view was not universally accepted, the most influential of those who **rejected** it being Aristoxenus of Tarentum (fourth century BC). He **emphasised**, instead, the role of sensory experience. For him the **criterion** of musical **phenomena** was not mathematics but the ear.

Long before the time of Aristoxenus, some of the most acute Greek thinkers had found that the **concept** of time was difficult to reconcile with their idea of **rationality**. Indeed, parmenides, the founding father of logical disputation, argued that time cannot pertain to anything that is truly real. The essence of his difficulty was that time and change imply that the same thing can have contradictory properties - it can be, say, hot and cold, depending on the time - and this conflicted with the rule that nothing can possess **incompatible** attributes. His basic proposition was "That which is *is*, and it is impossible for it not to be." From this he argued that, since only the present "is", it follows that past and future are alike meaningless, the only time is a continual present time and what exists is both uncreated and imperishable. Parmenides drew a fundamental distinction between the world of appearance, characterised by time and change, and the world of reality which is unchanging and timeless. The former is revealed to us by our senses, but these are deceptive. The latter is revealed to us by reason and is the only true mode of existence.

(Time in History by G. J. Whitrow)

The 1931 General Election

The 1931 general election gave the Conservatives a huge **overall majority** in the House of Commons, **enabling** them to **pursue** their tariff **policy** with little hindrance. The announcement of the election itself drew together the various **elements** in the Conservative party, and **validated** Baldwin's decision to enter the National Government. From 1931, threats to his leadership disappeared, Moreover, because the Conservatives took with them into the National coalition **elements** of the **Liberal** and **Labour** parties, the party competition of the 1930s became seriously unbalanced, the left being too shattered and divided to offer effective opposition.

The effect of this election on the other parties was disastrous. While it served to reconcile warring **elements** in the Conservative party, in the other parties it prevented any such reconciliation. In particular it widened the gap between **Labour** and National **Labour**, and made it quite impossible for any reunion to take place. For the **Liberals**, the election meant a breach between the party and its leader, Lloyd George, Indeed, it meant the end of Lloyd George's connection with the **Liberal** party. He refused to

allow the party **access** to his **fund**, and partly for this reason the **Liberals** were forced to accept a drastic reduction in the number of candidatures, from 513 in 1929 to 112 in 1931. The condition of the **Liberals** was far more serious than that of **Labour**, for the **Liberal** party was beginning to lose its sense of **identity** and purpose (and has still not fully **recovered** it). Once the party had shown itself, in the 1929-31 Parliament, unwilling to support Lloyd George's programme of national reconciliation, it had no answer to the question: What did the **Liberal** party stand for? Its only rallying cry remained free trade; and yet it was clear that the 1931 election would result in a protectionist **majority**. The seeming gains made by the **Liberals** in the negotiations before the Cabinet agreed to an election - that there should be no joint manifesto, and no pledge to introduce tariffs, merely an impartial inquiry - turned out (as might have been expected) to be worthless. The squabbling in Cabinet over the **formula** on which the National Government was to fight the election was, in reality, a form of shadow-boxing: for, whatever the **formula**, it would be **interpreted** by those who had the power to **interpret** it, that is, the Conservative and protectionist **majority**. Lloyd George, himself perfectly willing to countenance departures from free trade in his 1918-22 Coalition, now argued that free trade was best defended through a vote for the **Labour** Party. The 1931 general election was the last election until that of February 1974 at which the electoral performance of the **Liberals** was of **significance** to the two **major** parties. In agreeing to fight the election as part of the National Government, the **Liberal** party abdicated from its **role** as a **major participant** in the political system.

Because they were losing their sense of **identity**, the **Liberals** were split three ways by the 1931 election - into Simonites, Samuelites, and the Lloyd George family group. The first group **advocated co-operation**, culminating in a merger, with the Conservatives; the second sought to preserve an independent **Liberal** party; the third **sought co-operation** with **Labour**. So also the French **Radicals** in the Fourth Republic were to splinter in all directions, **participating** in governments of both left and right. The **Liberal** party could no more than the **Radicals** answer the **fundamental** question of whether, with political liberalism and universal suffrage **achieved**, there remained a **distinctive philosophy** of liberalism which could **differentiate** the **Liberals** from other political parties.

Between 1929 and the formation of the second National Government after the general election, the **Liberal** party had been a genuine **participant** in the political system and the other parties had to consider carefully what its **reactions** might be. During the course of the 1929-31 government, MacDonald gradually **appreciated** that the hopes which he had entertained during the 1920s of **eliminating** the **Liberals** and winning over the whole of the progressive vote for the **Labour** party could not be **achieved**. It was for this reason that he felt compelled to offer the **Liberals** the **alternative** vote, an electoral system which would have the effect of entrenching the third party as part of the political system. The events between the formation of the first National Government and the general election, however, turned what had been an incipient three-party system into an unbalanced two-party system in which the Conservatives, **reinforced** by defectors from the **Liberal** and **Labour** parties, the **Liberal** Nationals, and National **Labour** party, were the **obvious beneficiaries**.

It was the general election, then, and not the formation of the first National Government, that was the **crucial** event in the politics of the 1930s. The King was

involved in the decisions precipitating both events. In recent years there has been considerable discussion of the role of the Sovereign in the eventuality of a hung Parliament, such as that of 1929-31, and the general conclusion has been that her role is essentially a passive one. Yet both in the formation of the National Government and in the decision that it would fight the election as a government the King played an important, perhaps a crucial role. That was in fact the private view of Harold Nicolson, although he did not allow it to be expressed in his official biography of George V. In an unpublished section of his diaries, he writes of his interview with Queen Mary on 21 March 1949, "I talked to her about the 1931 crisis and said that I was convinced the King had been a determinant influence on that occasion. 'Yes certainly; he certainly was.' "

It is perhaps futile to ask the question, were the King's actions constitutional? In a country without a codified constitution, it is hardly possible to give a definitive answer. If one asks the further question, were the King's actions wise? one's answer is likely to be all too heavily conditioned by hindsight, by the views one takes of the later politics of the 1930s, of the restoration of a two-party system, and of the decline of the Liberal Party. The historian, perhaps, can do little more than echo Disraeli's pregnant remark in *Sybil*, Book IV, Chapter I: "when parties are in the present state of equality, the Sovereign is no longer a mere pageant."

(20th Century British History by Vernon Bogdanor)

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The effect of this election on the other parties was disastrous. While it served to reconcile warring elements in the Conservative party, in the other parties it prevented any such reconciliation. In particular it widened the gap between Labour and National Labour, and made it quite impossible for any reunion to take place. For the Liberals, the election meant a breach between the party and its leader, Lloyd George, Indeed, it meant the end of Lloyd George's connection with the Liberal party. He refused to allow the party access to his fund, and partly for this reason the Liberals were forced to accept a drastic reduction in the number of candidatures, from 513 in 1929 to 112 in 1931, The condition of the Liberals was far more serious than that of Labour, for the Liberal party was beginning to lose its sense of identity and purpose (and has still not fully recovered it). Once the party had shown itself, in the 1929-31 Parliament, unwilling to support Lloyd George's programme of national reconciliation, it had no answer to the question: What did the Liberal party stand for? Its only rallying cry remained free trade; and yet it was clear that the 1931 election would result in a protectionist majority. The seeming gains made by the Liberals in the negotiations before the Cabinet agreed to an election - that there should be no joint manifesto,

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(20th Century British History by Vernon Bogdanor)

Economic and Social Policies

In terms of **economic** and social **policies** the **impact** of the 1980-1 riots was equally **ambiguous** and **contradictory**. Part of this **ambiguity**, as outlined above, resulted from the Government's strenuous efforts to **deny** any **link** between its **policies** and the outbreak of violence and disorder. This **denial** was particularly important, since at the time the Thatcher **administration** was going through a bad **period** in terms of popular opinion on **issues** such as unemployment, social services, and housing. While Lord Scarman was careful not to enter the political dispute between the Government and the **Labour** party on **issues** such as unemployment and housing, his call for more direct action to deal with these problems, along with racial disadvantage, **posed** a **challenge** to the political legitimacy of the **policies** which the Government had followed from 1979 onwards. It also **posed** a delicate problem for the Home Secretary himself, since Lord Scarman had been appointed by him to carry out his Inquiry. Having spent the whole summer **denying** any **link** between its **policies** and the riots, the Government had to tread warily in **responding** to the **economic** and social **policy** proposals of the Scarman Report when it was **published** in November 1981.

The parliamentary **debate** on the Report showed the Home Secretary adopting a two-pronged **strategy** in his **response**. First, he accepted many of the recommendations of the Report, particularly in relation to the **role** of the police. Additionally, he accepted the need to tackle racial disadvantage and other social **issues**. Second, he **emphasised** the Government's view that, whatever broader measures were taken to deal with racial and social inequalities, the immediate **priority** was to **restore** and **maintain** order on the streets. When the Home Secretary talked of the need for the Government to give a lead in tackling racial disadvantage he therefore saw this as an **issue** for the longer term. On the other hand, he was much more **specific** about the reform of the police and the development of new tactics and **equipment** for the management of urban disorder (*Hansard*, **vol.** 14, 10 December 1981).

In 1985, however, the Government **specifically rejected** calls for another inquiry like Lord Scarman's, arguing that since the riots were a "criminal enterprise" it was useless to search for social explanations or to have yet another report advising it about what to do. **Implicitly**, the Government was saying that it knew what the problems were, and how they could be tackled.

While some senior policemen, like Metropolitan Police Commissioner Sir Kenneth Newman, wanted to stress the link between the police and other areas of "social policy" (Metropolitan Police, 1986), the official government response attempted to decontextualise the riots and see them as the actions of a small minority who were either criminalized or influenced by extreme political ideas. The dominant approach of the Government attempted to emphasise two main arguments.

1. that the riots were "a lust for blood", an "orgy of thieving", "a cry for loot and not a cry for help";
2. that the riots did not reflect a failure to carry out the "urgent programme of action" recommended by Lord Scarman in 1981, but were the outcome of a spiralling wave of crime and disorder in inner-city areas.

The logic of this approach, articulated by Home Secretary Douglas Hurd most clearly, was that the riots were both "unjustifiable" and a "criminal activity". In a widely reported speech to police chiefs at the time of the disorders Hurd made this point clear:

Handsworth needs more jobs and better housing. But riots only destroy. They create nothing except a climate in which necessary development is even more difficult. Poor housing and other social ills provide no kind of reason for riot, arson and killing. One interviewer asked me whether the riot was not a cry for help by the rioters. The sound which law-abiding people heard at Handsworth was not a cry for help but a cry for loot. That is why the first priority, once public order is secure, must be a thorough and relentless investigation into the crimes which were committed. (*Daily Telegraph*, 14 September 1985)

Such arguments resonated through the media and in the various parliamentary debates during September and October 1985. They became part of the symbolic political language through which the riots were understood by policy makers and by popular opinion.

Since the 1985 unrest, and particularly after the 1987 General Election, the Government has announced a number of initiatives on the inner city, and it has presented these as part of an effort to rejuvenate depressed areas on a sound basis. The evidence that has emerged since then, however, points to a major discrepancy between the Government's promises of action and the allocation of resources to implement them (Robson, 1988). It is perhaps too early to reach a conclusion on this point, but a repeat of the period of inaction between 1982 and 1985 seems to be evident, within the current political context. A number of local authorities have attempted to take more positive action to deal with the issues raised by the 1985 riots, but their experience has shown that such local initiatives are often severely limited by the actions of national government, the police, and broader economic and political pressures.

In the years since 1981 the one consistent response to urban unrest has been the provision of more resources, more training, and more equipment to the police. Instead of tackling the causes of urban unrest, the Government has built up force to deal with the manifestation of those root conditions.

Increasingly the most strident political voices are raised in the name of free enterprise and law and order, not for equity and social justice. For the New Right and other influential sectors of political opinion the attempt to achieve racial equality through legal and political means is at best naive political folly, and at worst a restriction on the workings of the market. The present political climate gives little cause for optimism that a radical change in governmental priorities in this field is likely (Solomos, 1989).

The Government's plan of *Action for Cities* (DoE, 1987), issued after Mrs Thatcher's post-election promise, says very little directly about racial inequality. It remains to be seen whether it will suffer the fate of numerous other initiatives on the inner cities and fade into obscurity. But one thing seems clear: during the past decade the Government has been more intent on reducing the powers of local authorities than on providing for fundamental changes in the social conditions of the inner cities.

(Tackling The Inner Cities By Susanne MacGregor And Ben Pimlott)

Ethics

Ethics is traditionally a department of philosophy, and that is my reason for discussing it. I hardly think myself that it ought to be included in the domain of philosophy, but to prove this would take as long as to discuss the subject itself and would be less interesting.

As a provisional definition, we may take ethics to consist of general principles which help to determine rules of conduct. It is not the business of ethics to say how a person should act in such and such specific circumstances; that is the province of casuistry. The word 'casuistry' has acquired bad connotations, as a result of the Protestant and Jansenist attacks on the Jesuits. But in its old and proper sense it represents a perfectly legitimate study. Take, say, the question: In what circumstances is it right to tell a lie? Some people, unthinkingly, would say: Never! But this answer cannot be seriously defended. Everybody admits that you should lie if you meet a homicidal maniac pursuing a man with a view to murdering him, and he asks you whether the man has passed your way. It is admitted that lying is a legitimate branch of the art of warfare; also that priests may lie to guard the secrets of the confessional, and doctors to protect the professional confidences of their patients. All such questions belong to casuistry in the old sense, and it is evident that they are questions deserving to be asked and answered. But they do not belong to ethics in the sense in which this study has been included in philosophy.

It is not the business of ethics to arrive at actual rules of conduct, such as: 'Thou shalt not steal.' This is the province of morals. Ethics is expected to provide a basis from which such rules can be deduced. The rules of morals differ according to the age, the race, and the creed of the community concerned, to an extent that is hardly realized by those who have neither travelled nor studied anthropology. Even within a homogeneous community differences of opinion arise. Should a man kill his wife's lover? The Church says no, the law says no, and common sense says no; yet many people would say yes, and juries often refuse to condemn. These doubtful cases arise when a moral rule is in process of changing. But ethics is concerned with something more general than moral rules, and less subject to change. It is true that,

in a given community, an ethic which does not lead to the moral rules accepted by that community is considered immoral. It does not, of course, follow that such an ethic is in fact false since the moral rules of that community may be undesirable. Some tribes of headhunters hold that no man should marry until he can bring to the wedding the head of an enemy slain by himself. Those who question this moral rule are held to be encouraging licence and lowering the standard of manliness. Nevertheless, we should not demand of an ethic that it should justify the moral rules of headhunters.

Perhaps the best way to approach the subject of ethics is to ask what is meant when a person says: 'You ought to do so-and-so' or 'I ought to do so-and-so.' Primarily, a sentence of this sort has an emotional content; it means 'this is the act towards which I feel the emotion of approval'. But we do not wish to leave the matter there; we want to find something more objective and systematic and constant. The ethical teacher says: 'You ought to approve acts of such-and-such kinds.' He generally gives reasons for this view, and we have to examine what sorts of reasons are possible. We are here on very ancient ground. Socrates was concerned mainly with ethics; Plato and Aristotle both discussed the subject at length; before their time, Confucius and Buddha had each founded a religion consisting almost entirely of ethical teaching, though in the case of Buddhism there was afterwards a growth of theological doctrine. The views of the ancients on ethics are better worth studying than their views on (say) physical science; the subject has not yet proved amenable to exact reasoning, and we cannot boast that the moderns have as yet rendered their predecessors obsolete.

(An Outline of Philosophy, by Bertrand Russell.)

The Structure of Scientific Revolutions

by Thomas S. Kuhn

I Introduction

A scientific community cannot practice its trade without some set of received beliefs. These beliefs form the foundation of the "educational initiation that prepares and licenses the student for professional practice". The nature of the "rigorous and rigid" preparation helps ensure that the received beliefs are firmly fixed in the student's mind. Scientists take great pains to defend the assumption that scientists know what the world is like...To this end, "normal science" will often suppress novelties which undermine its foundations. Research is therefore not about discovering the unknown, but rather "a strenuous and devoted attempt to force nature into the conceptual boxes supplied by professional education".

A shift in professional commitments to shared assumptions takes place when an anomaly undermines the basic tenets of the current scientific practice. These shifts are what Kuhn describes as scientific revolutions - "the tradition-shattering complements to the tradition-bound activity of normal science". New assumptions - "paradigms" - require the reconstruction of prior assumptions and the re-evaluation of prior facts. This is difficult and time consuming. It is also strongly resisted by the established community.

II The Route to Normal Science

So how are paradigms created and what do they contribute to scientific inquiry?

Normal science "means research firmly based upon one or more past scientific achievements, achievements that some particular scientific community acknowledges for a time as supplying the foundation for its further practice". These achievements must be sufficiently unprecedented to attract an enduring group of adherents away from competing modes of scientific activity and sufficiently open-ended to leave all sorts of problems for the redefined group of practitioners (and their students) to resolve. These achievements can be called paradigms. Students study these paradigms in order to become members of the particular scientific community in which they will later practice.

Because the student largely learns from and is mentored by researchers "who learned the bases of their field from the same concrete models" there is seldom disagreement over fundamentals. Men whose research is based on shared paradigms are committed to the same rules and standards for scientific practice. A shared commitment to a paradigm ensures that its practitioners engage in the paradigm observations that its own paradigm can do most to explain. Paradigms help scientific communities to bound their discipline in that they help the scientist to create avenues of inquiry, formulate questions, select methods with which to examine questions, define areas of relevance, and establish or create meaning. A paradigm is essential to scientific inquiry - "no natural history can be interpreted in the absence of at least some implicit body of intertwined theoretical and methodological belief that permits selection, evaluation, and criticism".

How are paradigms created, and how do scientific revolutions take place? Inquiry begins with a random collection of "mere facts" (although, often, a body of beliefs is already implicit in the collection). During these early stages of inquiry, different researchers confronting the same phenomena describe and interpret them in different ways. In time, these descriptions and interpretations entirely disappear. A pre-paradigm school appears. Such a school often emphasises a special part of the collection of facts. Often, these schools vie for pre-eminence.

From the competition of these pre-paradigmatic schools, one paradigm emerges - "To be accepted as a paradigm, a theory must seem better than its competitors, but it need not, and in fact never does, explain all the facts with which it can be confronted", thus making research possible. As a paradigm grows in strength and in the number of advocates, the other pre-paradigm schools or the previous paradigm fade.

A paradigm transforms a group into a profession or, at least, a discipline. And from this follow the formation of specialised journals, foundation of professional bodies and a claim to a special place in academe. There is a promulgation of scholarly articles intended for and "addressed only to professional colleagues, [those] whose knowledge of a shared paradigm can be assumed and who prove to be the only ones able to read the papers addressed to them".

III - The Nature of Normal Science.

If a **paradigm** **consists** of basic and incontrovertible **assumptions** about the nature of the discipline, what questions are left to ask?

When they first appear, **paradigms** are limited in **scope** and in **precision**. But more successful does not mean completely successful with a single problem or notably successful with any large number. **Initially**, a **paradigm** offers the promise of success. **Normal** science **consists** in the actualisation of that promise. This is **achieved** by extending the knowledge of those facts that the **paradigm** **displays** as particularly **revealing**, increasing the extent of the match between those facts and the **paradigm's** **predictions**, and further articulation of the **paradigm** itself.

In other words, there is a good deal of mopping-up to be done. Mop-up operations are what engage most scientists throughout their careers. Mopping-up is what **normal** science is all about! This **paradigm** -based **research** is "an attempt to force nature into the pre-formed and relatively **inflexible** box that the **paradigm** supplies". No effort is made to call forth new sorts of **phenomena**, no effort to discover anomalies. When anomalies pop up, they are usually discarded or **ignored**. Anomalies are usually not even noticed and no effort is made to invent a new **theory** (and there's no tolerance for those who try). Those **restrictions**, born from confidence in a **paradigm**, turn out to be essential to the development of science. By **focusing** attention on a small **range** of relatively esoteric problems, the **paradigm** forces scientists to **investigate** some part of nature in a detail and depth that would otherwise be unimaginable" and, when the **paradigm** **ceases** to function properly, scientists begin to behave differently and the nature of their **research** problems changes.

IV - Normal Science as Puzzle-solving.

Doing **research** is essentially like solving a puzzle. Puzzles have rules. Puzzles generally have predetermined solutions.

A striking **feature** of doing **research** is that the aim is to discover what is known in advance. This in spite of the fact that the **range** of **anticipated** results is small compared to the possible results. When the **outcome** of a **research** **project** does not fall into this **anticipated** result **range**, it is generally considered a failure.

So why do **research**? Results add to the **scope** and **precision** with which a **paradigm** can be applied. The way to **obtain** the results usually remains very much in doubt - this is the **challenge** of the puzzle. Solving the puzzle can be fun, and **expert** puzzle-solvers make a very nice living. To classify as a puzzle (as a genuine **research** question), a problem must be characterised by more than the **assured** solution, but at the same time solutions should be **consistent** with **paradigm** **assumptions**.

Despite the fact that novelty is not **sought** and that accepted belief is generally not **challenged**, the scientific enterprise can and does bring about unexpected results.

V - The Priority of paradigms.

The **paradigms** of a **mature** scientific **community** can be determined with relative ease. The "rules" used by scientists who share a **paradigm** are not so easily determined. Some reasons for this are that scientists can disagree on the

interpretation of a paradigm. The existence of a paradigm need not imply that any full set of rules exist. Also, scientists are often guided by tacit knowledge - knowledge acquired through practice and that cannot be articulated explicitly. Further, the attributes shared by a paradigm are not always readily apparent.

Paradigms can determine normal science without the intervention of discoverable rules or shared assumptions. In part, this is because it is very difficult to discover the rules that guide particular normal-science traditions. Scientists never learn concepts, laws, and theories in the abstract and by themselves. They generally learn these with and through their applications. New theory is taught in tandem with its application to a concrete range of phenomena.

Sub-specialties are differently educated and focus on different applications for their research findings. A paradigm can determine several traditions of normal science that overlap without being coextensive. Consequently, changes in a paradigm affect different sub-specialties differently. "A revolution produced within one of these traditions will not necessarily extend to the others as well".

When scientists disagree about whether the fundamental problems of their field have been solved, the search for rules gains a function that it does not ordinarily possess.

VI - Anomaly and the Emergence of Scientific Discoveries.

If normal science is so rigid and if scientific communities are so close-knit, how can a paradigm change take place? Paradigm changes can result from discovery brought about by encounters with anomaly.

Normal science does not aim at novelties of fact or theory and, when successful, finds none. Nonetheless, new and unsuspected phenomena are repeatedly uncovered by scientific research, and radical new theories have again and again been invented by scientists. Fundamental novelties of fact and theory bring about paradigm change. So how does paradigm change come about? There are two ways: through discovery - novelty of fact - or by invention - novelty of theory. Discovery begins with the awareness of anomaly - the recognition that nature has violated the paradigm - induced expectations that govern normal science. The area of the anomaly is then explored. The paradigm change is complete when the paradigm has been adjusted so that the anomalous become the expected. The result is that the scientist is able "to see nature in a different way".. How paradigms change as a result of invention is discussed in greater detail in the following chapter.

Although normal science is a pursuit not directed to novelties and tending at first to suppress them, it is nonetheless very effective in causing them to arise. Why? An initial paradigm accounts quite successfully for most of the observations and experiments readily accessible to that science's practitioners. Research results in the construction of elaborate equipment, development of an esoteric and shared vocabulary, refinement of concepts that increasingly lessens their resemblance to their usual common-sense prototypes. This professionalisation leads to immense restriction of the scientist's vision, rigid science, resistance to paradigm change, and a detail of information and precision of the observation-theory match that can be achieved in no other way. New and refined methods and instruments result in greater

precision and understanding of the paradigm. Only when researchers know with precision what to expect from an experiment can they recognise that something has gone wrong.

Consequently, anomaly appears only against the background provided by the paradigm. The more precise and far-reaching the paradigm, the more sensitive it is to detecting an anomaly and inducing change. By resisting change, a paradigm guarantees that anomalies that lead to paradigm change will penetrate existing knowledge to the core.

VII - Crisis and the Emergence of Scientific Theories.

As is the case with discovery, a change in an existing theory that results in the invention of a new theory is also brought about by the awareness of anomaly. The emergence of a new theory is generated by the persistent failure of the puzzles of normal science to be solved as they should. Failure of existing rules is the prelude to a search for new ones. These failures can be brought about by observed discrepancies between theory and fact or changes in social/cultural climates. Such failures are generally long recognised, which is why crises are seldom surprising. Neither problems nor puzzles yield often to the first attack. Recall that paradigm and theory resist change and are extremely resilient. Philosophers of science have repeatedly demonstrated that more than one theoretical construction can always be placed upon a given collection of data. In early stages of a paradigm, such theoretical alternatives are easily invented. Once a paradigm is entrenched (and the tools of the paradigm prove useful to solve the problems the paradigm defines), theoretical alternatives are strongly resisted. As in manufacture so in science-retooling is an extravagance to be reserved for the occasion that demands it. Crises provide the opportunity to retool.

VIII - The Response to Crisis.

The awareness and acknowledgement that a crisis exists loosens theoretical stereotypes and provides the incremental data necessary for a fundamental paradigm shift. Normal science does and must continually strive to bring theory and fact into closer agreement. The recognition and acknowledgement of anomalies result in crises that are a necessary precondition for the emergence of novel theories and for paradigm change. Crisis is the essential tension implicit in scientific research. There is no such thing as research without counterinstances. These counterinstances create tension and crisis. Crisis is always implicit in research because every problem that normal science sees as a puzzle can be seen, from another viewpoint, as a counterinstance and thus as a source of crisis.

In responding to these crises, scientists generally do not renounce the paradigm that has led them into crisis. Rather, they usually devise numerous articulations and ad hoc modifications of their theory in order to eliminate any apparent conflict. Some, unable to tolerate the crisis, leave the profession. As a rule, persistent and recognised anomaly does not induce crisis. Failure to achieve the expected solution to a puzzle discredits only the scientist and not the theory. To evoke a crisis, an anomaly must usually be more than just an anomaly. Scientists who paused and

examined every anomaly would not get much accomplished. An anomaly must come to be seen as more than just another puzzle of normal science.

All crises begin with the blurring of a paradigm and the consequent loosening of the rules for normal research. As this process develops, the anomaly comes to be more generally recognised as such, more attention is devoted to it by more of the field's eminent authorities. The field begins to look quite different: scientists express explicit discontent, competing articulations of the paradigm proliferate and scholars view a resolution as the subject matter of their discipline. To this end, they first isolate the anomaly more precisely and give it structure. They push the rules of normal science harder than ever to see, in the area of difficulty, just where and how far they can be made to work.

All crises close in one of three ways. (i) Normal science proves able to handle the crisis-provoking problem and all returns to "normal." (ii) The problem resists and is labelled, but it is perceived as resulting from the field's failure to possess the necessary tools with which to solve it, and so scientists set it aside for a future generation with more developed tools. (iii) A new candidate for paradigm emerges, and a battle over its acceptance ensues. Once it has achieved the status of paradigm, a paradigm is declared invalid only if an alternate candidate is available to take its place. Because there is no such thing as research in the absence of a paradigm, to reject one paradigm without simultaneously substituting another is to reject science itself. To declare a paradigm invalid will require more than the falsification of the paradigm by direct comparison with nature. The judgement leading to this decision involves the comparison of the existing paradigm with nature and with the alternate candidate. Transition from a paradigm in crisis to a new one from which a new tradition of normal science can emerge is not a cumulative process. It is a reconstruction of the field from new fundamentals. This reconstruction changes some of the field's foundational theoretical generalisations. It changes methods and applications. It alters the rules.

How do new paradigms finally emerge? Some emerge all at once, sometimes in the middle of the night, in the mind of a man deeply immersed in crisis. Those who achieve fundamental inventions of a new paradigm have generally been either very young or very new to the field whose paradigm they changed. Much of this process is inscrutable and may be permanently so.

IX - The Nature and Necessity of Scientific Revolutions.

Why should a paradigm change be called a revolution? What are the functions of scientific revolutions in the development of science?

A scientific revolution is a non-cumulative developmental episode in which an older paradigm is replaced in whole or in part by an incompatible new one. A scientific revolution that results in paradigm change is analogous to a political revolution. Political revolutions begin with a growing sense by members of the community that existing institutions have ceased adequately to meet the problems posed by an environment that they have in part created. The dissatisfaction with existing institutions is generally restricted to a segment of the political community. Political revolutions aim to change political institutions in ways that those institutions

themselves **prohibit**. As crisis deepens, **individuals commit** themselves to some concrete proposal for the **reconstruction** of society in a new **institutional framework**. Competing camps and parties form. One camp **seeks** to defend the old institutional constellation. One (or more) camps **seek** to **institute** a new political order. As polarisation **occurs**, political recourse fails. Parties to a **revolutionary conflict** finally resort to the **techniques** of mass persuasion.

Like the choice between competing political **institutions**, that between competing **paradigms** proves to be a choice between **fundamentally incompatible modes** of community life. **Paradigmatic** differences cannot be reconciled. When **paradigms** enter into a **debate** about **fundamental** questions and **paradigm** choice, each group uses its own **paradigm** to argue in that **paradigm's** defence. The result is a circularity and inability to share a universe of discourse. A successful new **paradigm** permits **predictions** that are different from those **derived** from its predecessor. That difference could not **occur** if the two were **logically compatible**. In the **process** of being assimilated, the second must **displace** the first.

Consequently, the assimilation of either a new sort of **phenomenon** or a new scientific **theory** must demand the **rejection** of an older **paradigm**. If this were not so, scientific development would be genuinely cumulative. **Normal research** is cumulative, but not scientific **revolution**. New **paradigms** arise with destructive changes in beliefs about nature.

Consequently, "the **normal-scientific tradition** that **emerges** from a scientific **revolution** is not only **incompatible** but often actually incommensurable with that which has gone before". In the circular argument that results from this conversation, each **paradigm** will satisfy more or less the **criteria** that it dictates for itself, and fall short of a few of those dictated by its opponent. Since no two **paradigms** leave all the same problems unsolved, **paradigm** debates always **involve** the question: Which problems is it more **significant** to have solved? In the **final analysis**, this **involves** a question of values that lie outside of **normal** science altogether. It is this recourse to **external criteria** that most **obviously** makes **paradigm** debates **revolutionary**.

X - Revolutions as Changes of World View.

During scientific **revolutions**, scientists see new and different things when looking with familiar instruments in places they have looked before. Familiar objects are seen in a different light and joined by unfamiliar ones as well. Scientists see new things when looking at old objects. In a sense, after a **revolution**, scientists are **responding** to a different world.

Why does a shift in view **occur**? Genius? Flashes of intuition? Sure. Because different scientists **interpret** their observations differently? No. Observations are themselves nearly always different. Observations are **conducted** within a **paradigm framework**, so the **interpretative** enterprise can only articulate a **paradigm**, not correct it. Because of **factors** embedded in the nature of human **perception** and retinal impression? No doubt, but our knowledge is simply not yet advanced enough on this matter. Changes in definitional **conventions**? No. Because the existing **paradigm** fails to fit? Always. Because of a change in the relation between the scientist's

manipulations and the paradigm or between the manipulations and their concrete results? You bet. It is hard to make nature fit a paradigm.

XI - The Invisibility of Revolutions.

Because paradigm shifts are generally viewed not as revolutions but as additions to scientific knowledge, and because the history of the field is represented in the new textbooks that accompany a new paradigm, a scientific revolution seems invisible.

The image of creative scientific activity is largely created by a field's textbooks. Textbooks are the pedagogic vehicles for the perpetuation of normal science. These texts become the authoritative source of the history of science. Both the layman's and the practitioner's knowledge of science is based on textbooks. A field's texts must be rewritten in the aftermath of a scientific revolution. Once rewritten, they inevitably disguise not only the role but the existence and significance of the revolutions that produced them. The resulting textbooks truncate the scientist's sense of his discipline's history and supply a substitute for what they eliminate. More often than not, they contain very little history at all. In the rewrite, earlier scientists are represented as having worked on the same set of fixed problems and in accordance with the same set of fixed canons that the most recent revolution and method has made seem scientific. Why dignify what science's best and most persistent efforts have made it possible to discard?

The historical reconstruction of previous paradigms and theorists in scientific textbooks make the history of science look linear or cumulative, a tendency that even affects scientists looking back at their own research. These misconstructions render revolutions invisible. They also work to deny revolutions as a function. Science textbooks present the inaccurate view that science has reached its present state by a series of individual discoveries and inventions that, when gathered together, constitute the modern body of technical knowledge - the addition of bricks to a building. This piecemeal-discovered facts approach of a textbook presentation illustrates the pattern of historical mistakes that misleads both students and laymen about the nature of the scientific enterprise. More than any other single aspect of science, the textbook has determined our image of the nature of science and of the role of discovery and invention in its advance.

XII - The Resolution of Revolutions.

How do the proponents of a competing paradigm convert the entire profession or the relevant subgroup to their way of seeing science and the world? What causes a group to abandon one tradition of normal research in favour of another?

Scientific revolutions come about when one paradigm displaces another after a period of paradigm-testing that occurs only after persistent failure to solve a noteworthy puzzle has given rise to crisis. This process is analogous to natural selection: one theory becomes the most viable among the actual alternatives in a particular historical situation.

What is the process by which a new candidate for paradigm replaces its predecessor? At the start, a new candidate for paradigm may have few supporters

(and the motives of the supporters may be suspect). If the supporters are competent, they will improve the paradigm, explore its possibilities, and show what it would be like to belong to the community guided by it. For the paradigm destined to win, the number and strength of the persuasive arguments in its favour will increase. As more and more scientists are converted, exploration increases. The number of experiments, instruments, articles, and books based on the paradigm will multiply. More scientists, convinced of the new view's fruitfulness, will adopt the new mode of practising normal science, until only a few elderly hold-outs remain. And we cannot say that they are (or were) wrong. Perhaps the scientist who continues to resist after the whole profession has been converted has ipso facto ceased to be a scientist.

XIII - Progress Through Revolutions.

In the face of the arguments previously made, why does science progress, how does it progress, and what is the nature of its progress?

To a very great extent, the term science is reserved for fields that do progress in obvious ways. But does a field make progress because it is a science, or is it a science because it makes progress? Normal science progresses because the enterprise shares certain salient characteristics. Members of a mature scientific community work from a single paradigm or from a closely related set. Very rarely do different scientific communities investigate the same problems. The result of successful creative work is progress.

Even if we argue that a field does not make progress, that does not mean that an individual school or discipline within that field does not. The man who argues that philosophy has made no progress emphasises that there are still Aristotelians, not that Aristotelianism has failed to progress. It is only during periods of normal science that progress seems both obvious and assured. In part, this progress is in the eye of the beholder. The absence of competing paradigms that question each other's aims and standards makes the progress of a normal-scientific community far easier to see. The acceptance of a paradigm frees the community from the need to constantly re-examine its first principles and foundational assumptions. Members of the community can concentrate on the subtlest and most esoteric of the phenomena that concern it. Because scientists work only for an audience of colleagues, an audience that shares values and beliefs, a single set of standards can be taken for granted. Unlike in other disciplines, the scientist need not select problems because they urgently need solution and without regard for the tools available to solve them. The social scientists tend to defend their choice of a research problem chiefly in terms of the social importance of achieving a solution. Which group would one then expect to solve problems at a more rapid rate?

We may have to relinquish the notion, explicit or implicit, that changes of paradigm carry scientists and those who learn from them closer and closer to the truth. The developmental process described by Kuhn is a process of evolution from primitive beginnings. It is a process whose successive stages are characterised by an increasingly detailed and refined understanding of nature. This is not a process of evolution toward anything. Important questions arise. Must there be a goal set by nature in advance? Does it really help to imagine that there is some one full, objective, true account of nature? Is the proper measure of scientific achievement the

extent to which it brings us closer to an ultimate goal? The analogy that relates the evolution of organisms to the evolution of scientific ideas "is nearly perfect". The resolution of revolutions is the selection by conflict within the scientific community of the fittest way to practice future science. The net result of a sequence of such revolutionary selections, separated by period of normal research, is the wonderfully adapted set of instruments we call modern scientific knowledge. Successive stages in that developmental process are marked by an increase in articulation and specialisation. The process occurs without benefit of a set goal and without benefit of any permanent fixed scientific truth. What must the world be like in order than man may know it?

(A Synopsis from the original by Professor Frank Pajares, Emory University)

Language

Language is communication among human beings that is characterised by the use of arbitrary spoken or written symbols with agreed-upon meanings. More broadly, language may be defined as communication in general; it is regarded by some linguists as a form of knowledge, that is, of thought or cognition.

Approaches to Language

Language can be studied from at least two points of view: its use or its structure. Language use is the concern of scholars in many fields, among them literature, communications, speech and rhetoric, sociology, political science, and psychology. Examined in studies of language use are what humans say, what they say they are thinking, and what they mean by what they write and say to one another. Included are content analysis and criticism of literature, studies of the history and changes of meaning of words, and descriptions of the social factors that determine what appropriate speech behaviour is. The fields of speech and rhetoric include studies of the ways in which language can influence behaviour. For literary specialists, language consists of words arranged to produce a logical or harmonious effect. For lexicographers, it is an inventory of vocabulary, including the meanings, origins, and histories of words. Language is also the particular way words are selected and combined that is characteristic of an individual, a group, or a literary genre.

Language structure is the concern of linguistics. Within the field of linguistics the definitions of language vary, and linguists differ in approach according to the definition they use. Those who study language as written communication are interested in the structure of what they call "text" - how sentences and their parts are organised into coherent wholes - and concerned with how one language can be accurately translated into another. In the field of machine translation, computers handle the vast amount of data needed for such studies. Comparative linguists seek to identify families of languages descended from a common ancestor.

Structural and descriptive linguists view spoken language as having a hierarchical structure of three levels: sounds, sound combinations (such as words), and word combinations (sentences). At the phonemic level, sounds are analysed; at the morphemic level, the combination of sounds into meaningful units of speech

(morphemes, that is, words or word-building units) is described; and at the syntactic level, the combination of words in sentences and **clauses** is the **focus**.

Linguists who **define** language as knowledge are transformational generative grammarians. They study both the nature of the human **capacity** to **acquire** language and the language **acquisition process**.

Animal and Human Communication

The study of language as a means of expression or communication necessarily includes the study of gestures and sounds. Considering that animals gesture and make sounds, do animals as well as humans have language? It seems clear that many species **communicate**; human as **distinct** from animal **communication**, however, has been characterised by some scholars as **unique** in having the following seven **features**: (1) Human languages have separate, interrelated systems of grammar and of sound and gesture. (2) They allow new things to be **communicated** all the time. (3) Humans make a **distinction** between the content that is **communicated** and their **labels** for that content. (4) In human **communication**, spoken language is interchangeable with language that is heard. (5) Human languages are used for special purposes; intent lies behind what is **communicated**. (6) What is **communicated** can refer to the past and the future. (7) Human language is learned by children from **adults** and is passed down from **generation to generation**.

Some **convincing** recent **research** in teaching American Sign Language (AMESLAN) to primates indicates, however, that a number of these **features** may not be **uniquely** human. **Nonetheless**, it seems safe to say that although language as a system of **communication** is not **uniquely** human, human language **nevertheless** has **unique** characteristics. Humans string together **discrete** signs and units of grammar to form an **infinite** set of never-before heard, thought, read, or signed sentences. Infants who have not yet been taught grammar form their own rules of language by using their linguistic ability together with **input** from the speech **community** into which they are born.

Essentials for Speech

For human language to be possible, certain **factors** are necessary. These **factors** are physiological (the body must be **capable** of producing the sounds of speech), grammatical (the speech must have **structure**); and semantic (the mind must be **capable** of dealing with the meanings of what is spoken).

Physiology

Although most of the human organs of speech **evolved primarily** to perform other **functions** (such as eating), they are so well **equipped** for speaking that human speech appears to be the most efficient **communication** system of any living organism. In speech, an airstream is produced by the lungs and modulated by vibration (or lack of vibration) of the vocal cords and by movement of the tongue, the soft palate, and the lips. The airstream can be obstructed in **varying** degrees by the teeth and can be closed off from or kept open to the nasal cavity. People who have physiological impairments of speech and hearing still possess language, although the

production and reception of language may have been transferred to visual systems such as AMESLAN.

Grammar

All human language has a grammatical structure whereby sound (signalling) units are combined to produce meaning. The minimal units of sound combination that have meaning are called morphemes. A morpheme can correspond to a word, but it can also refer to other sound combinations that have meaning but are not words (such as prefixes and suffixes). In the word coexist, for example, both co and exist are morphemes. Words and morphemes can be classed together according to what they do in a sentence. Classes of morphemes include parts of speech (such as nouns and verbs) as well as prefixes, suffixes, and so forth. Members of different word classes form phrases that in turn combine into larger units - sentences or utterances.

Semantics

Finally, in human language, the speaker necessarily attaches meaning to the structured sound sequences, and the meaning is perceived and understood by other humans who share the same language. The process of communicating meanings with sounds, words, and sentences and perceiving meanings that others communicate in this way is believed to involve grammar as a tool for relating thoughts or ideas to speech, or signalling. Every meaningful sentence or utterance has a surface and an underlying structure. At the surface are the words and sentence elements as spoken and interpreted. At the underlying or deep level are the words and sentence elements as they are grammatically structured. This level of deep structure is where sentence structure appears ambiguous. Two different surface structures can be perceived to mean one thing, and one surface structure of a sentence may have two meanings. The surface sentence "Flying planes can be dangerous" means both that it can be dangerous for someone to fly planes and that planes that are flying can be dangerous. The different interpretations of this sentence have to do with its common surface structure having two distinct deep structures. On the other hand, "To please John is easy" and "It is easy to please John", despite different surface structures, are the same sentence at the level of deep structure. Human communication is a unique process combining special speech organs, grammatical structure, and intended and understood meanings.

Languages of the World

Spoken-gestured-signalled communication involves the same process for all humans, and any human language can convey any human thought; nevertheless, the actual languages spoken in the world are numerous, and they differ vastly in their sound systems and grammatical structures.

Classification by Form

Languages can be classified by the form of their grammar. Beginning in the 19th century, linguists attempted to group the world's languages into four morphological, or typological, categories (that is, categories based on how words are formed): analytic, agglutinative, inflectional, and incorporating. Analytic languages typically

have words of one syllable with no affixes, or added parts; words are on their own, **isolated**, as in Chinese. In agglutinative (from the Latin for "to glue to") languages, words are composed of roots, or basic parts, and one or more affixes (prefixes at the beginning, infixes in the middle, and suffixes at the end of words) with **distinct** meanings. An example is Turkish, which has *äv* ("house"), *ävďä* ("in the house"), *ävľär* ("houses"), and *ävľärďa* ("in the houses"). In inflectional languages, the basic and added parts have merged, and the added parts have no independent meaning. For example, in Latin, which is inflectional, the subject's person and number are reflected in the form of the verb, as in *fero* ("I bear"), *ferimus* ("we bear"), and *ferent* ("they bear") (See also Inflection). An **incorporating** language is one in which objects, indirect objects, and other sentence **elements** are **incorporated** into the verb as one word. Swahili does this, as in *hatukuviwanunulia*, which means "We did not buy them (= things) for them (= people)". The **components** of this word are *ha* (**negative**), *tu* ("we"), *ku* (**indicator** of past), *vi* ("them", meaning "objects"), *wa* ("them", meaning "people"), and *nunulia* ("buy for").

Genetic Classification

Even though two languages form words or organise sentence **elements** in the same way, they are not necessarily related to each other. To **establish** relationships among languages is to study their genealogy and classify them genetically. Unlike a typological classification, a genetic classification **involves** comparing the sound and meaning units of different languages in order to show common parentage. Like family resemblances among people, shared genetic resemblances among related languages do not depend on where the languages are spoken or when they existed. Members of a language family have a historical connection with one another and descend in common from a single ancestor. Language family trees show the relationships among languages; the oldest **traceable** ancestor language is shown at the top of the tree, and the bottom branches show the distance of relationship among current living members of the family. Related languages are alike in that their grammatical **elements** and vocabulary show regular **correspondences** in both sound and meaning. For example, the English word *fish* **corresponds** to Latin *piscis*, and English *father* to Latin *pater*. The English and Latin words are cognates, that is, genetically the same. Where English has *f*, Latin has *p*; English *th* **corresponds** to Latin *t*; and so forth. Comparative linguistics is the field in which sound and meaning **correspondences** (that is, cognates) among languages are **analysed**; genetic groups of languages are **established**; and by comparing modern languages, the **hypothetical** ancestor languages of such groups are tentatively **reconstructed**. (Such **reconstructed** precursor languages are **indicated** by the term *proto-*, as in Proto-Indo-European.)

European and Asian Families

The best-known language family is the Indo-European family, which represents about 1.6 billion people and includes most of the languages of Europe and northern India and several languages of the **region** in between. Indo-European has the following subfamilies: Italic, Germanic, Celtic, Greek, Baltic, Slavic, Armenian, Albanian, Indo-Iranian, and the extinct Hittite and Tocharian. Further sub-classifications exist within subfamilies. English, for example, belongs to the Anglo-Frisian group of the West Germanic branch of the Germanic subfamily. The closest relative of English is

Frisian, which is spoken today only in parts of Germany and the Netherlands. The relationship of English to other Indo-European languages such as Swedish (North Germanic), Latin (Italic), and Sanskrit (Indo-Iranian) is progressively more distant.

The Indo-European family is only one of several dozen families and proposed larger groupings. Linguists differ in their **approach** to classification, and what a conservative scholar may term a family, another more **liberal** scholar may consider a subfamily within a larger grouping. Conservative scholars, on the other hand, may consider that too little **evidence** exists to support such larger groupings.

Other languages are present in Europe besides the Indo-European family. Basque is an **isolate**, or a language with no known relatives; and Finnish, Estonian, Saami (Lapp), and Hungarian are the westernmost members of the Finno-Ugric branch of the Uralic family (which also includes various languages of the Ural Mountains **region** and Siberia). Occasionally **linked** with the Uralic languages in a Ural-Altaic group (a relationship now **rejected** by most scholars) is the Altaic family, the main branches of which are Turkic, Mongolian, and Manchu-Tungus (see Altaic Languages). Several unrelated language groups of Siberia are referred to by the **regional** name Palaeosiberian languages. In the Caucasus three groups, possibly related, have been **identified**; the best known of the Caucasian languages is Georgian. Many languages of India and its northwest neighbours belong to the Indo-Iranian branch of Indo-European. Two other groups - the Munda languages, usually considered a branch of the Austro-Asiatic languages, and the Dravidian family - represent more than 80 million speakers (see Indian Languages). In South-East Asia the Sino-Tibetan languages have hundreds of millions of speakers. The family's **principal** branches are the Tibeto-Burman and the Sinitic (which includes the many Chinese "dialects", really separate languages). Some scholars **attach** the Tai languages (including Thai or Siamese) to this family; others consider them of separate ancestry.

Pacific and African Languages

In the Pacific, the three main language groups are, first, the Malayo-Polynesian languages, a family that has a Western or Indonesian branch and an Eastern or Oceanic branch; second, the Papuan languages, a **regional** group of New Guinea, **comprising** a number of **isolates** and families (some possibly related to one another); and third, the Australian aboriginal languages (related to one another but not to non-Australian languages). The extinct Tasmanian language may represent a fourth group.

The languages of the Hamito-Semitic or Afro-Asiatic family are spoken in the Middle East and Africa. The family's five branches are Semitic, including Arabic and Hebrew (see Semitic Languages); Chad, including Hausa, widely spoken in West Africa; Berber; Cushitic; and (now extinct) Egyptian-Coptic. Africa has three other important families. Of the Niger-Kordofanian family, the **major** branch is the Niger-Congo; it includes Africa's most **widespread** group, the Bantu languages (such as Swahili and Zulu). In the Nilo-Saharan family the **principal** sub-division is the Chari-Nile; its Nilotic branch includes such languages as Masai. The Khoisan family **comprises** the click languages of the San and other peoples of the Kalahari Desert.

Native American Languages

Attempts to classify native American languages have resulted in the conservative **identification** of more than 150 families. In **liberal** classifications these are further grouped into about a dozen **so-called** superstocks, but recent studies have **challenged** such groupings. Even with a **liberal approach**, many small families remain **unlinked** to larger groups, and many **isolates** exist. Along the Arctic coast and in Greenland, Inupiaq (Eskimo-Aleut family) is spoken by the Inuit (Eskimo). Sub-arctic Canada includes various Athabascan and Algonquian languages. Native American languages in the United States east of the Mississippi River are **predominantly** Algonquian, Iroquoian, and Muskogean. The **principal** Great Plains family is the Siouan, but Caddoan and western Algonquian languages are also spoken. Shoshonean languages (Uto-Aztecan family) **dominate** the Great Basin, bordered on the north by the Sahaptian family. On the Northwest Coast are the Salishan and Wakashan families, Tlingit (thought to be related to Athabascan languages), and a probable **isolate**, Haida. The Apachean branch of Athabascan is found throughout the Southwest, alongside the Yuman family and the Pima-Papago language (Uto-Aztecan) of Arizona and southern California. In California many small families exist, their **mutual** relationships often disputed.

Important in Mexico and Central America are the Uto-Aztecan family (Aztec or Nahuatl), the Otomanguean superstock (Mixtec, Otomí, and Zapotec, among others), and families such as Mixe-Zoquean, Totonacan, and Tequistlatecan. The Mayan family **comprises** about two dozen languages with millions of speakers.

Depending on their **approach**, linguists classify South American languages into 90-**odd** families and **isolates** or into three nearly all-inclusive superstocks (superfamilies, or groups of families that may be remotely related); Macro-Chibchan, Andean-Equatorial, and Gê-Pano-Carib. The most widely spoken native South American languages are Quechua and Aymara, Guaraní, and Mapuche or Araucanian. Important in Central America and northern South America are Macro-Chibchan languages (such as Guaymí, Paez, and Warao) and also the large Arawakan group (including Island or Black Carib, Guajiro, and Campa). The widely accepted Macro-Gê superstock includes many languages spoken in the Brazilian tropics.

Areal Classification

The geographic, or **areal**, classification of languages is also useful. **Areal** classification is based on the observation of the ways in which neighbouring languages have influenced one another. In discussions of the Northwest Coast languages of North America, for example, statements are often made that these languages share various consonants of a certain type, or that they all have a large fishing-related vocabulary. **Underlying** such statements is an **assumption** that the **similarities** exist because, over time, these languages have borrowed grammar, sounds, and vocabulary from one another. Such **regional** resemblances, however, do not necessarily **indicate** either genetic relationship or typological **similarity**.

Written and Spoken Language

When **individual** languages have a written as well as a spoken form, it is often the case that the writing system does not represent all the **distinctive** sounds of the language. The writing system of one language may make use of **symbols** from the

writing system of another language, applying them to sounds, syllables, or morphemes for which they were not originally intended. Written and spoken forms of the same language can be compared by studying the "fit" between the writing system and the spoken language.

Many kinds of writing systems exist. In Chinese, a written character is used for every morpheme. The written form of the Cherokee language has a **symbol** for every consonant-and-vowel syllable. Japanese is also written with such a system, which is called a syllabary. In writing systems using an alphabet, such as the Latin alphabet, each **symbol theoretically** stands for a sound in the spoken language. The Latin alphabet has 26 letters, and languages written with it generally use all 26, whether their spoken form has more or fewer sounds. Although it is used for written English, the Latin alphabet does not have symbols for all the sounds of English. For example, for some sounds, combinations of two letters (digraphs), such as th, are used. Even so, the combination th does not **indicate** the spoken **distinction** between th in "thin" and th in "this".

The written form of a language is static, unchanging, reflecting the form of the language at the time the alphabet, syllabary, or character system was adopted. The spoken form is **dynamic**, always changing; **eventually**, the written and spoken forms may no longer **coincide**. One of the problems with the English written language is that it still represents the pronunciation of the language several centuries ago. The word light, for example, is today pronounced "lite"; the spelling "light" reflects the former pronunciation. In languages with writing systems that have been recently developed (such as Swahili) or reformed (such as Hebrew), the written and spoken forms are more likely to fit.

Unlike speech, writing may **ignore** pitch and **stress**, omit vowels, or include punctuation and capitalisation. The written and spoken forms of a language also differ in that writing does not **incorporate** spoken dialect differences. Speakers of **mutually** unintelligible Chinese dialects, for example, can read one another's writing even though they cannot **communicate** through speech. **Similarly**, speakers of the different German dialects all write in High German, the accepted standard form of the language.

Standard and Nonstandard Language

The written form of a language may have more prestige than the spoken form, and it also may have a more **complex** grammar and a **distinctive** vocabulary. A standard written literary language thus tends to influence the speech of educated people. In certain **circumstances** they will try to imitate it when they talk, and they may relegate the unwritten form to situations where prestige is less important. In Arabic-speaking countries, for example, educated people sometimes use **classical** Arabic in speech as well as in writing, **whereas** uneducated people speak only colloquial Arabic. The use of two such varieties of a single language by the same speaker in different situations is called diglossia. People who use the spoken form of a standard literary dialect in public and their native **regional** dialect when they are with friends (as do many German-speaking Swiss) are said to be diglossic.

A standard language is that one of the language's dialects that has become **dominant**. Often, such **dominance** is due to governmental **policy** whereby one dialect is given prestige over others, and various **regulations** or customs **ensure** that it is used. The standard language (such as High German) is frequently the dialect used in writing; that is, it is the literary language of a speech **community**, or at least a dialect that has an existing orthography and a body of material written in it.

Few people actually speak such a standard language; rather, they **approximate** it with their own **regional variations**. The standard dialect is the one that is used when a language is taught to nonnative speakers; the learners then speak it, but do so with an accent, or **variation** carried over from their first language and **region**. The standard language also provides a common means of **communication** among speakers of **regional** dialects (as in the examples given above for German). Standard languages are thus highly useful in efforts to unite people and **create** a sense of national spirit.

Dialect, Argot, and Jargon

A dialect is a variety of a language that differs **consistently** from other varieties of the same language used in different geographical **areas** and by different social groups. For example, Boston **residents** who speak the New England dialect of American English drink tonic and frappés, **whereas** people in Los Angeles sip sodas and milkshakes. Within groups of people who speak the same geographical or social dialect, other language **variations** exist that depend on **specific** situations. People who have activities in common or share a profession or trade may have a special "language" called an argot that **identifies** them as **distinct** from outsiders. Teenagers, thieves, and prostitutes have an argot separating them from parents, police, and other **authorities**. Such a specialised informal argot is called slang. An argot or specialised terminology, as shared by members of a profession, without any connotation of slang, is called a jargon. **Professional** groups with **distinct** jargons include physicians, lawyers, clergy, linguists, and art critics. (The use of the terms argot, jargon, and slang, however, **varies somewhat** from writer to writer).

Pidgins and Creoles

Just as a language may develop varieties in the form of dialects and argots, languages as a whole may change (Latin, for example, **evolved** into the different Romance languages). Sometimes rapid language change **occurs** as a result of **contact** between people who each speak a different language. In such **circumstances** a pidgin may arise. Pidgins are grammatically based on one language but are also influenced, especially in vocabulary, by others; they have relatively small sound systems, reduced vocabularies, and simplified and **altered** grammars, and they **rely** heavily on **context** in order to be understood. Pidgins are often the result of **contact** by traders with island and coastal peoples. A pidgin has no native speakers; when speakers of a pidgin have children who learn the pidgin as their first language, that language is then called a creole. Once the creole has enough native speakers to form a speech **community**, the creole may **expand** into a fuller language. This is the case with Krio, now the national language of Sierra Leone in West Africa. Krio arose from what was originally an English-based pidgin.

International Languages

In the midst of world linguistic **diversity**, a number of international languages have been proposed as a means for solving world problems thought to be caused by misunderstandings of **communication**. Sometimes, existing natural languages are advanced to fill this **role**. These **so-called** LWCs (Languages of Wider **Communication**) - such as English or French, already spoken by many people as a second language as well as by many native speakers - have proponents who hold that everyone should know one or the other. More often, efforts have been made to **construct** artificial languages for everyone to learn. A number of artificial languages have enjoyed a **period** of vogue, then fallen into disuse. One artificial language, Esperanto, has had a relatively high success rate because it has a regular grammar, an "easy" pronunciation, and a vocabulary based on Latin and ancient Greek and on the Romance and Germanic languages. To speakers of languages of other families, however, Esperanto seems less international and is harder to speak and learn. One new language proposed for international use is LOGLAN (standing for **logical** language), a laboratory-**created** language that is claimed to be **culture-free** and to allow people to speak their thoughts clearly and **unambiguously**. It has a small sound system and few grammatical rules, and its vocabulary is drawn from the eight most widely spoken languages in the world today, including Hindi, Japanese, Chinese, as well as Russian and other Indo-European languages.

Even if a perfect international language could be devised and adopted, however, it is by no means certain that it could **minimise global communication** problems. Moreover, the thought **processes** that relate languages to the ideas that people express with them are still not understood. Even if everyone did learn Esperanto or LOGLAN and used these languages in international or public dealings, it is probable that **processes** of language change would soon take over. The world would then have dialects of Esperanto or some other international language, leading **eventually** to even further **differentiation** or to pidginisation, creolisation, and so forth. Indeed, English and French in different parts of the world have already become **differentiated**; the English spoken in India, for example, is different both from American English and from British English.

Language Development, Change, and Growth

Defined as the production and **perception** of speech, language **evolved** as the human species **evolved**. As a **communication** system, it can be related to the **communication** systems of other animals. As discussed above, however, human language has a **creative and interpretive aspect** that appears to mark it as **distinctive**. The understanding of human speech is believed to **involve** specialisation of part of the left hemisphere of the brain (Broca's **area**). It is possible that human language may not have been **distinct** from animal **communication** until this physiological specialisation **occurred**. The production of human language is believed to have **occurred** first in Neanderthals (100,000-30,000 years ago); it is speculated that about 40,000 to 30,000 years ago the **emergence** of modern Homo sapiens (with skull and vocal tract possibly better specialised for speech) was **accompanied** by **significant** linguistic development. Modern human language, then, may be only 30,000 to 40,000 years old. The immense **diversity** of languages spoken in the world **indicates** an incredible acceleration in the rate of change of human language, once it **emerged**. If there was in fact a first language, its sounds, grammar, and vocabulary cannot be **definitely** known. Historical linguists, **focusing** on finding out and describing how, why, and in

what form languages occur, can only suggest hypotheses to account for language change.

In the 18th century the German philosopher Gottfried Wilhelm Leibniz suggested that all ancient and modern languages diverged from a single protolanguage. This idea is referred to as monogenesis. Most scholars believe that such a language can, at best, be posited only as a set of hypothetical formulas from which one can derive the world's languages, and according to which they can be related to one another; it is unlikely that such a reconstruction reflects a real first language as it was actually spoken. Although many modern languages do derive from a single ancestor, it is also possible that human language arose simultaneously at many different places on earth and that today's languages do not have a single common ancestor. The theory that present language families derive from many original languages is called polygenesis.

Whether human language was ultimately monogenetic or polygenetic, the differences among languages are believed to be relatively superficial. Although many humans find it difficult to learn a second language, and although languages such as Chinese, English, and Swahili may seem to have little in common, the differences among languages are not nearly so great as the similarities among them. The sounds and sound combinations of the world's languages, despite the ways in which they differ from language to language, are believed to have been selected from a universal set of possible sounds and sound combinations available to all human languages. Human languages likewise have individual structural properties that are selected from a common pool of possible structures. That is, no human language utilises any sounds that cannot be produced by any human being, or any grammatical categories that cannot be learned by any human - whether or not the native language of a given person makes use of those sounds and structures. The range of possible language changes, in other words, seems to be limited by the universal structural properties of language.

When a language undergoes substantial changes both in vocabulary and in sound and structure, the whole language may become another language. This occurs in pidginisation and creolisation and also, for example, in the development of the modern Romance languages from Latin. Language growth can also occur when a minor dialect becomes dominant and breaks off from other dialects. Eventually, the dialect that is split off ceases to be mutually intelligible with the other dialects; it may develop new dialects of its own, become subject to pidginisation and creolisation, and so forth, over and over again through time. This continual growth and development characterises language in all its aspects as a living expression of both human nature and culture.

Music

Music is the organised movement of sounds through a continuum of time. Music plays a role in all societies, and it exists in a large number of styles, each characteristic of a geographical region or a historical era.

Cultural Definitions

All known societies have music, but only a few languages have a **specific** word for it. In Western culture, dictionaries usually **define** music as an art that is concerned with combining sounds - particularly pitches - to produce an artefact that has beauty or attractiveness, that follows some kind of **internal logic** and **exhibits** intelligible **structure**, and that **requires** special skill on the part of its **creator**. Clearly, music is not easy to **define**, and yet historically most people have recognised the **concept** of music and generally agreed on whether or not a given sound is musical.

Indefinite border **areas** exist, however, between music and other sound **phenomena** such as speech, and the **cultures** of the world differ in their opinion of the musicality of various sounds. Thus, simple tribal chants, a half-spoken **style** of singing, or a composition **created** by a **computer** program may or may not be accepted as music by members of a given society or subgroup. Muslims, for example, do not consider the chanting of the Koran to be a kind of music, although the **structure** of the chant is **similar** to that of secular singing. The social **context** of sounds may determine whether or not they are regarded as music. Industrial noises, for **instance**, are not usually regarded as music except when presented as part of a composition controlled by a **creative individual**. In the last 50 years, however, new aesthetic **approaches** in Western music have **challenged** this view. Composers such as John Cage have produced works in which the listener is invited to hear music in the ambient sounds of the **environment**.

Opinions also differ as to the origins and spiritual value of music. In some African **cultures** music is seen as something **uniquely** human; among some Native Americans it is thought to have originated as a way for spirits to **communicate**. In Western culture music is regarded as **inherently** good, and sounds that are welcome are said to be "music to the ears". In some other **cultures** - for example, Islamic culture - it is of low value, associated with sin and evil, and attempts have been made to outlaw its practice.

Music as a Cultural System

Music has many uses, and in all societies certain events are **inconceivable** without it. A proper consideration of music should **involve** the musical sound itself; but it should also deal with the **concepts** leading to its existence, with its particular forms and **functions** in each culture, and with the human behaviour that produces the sound.

Somewhat **analogous** to having a language, each society may be said to have a music - that is, a self-contained system within which musical **communication** takes place and that, like a language, must be learned to be understood. Members of some societies **participate** in several musics; thus, modern Native Americans take part in both **traditional** Native American music and mainstream Western music.

Within each music, various strata may exist, distinguished by degree of learning (**professional** versus untrained musicians), level of society (the music of the elite versus that of the masses), patronage (court or church or public commercial **establishments**), and manner of dissemination (oral, notated, or through mass **media**). In the West and in the high **cultures** of Asia, it is possible to distinguish three basic strata: first, art or **classical** music, composed and performed by trained **professionals** originally under the patronage of courts and religious **establishments**;

second, folk music, shared by the population at large - particularly its rural component - and transmitted orally; and, third, popular music, performed by professionals, disseminated through radio, television, records, film, and print, and consumed by the urban mass public.

The Sounds of Music

In the simplest terms music can be described as the juxtaposition of two elements: pitch and duration, usually called melody and rhythm. The minimal unit of musical organisation is the note - that is, a sound with specific pitch and duration. Music thus consists of combinations of individual notes that appear successively (melody) or simultaneously (harmony) or, as in most Western music, both.

Melody

In any musical system, the creation of melody involves selecting notes from a prescribed set called a scale, which is actually a group of pitches separated by specific intervals (the distances in pitch between notes). Thus, the scale of 18th- and 19th-century Western music is the chromatic scale, represented by the piano keyboard with its 12 equidistant notes per octave; composers selected from these notes to produce all their music. Much Western music is also based on diatonic scales - those with seven notes per octave, as illustrated by the white keys on the piano keyboard. In the diatonic scales and in the pentatonic scales - those with five notes per octave, most often corresponding to the black keys on the piano - that are common in folk music, the notes are not equidistant.

Intervals can be measured in units called cents, 1,200 per octave. The typical intervals of Western music are multiples of 100 cents (semitones), but in other musical cultures intervals of about 50, 150, and 240 cents, for example, are also found. The human ear can distinguish intervals as small as 14 cents, but no interval that small seems to play a significant role in any musical system.

Rhythm

The handling of time in music is expressed through concepts such as the lengths of notes and the interrelationships among them; relative degrees of emphasis on different notes; and, in particular, metre.

Most Western music is built on a structure of regularly recurring beats - that is, a metrical structure. This structure may be explicit (as in the beating of the bass drum in popular music and marching bands), or it may be implied (often in symphonic or instrumental music). The three most common metres in Western music are units of four beats (with main stress on the first beat, secondary stress on the third beat); of three beats (stress on the first); and of six beats (primary stress on the first, secondary on the fourth). Conventionally, these metres are called o, k, and u. Far greater complexity is found, however, in 20th-century Western art music, Indian classical music, and West African drum ensembles. Furthermore, much music is structured without regular metre, as in some genres in India and the Middle East, and in Christian, Jewish, Islamic, and Buddhist liturgical chant.

Other Elements

The organisation given to simultaneously produced pitches is also of great importance. Two or more voices or instruments performing together may be perceived as producing independent but related melodies (counterpoint); or the emphasis may be on how the groups of simultaneous notes (chords) are related to one another, as well as on the progression of such groups through time (harmony). Timbre, or sound quality, is the musical element that accounts for the differences in the characteristic sounds of musical instruments. Singers have a variety of timbres as well, each affected by such features as vocal tension, nasality, amount of accentuation, and slurring of pitch from one note to the next.

One major characteristic of music everywhere is its transposability. A tune can be performed at various pitch levels and will be recognised as long as the interval relationships among the notes remain constant. Analogously, rhythmic patterns can almost always be identified as identical, whether executed quickly or slowly. These elements of music are used to organise pieces extending from simple melodies using a scale of three notes and lasting only ten seconds (as in the simplest tribal musics) to highly complex works such as operas and symphonies. The organisation of music normally involves the presentation of basic material that may then be repeated precisely or with changes (variations), may alternate with other materials, or may proceed continually to present new material. Composers in all societies, often unconsciously, strike a balance between unity and variety, and almost all pieces of music contain a certain amount of repetition - whether of individual notes, short groups of notes (motives), or longer units such as melodies or chord sequences (often called themes).

Instruments

All societies have vocal music; and with few exceptions, all have instruments. Among the simplest instruments are sticks that are struck together; notched sticks that are scraped; rattles; and body parts used to produce sound, as in slapping the thighs and clapping. Such simple instruments are found in many tribal cultures; elsewhere, they may be used as toys or in archaic rituals. Certain highly complex instruments exhibit flexibility not only in pitch but also in timbre. The piano produces the chromatic scale from the lowest to the highest pitch used in the Western system and responds, in quality of sound, to wide variation in touch. On the organ, each keyboard can be connected at will to a large number and combination of pipes, thereby making available a variety of tone colours. On the Indian sitar, one plucked string is used for melody, other plucked strings serve as drones, while still others produce fainter sounds through sympathetic vibration. Modern technology has utilised electronic principles to create a number of instruments that have almost infinite flexibility.

The Creation of Music

Music is created by individuals, using a traditional vocabulary of musical elements. In composition - the principal creative act in music - something that is considered new is produced by combining the musical elements that a given society recognises as a system. Innovation as a criterion of good composing is important in Western culture, less so in certain other societies. In Western music, composition is normally carried

out with the help of notation; but in much popular music, and particularly in folk, tribal, and most non-Western cultures, composition is done in the mind of the composer, who may sing or use an instrument as an aid, and is transmitted orally and memorised. Creative acts in music also include improvisation, or the creation of new music in the course of performance. Improvisation usually takes place on the basis of some previously determined structure, such as a note or a group of chords; or it occurs within a set of traditional rules, as in the ragas of India or the maqams of the Middle East, which use certain modes. Performance, which involves a musician's personal interpretation of a previously composed piece, has smaller scope for innovation. It may, however, be viewed as part of a continuum with composing and improvising.

The normal method of retaining music and transmitting it is oral or, more properly, aural - most of the world's music is learned by hearing. The complex system of musical notation used in Western music is in effect a graph, indicating principally movement in pitch and time, with only limited capability to regulate more subtle elements such as timbre. Both Western and Asian cultures possess other notation systems, giving letter names to notes, indicating hand positions, or charting the approximate contour of melodic movement.

The Social Role of Music

Music everywhere is used to accompany other activities. It is, for example, universally associated with dance. Although words are not found in singing everywhere, the association of music and poetry is so close that language and music are widely believed to have had a common origin in early human history.

The Function of Music

Music is a major component in religious services, secular rituals, theatre, and entertainment of all sorts. In many societies it is also an activity carried on for its own sake. In Western society in the late 20th century, for example, one main use of music involves listening at concerts or to radio or recordings (music for its own sake); another involves the provision of music as a suitable background for unrelated activities such as study or shopping (music as an adjunct to something else). In many societies music serves as the chief entertainment at royal courts. Everywhere, musicians sometimes perform for their own diversion; in some societies, however, this private use of music has been formalised - in southern Africa, for example, special genres and styles are reserved for musicians' performances for their personal entertainment. The most ubiquitous use of music, however, is as a part of religious ritual. In some tribal societies, music appears to serve as a special form of communication with supernatural beings, and its prominent use in modern Christian and Jewish services may be a remnant of just such an original purpose. Another, less obvious, function of music is social integration. For most social groups, music can serve as a powerful symbol. Members of most societies share keen feelings as to what kind of music belongs. Indeed, some minorities (for instance in the United States, black Americans and Euro-American ethnic groups) use music as a major symbol of group identity.

Music may serve as a **symbol** in other ways, as well. It can represent extramusical ideas or events (as in the symphonic poems of the German composer Richard Strauss), and it can underscore ideas that are verbally presented in operas (notably those of the German composer Richard Wagner), in film and television **drama**, and often in songs. It also **symbolises military**, patriotic, and funerary moods and events. In a more general sense, music may express the central social values of a society. Thus, the **hierarchical** caste system of India is **symbolised** in the **hierarchy** of performers in an ensemble. The avoidance of voice blending in a North American Plains peoples singing group reflects the value placed on **individualism**. In Western music the interrelationship of conductor and orchestra **symbolises** the need, in a modern industrial society, for strongly **coordinated cooperation** among various kinds of specialists.

The Musician

In most of the world's societies, musicianship **requires** talent, special knowledge or training, and effort, and the view is **widespread** that a successful musical work or performance is difficult to **achieve**. There is no **evidence** that superior musical abilities arise in one society or race as opposed to another; rather, **variations in achievement** are the result of differences in **technology**, in the degree of specialisation of musicians, and in the value placed on music. **Individual** talent, however, is recognised among most peoples, and the musical specialist exists everywhere: as a true **professional** in the West, India, the Far East, and Africa; as an informal leader and singer in folk **cultures**; and as someone who also has supernatural power in tribal societies. But if music is regarded as indispensable everywhere, the musician has rarely enjoyed great prestige. In certain early societies in Europe and America, for example, musicians were regarded as undesirable social deviants; this remains the case in the present-day Middle East. In many societies music is relegated to outsiders - foreigners or members of religious and **ethnic minorities**. Many modern social systems, including those in the West, inordinately reward the outstanding star performer but pay little attention to the average musician. **Nevertheless**, musicianship in most parts of the world **requires** long **periods** of **concentrated study**, extending in the case of European and Indian virtuosos to some 20 years.

Musical Regions

Each culture has its own music, and the **classical**, folk, and popular **traditions** of a **region** are usually closely related and easily recognised as part of one system. The peoples of the world can be grouped musically into several large **areas**, each with its characteristic musical dialect. These **areas** include Europe and the West; the Middle East with North Africa; Central Asia and the Indian subcontinent; South-East Asia and Indonesia; Oceania; China, Korea, and Japan; and the indigenous **cultures** of the Americas. All **coincide** roughly with **areas** determined by **cultural** and historical relationship, but, surprisingly, they do not **correspond** well with **areas** determined by language relationships.

The history of Western music - the one most easily **documented** because of Western musical notation - is conveniently divided into eras of **relative stability** separated by short periods of more **dramatic** change. The periods **conventionally** accepted are the Middle Ages (to c. 1450), the Renaissance (1450-1600), the Baroque era (1600-

1750), the Classical era (1750-1820), the Romantic era (1820-1920), and the modern period. Other cultures, less well documented, likewise have experienced change and development (not necessarily always in the direction of greater complexity), so that the simplest tribal musics also have their histories. In the 20th century, however, rapid travel and mass communication have led to a great decrease in the musical diversity of the world.

Approaches to Educational Research

It is perfectly possible to undertake a worthwhile investigation without having detailed knowledge of the various approaches to or styles of educational research, but a study of different approaches will give insight into different ways of planning an investigation, and, incidentally, will also enhance your understanding of the literature. One of the problems of reading about research methods and reading research reports is the terminology. Researchers use terms and occasionally jargon that may be incomprehensible to other people. It is the same in any field, where a specialised language develops to ease communication among professionals. So, before considering the various stages of planning and conducting investigations, it may be helpful to consider the main features of certain well-established and well-reported styles of research.

Different styles, traditions or approaches use different methods of collecting data, but no approach prescribes nor automatically rejects any particular method. Quantitative researchers collect facts and study the relationship of one set of facts to another. They use techniques that are likely to produce quantified and, if possible, generalisable conclusions. Researchers adopting a qualitative perspective are more concerned to understand individuals' perceptions of the world. They seek insight rather than statistical analysis. They doubt whether social 'facts' exist and question whether a 'scientific' approach can be used when dealing with human beings. Yet there are occasions when qualitative researchers draw on quantitative techniques, and vice versa.

Classifying an approach as quantitative or qualitative, ethnographic, survey, action research or whatever, does not mean that once an approach has been selected, the researcher may not move from the methods normally associated with that style. Each approach has its strengths and weaknesses and each is particularly suitable for a particular context. The approach adopted and the methods of data collection selected will depend on the nature of the inquiry and the type of information required.

It is impossible in the space of a few pages to do justice to any of the well-established styles of research, but the following will at least provide a basis for further reading and may give you ideas about approaches which you may wish to adopt in your own investigation.

Action research and the 'teacher as researcher' model

There are many definitions of action research. Cohen and Manion describe it as

essentially an on-the-spot procedure designed to deal with a concrete problem located in an immediate situation. This means that ideally, the step-by-step process

is constantly monitored over varying periods of time and by a variety of mechanisms (questionnaires, diaries, interviews and case studies, for example) so that the ensuing feedback may be translated into modifications, adjustments, directional changes, redefinitions, as necessary, so as to bring about lasting benefit to the ongoing process itself rather than to some future occasion... (Cohen and Manion 1994: 192)

As they point out, an important feature of action research is that the task is not finished when the project ends. The participants continue to review, evaluate and improve practice. Elliott (1991: 69) takes the definition a stage further:

It aims to feed practical judgement in concrete situations, and the validity of the 'theories' or hypotheses it generates depends not so much on 'scientific' tests of truth, as on their usefulness in helping people to act more intelligently and skilfully. In action research 'theories' are not validated independently and then applied to practice. They are validated through practice.

Brown and McIntyre, who describe an action-research model for curriculum innovation in Scottish schools, also draw attention to the principle of deriving hypotheses from practice. They write:

The research questions arise from an analysis of the problems of the practitioners in the situation and the immediate aim then becomes that of understanding those problems. The researcher/actor, at an early stage, formulates speculative, tentative, general principles in relation to the problems that have been identified; from these principles, hypotheses may then be generated about what action is likely to lead to the desired improvements in practice. Such action will then be tried out and data on its effects collected; these data are used to revise the earlier hypotheses and identify more appropriate action that reflects a modification of the general principles. Collection of data on the effects of this new action may then generate further hypotheses and modified principles, and so on as we move towards a greater understanding and improvement of practice. This implies a continuous process of research and the worth of the work is judged by the understanding of, and desirable change in, the practice that is achieved. (Brown and McIntyre 1981: 245)

The essentially practical, problem-solving nature of action research makes this approach attractive to practitioner-researchers who have identified a problem during the course of their work and see the merit of investigating it and, if possible, of improving practice. There is nothing new about practitioners operating as researchers, and the 'teacher as researcher' model has been extensively discussed (Bartholomew 1971, Cope and Gray 1979, Raven and Parker 1981).

Action research is not, of course, limited to projects carried out by teachers in an educational setting. It is appropriate in any context when 'specific knowledge is required for a specific problem in a specific situation, or when a new approach is to be grafted on to an existing system' (Cohen and Manion 1994: 194). Action research needs to be planned in the same systematic way as any other type of research, and the methods selected for gathering information will depend on the nature of the information required. Action research is not a method or technique. It is an approach which has proved to be particularly attractive to educators because of its practical,

problem-solving **emphasis**, because **practitioners** (sometimes with **researchers** from outside the **institution**; other times not) carry out the **research** and because the **research** is directed towards greater understanding and improvement of practice *over a period of time*.

Case study

The case-study **approach** is particularly **appropriate** for **individual researchers** because it gives an opportunity for one **aspect** of a problem to be studied in some depth within a limited time scale (though some case studies are carried out over a long **period** of time, as with Elizabeth Richardson's (1973) three-year study of Nailsea School).

Case study has been described as 'an umbrella term for a family of **research methods** having in common the decision to **focus** on inquiry around an **instance**' (Adelman et al. 1977). It is much more than a story about or a description of an event or state. As in all **research**, **evidence** is collected systematically, the relationship between **variables** is studied and the study is **methodically** planned. Case study is concerned **principally** with the **interaction** of **factors** and events and, as Nisbet and Watt (1980: 5) point out, 'sometimes it is only by taking a practical **instance** that we can **obtain** a full picture of this **interaction**'. Though observation and interviews are most frequently used in case study, no **method** is **excluded**. **Methods** of collecting information are **selected** which are **appropriate** for the **task**.

The great strength of the case-study **method** is that it allows the **researcher** to **concentrate** on a **specific instance** or situation and to identify, or attempt to identify, the various **interactive processes** at work. These **processes** may remain hidden in a large-scale **survey** but may be **crucial** to the success or failure of systems or organisations.

Case studies may be carried out to follow up and to put flesh on the bones of a **survey**. They can **precede** a **survey** and be used as a means of **identifying key issues** which merit further **investigation**, but the **majority** of case studies are carried out as free-standing exercises. The **researcher** identifies an 'instance', which could be the introduction of a new syllabus, the way a school **adapts** to a new **role**, or any **innovation** or stage of development in an **institution** - and observes, questions, studies. Each organisation has its common and its **unique features**. The case-study **researcher** aims to **identify** such **features** and to show how they **affect** the **implementation** of systems and influence the way an organisation **functions**.

Inevitably, where a single **researcher** is gathering all the information, **selection** has to be made. The **researcher** **selects** the **area** for study and decides which material to present in the **final** report. It is difficult to cross-check information and so there is always the danger of **distortion**. Critics of the case-study **approach** draw attention to this and other problems. They point to the fact that generalisation is not always possible, and question the value of the study of single events. Others disagree.

Denscombe (1998: 36-7) makes the point that 'the extent to which findings from the case study can be generalised to other examples in the class depends on how far the

case study example is similar to others of its type', and, drawing on the example of a case study of a small primary school, cautions that

this means that the researcher must obtain data on the significant features (catchment area, the ethnic origins of the pupils and the amount of staff turnover) for primary schools in general, and then demonstrate where the case study example fits in relation to the overall picture. (p. 37)

Bassey holds similar views, but prefers to use the term 'reliability' rather than 'generalisability'. In his opinion,

an important criterion for judging the merit of a case study is the extent to which the details are sufficient and appropriate for a teacher working in a similar situation to relate his decision making to that described in the case study. The reliability of a case study is more important than its generalisability. (Bassey 1981: 85)

He considers that if case studies

are carried out systematically and critically, if they are aimed at the improvement of education, if they are reliable, and if by publication of the findings they extend the boundaries of existing knowledge, then they are valid forms of educational research. (p. 86)

A successful study will provide the reader with a three-dimensional picture and will illustrate relationships, micropolitical issues and patterns of influences in a particular context.

A word of warning. Single researchers working to a deadline and within a limited timescale need to be very careful about the selection of case study topic. As Yin (1994: 137) reminds us:

Case studies have been done about decisions, about programmes, about the implementation process, and about organisational change. Beware these types of topic - none is easily defined in terms of the beginning or end point of the 'case'.

He considers that 'the more a study contains specific propositions, the more it will stay within reasonable limits' (p. 137). And we all have to keep our research within reasonable limits, regardless of whether we are working on a 100-hour project or a PhD.

The ethnographic style

The ethnographic style of fieldwork research was developed originally by anthropologists who wished to study a society or some aspect of a society, culture or group in depth. They developed an approach which depended heavily on observation and, in some cases, complete or partial integration into the society being studied. This form of participant observation enabled the researchers, as far as was possible, to share the same experiences as the subjects, to understand better why they acted in the way they did and 'to see things as those involved see things' (Denscombe

1998: 69). This approach is no longer limited to anthropological studies and has been effectively used in a good many studies of small groups.

Participant observation takes time and so is often outside the scope of researchers working on 100-hour projects. The researcher has to be accepted by the individuals or groups being studied, and this can mean doing the same job, or living in the same environment and circumstances as the subjects for lengthy periods. Time is not the only problem with this approach. As in case studies, critics point to the problem of representativeness. If the researcher is studying one group in depth over a period of time, who is to say that group is typical of other groups which may have the same title? Are teachers in one school necessarily representative of teachers in a similar school in another part of the country? Are canteen workers in one type of organisation likely to be typical of all canteen workers? Generalisability may be a problem, but as in the case-study approach the study may be relatable in a way that will enable members of similar groups to recognise problems and, possibly, to see ways of solving similar problems in their own group.

Surveys

The aim of a survey is to obtain information which can be analysed and patterns extracted and comparisons made. The census is one example of a survey in which the same questions are asked of the selected population (the population being the group or category of individuals selected). The census aims to cover 100 percent of the population, but most surveys have less ambitious aims. In most cases, a survey will aim to obtain information from a representative selection of the population and from that sample will then be able to present the findings as being representative of the population as a whole. Inevitably, there are problems in the survey method. Great care has to be taken to ensure that the sample population is truly representative. At a very simple level, that means ensuring that if the total population has 1000 men and 50 women, then the same proportion of men to women has to be selected. But that example grossly oversimplifies the method of drawing a representative sample, and if you decide to carry out a survey, you will need to consider what characteristics of the total population need to be represented in your sample to enable you to say with fair confidence that your sample is reasonably representative.

In surveys, all respondents will be asked the same questions in, as far as possible, the same circumstances. Question wording is not as easy as it seems, and careful piloting is necessary to ensure that all questions mean the same to all respondents. Information can be gathered by means of self-completion questionnaires (as in the case of the census) or by means of questionnaires, schedules or checklists administered by an interviewer. Whichever method of information gathering is selected, the aim is to obtain answers to the same questions from a large number of individuals to enable the researcher not only to describe but also to compare, to relate one characteristic to another and to demonstrate that certain features exist in certain categories. Surveys can provide answers to the questions What? Where? When? and How?, but it is not so easy to find out Why? Causal relationships can rarely if ever be proved by survey method. The main emphasis is on fact-finding, and if a survey is well structured and piloted, it can be a relatively cheap and quick way of obtaining information.

The experimental style

It is relatively easy to plan experiments which deal with measurable phenomena. For example, experiments have been set up to measure the effects of using fluoridated toothpaste on dental caries by establishing a control group (who did not use the tooth-paste) and an experimental group (who did). In such experiments, the two groups, matched for age, sex/gender, ratio of boys to girls, social class and so on were given a pre-test dental examination and instructions about which toothpaste to use. After a year, both groups were given the post-test dental examination and conclusions were then drawn about the effectiveness or otherwise of the fluoridated toothpaste. The principle of such experiments is that if two identical groups are selected, one of which (the experimental group) is given special treatment and the other (the control group) is not, then any differences between the two groups at the end of the experimental period may be attributed to the difference in treatment. A causal relationship has been established. It may be fairly straightforward to test the extent of dental caries (though even in this experiment the extent of the caries could be caused by many factors not controlled by the experiment), but it is quite another matter to test changes in behaviour. As Wilson (1979) points out, social causes do not work singly. Any examination of low school attainment or high IQ is the product of multiple causes:

To isolate each cause requires a new experimental group each time and the length and difficulty of the experiment increases rapidly. It is possible to run an experiment in which several treatments are put into practice simultaneously but many groups must be made available rather than just two.... The causes of social phenomena are usually multiple ones and an experiment to study them requires large numbers of people often for lengthy periods. This requirement limits the usefulness of the experimental method. (Wilson 1979: 22)

So, the experimental style does allow conclusions to be drawn about cause and effect, if the experimental design is sound, but in education and the social sciences generally, large groups are needed if the many variations and ambiguities involved in human behaviour are to be controlled. Such large-scale experiments are expensive to set up and take more time than most students working on 100-hour projects can give. Some tests which require only a few hours (e.g. to test short-term memory or perception) can be very effective, but in claiming a causal relationship, great care needs to be taken to ensure that all possible causes have been considered.

Narrative enquiry

It is only recently that I have become interested in the use and interpretation of narratives and in particular the acceptance of stories as valuable sources of data. Stories are certainly interesting and have been used for many years by management consultants and others who present examples of successful (and unsuccessful) practice as a basis for discussion as to how successful practice might be emulated and disasters avoided. What has always taxed me has been how information derived from storytelling can be structured in such a way as to produce valid research findings. It took an experienced group of postgraduate and postdoctoral students who had planned their research on narrative inquiry lines to sort me out and to explain precisely what was involved. I was not even sure what 'narrative inquiry' actually

meant and so, always believing the best way to find out is to ask an expert, I asked one member of the group, Dr Janette Gray, to tell me. She wrote as follows:

It involves the collection and development of stories, either as a form of data collection or as a means of structuring a research project. Informants often speak in a story form during the interviews, and as the researcher, listening and attempting to understand, we hear their 'stories'. The research method can be described as narrative when data collection, interpretation and writing are considered a 'meaning-making' process with similar characteristics to stories (Gudmundsdottir 1996: 295). Narrative inquiry can involve reflective autobiography, life story, or the inclusion of excerpts from participants' stories to illustrate a theme developed by the researcher. A narrative approach to inquiry is most appropriate when the researcher is interested in portraying intensely personal accounts of human experience. Narratives allow voice - to the researcher, the participants and to cultural groups - and in this sense they can have the ability to develop a decidedly political and powerful edge. (Gray 1998: 1)

Colleagues to whom I had earlier spoken and who had successfully adopted a narrative inquiry approach to one or more of their research projects had always made it clear that stories were not used merely as a series of 'story boxes' piled on top of one another and with no particular structure or connecting theme. The problem I had was in understanding how such structures and themes could be derived. Jan's explanation was as follows:

All forms of narrative inquiry involve an element of analysis and development of themes, dependent on the researcher's perspective. Stories share a basic structure. The power of a story is dependent on the storyteller's use of language to present an interpretation of personal experience. The skill of the narrative researcher lies in the ability to structure the inter-view data into a form which clearly presents a sense of a beginning, middle and an end. Even though the use of story as a research tool is a relatively new concept in the social sciences, historically story has been an accepted way of relating knowledge and developing self-knowledge. One of the major strengths of such a means of conducting inquiry is the ability to allow readers who do not share a cultural background similar to either the storyteller or the researcher to develop an understanding of motives and consequences of actions described within a story format. Narrative is a powerful and different way of knowing....

Data collection for narrative research requires the researcher to allow the storyteller to structure the conversations, with the researcher asking follow-up questions. So a narrative approach to the question of how mature-age under-graduates perceive their ability to cope with the experience of returning to study would involve extended, open-ended interviews with one or two mature-aged students. This would allow the students to express their personal experience of the problems, frustrations and joys of returning to study. It might also involve similar 'conversations' with other stakeholders in their education - perhaps family members; their tutors and lecturers - to provide a multiple perspective of the context of the education of mature-aged undergraduates. (Gray 1998: 2)

Jan added that 'the benefit of considerate and careful negotiation will be a story allowing an incredibly personal and multi-faceted insight into the situation being

discussed'. I am sure this is so. I have become convinced of the value of this approach and that stories can in some cases serve to enhance understanding within a case study or an ethnographic study. However, narratives can present their own set of problems:

Interviews are time-consuming and require the researcher to allow the storytellers to recount in their own way the experience of being (or teaching) a student. This may not emerge in the first interview. Until a trust relationship has developed between researcher and storyteller, it is highly unlikely that such intimate information will be shared. Such personal involvement with the researcher involves risks and particular ethical issues. The storytellers may decide they have revealed more of their feelings than they are prepared to share publicly and they may insist either on substantial editing or on with-drawing from the project. (Gray 1998: 2)

Problems of this kind can arise in almost any kind of research, particularly those which are heavily dependent on interview data, but the close relationship needed for narrative inquiry can make the researcher (and the storyteller) particularly vulnerable.

The fact that the narrative approach carries with it numbers of potential difficulties, particularly for first-time researchers, and researchers operating within a particularly tight schedule, certainly does not mean that it should be disregarded when considering an appropriate approach to the topic of your choice. Far from it - but as is the case with all research planning, I feel it would be as well to discuss the issues fully with your supervisor before deciding what to do, and if possible to try to find a supervisor who is experienced, or at least interested in narrative inquiry.

Which approach?

Classifying an approach as ethnographic, qualitative, experimental, or whatever, does not mean that once an approach has been selected, the researcher may not move from the methods normally associated with that style. But understanding the major advantages and disadvantages of each approach is likely to help you to select the most appropriate methodology for the task in hand. This chapter covers only the very basic principles associated with the different styles or approaches to research which will suffice - at any rate until you have decided on a topic and considered what information you need to obtain.

Further reading is provided at the end of this chapter. As far as possible, I have tried to indicate books and journals which should be available in academic libraries. However, always consult the library catalogue. If there is an on-line facility, the librarian will show you how the system operates. Then take advantage of what the library has in stock or is able to obtain from another library in the area - preferably without cost. Borrowing books through the interlibrary loan system can be quite expensive - and it can be slow.

(Doing your research project by Judith Bell)

Statistical Inference

4.1 The problem

Until now we have been considering how to describe or summarise a set of **data** considered simply as an object in its own right. Very often we want to do more than this: we wish to use a collection of observed values to make **inferences** about a larger set of **potential** values; we would like to consider a particular set of **data** we have **obtained** as representing a larger class. It turns out that to accomplish this is by no means **straightforward**. What is more, an exhaustive treatment of the difficulties **involved** is beyond the **scope** of this book. In this **chapter** we can only provide the reader with a general outline of the problem of making **inferences** from observed values. A full understanding of this exposition will depend to some degree on familiarity with the content of later **chapters**. For this reason we suggest that this **chapter** is first read to **obtain** a general grasp of the problem, and returned to later for re-reading in the light of subsequent **chapters**.

We will **illustrate** the problem of **inference** by introducing some of the cases which we will **analyse** in greater detail in the **chapters** to come. One, for example, in **chapter 8**, concerns the size of the comprehension vocabulary of British children between 6 and 7 years of age. It is **obviously** not possible, for practical reasons, to test all British children of this age. We simply will not have the **resources**. We can only test a sample of children. We have learned, in **chapters 2 and 3**, how to make an **adequate** description of an observed group, by, for example, **constructing** a histogram or calculating the mean and standard **deviation** of the vocabulary sizes of the subset of children **selected**. But our interest is often broader than this; we would like to know the mean and standard **deviation** which *would* have been **obtained** by testing all children of the **relevant** age. How close would these have been to the mean and standard **deviation** actually observed? This will depend on the relationship we expect to hold between the group we have **selected** to measure and the larger group of children from which it has been **selected**. How far can we **assume** the characteristics of this latter group to be **similar** to those of the smaller group which has been observed? This is the **classical** problem of **statistical inference**: how to **infer** from the properties of a part the likely properties of the whole. It will turn up repeatedly from now on. It is worth **emphasising** at the outset that because of the way in which samples are **selected** in many studies in linguistics and applied linguistics, it is often simply not possible to generalise beyond the samples. We will return to this difficulty.

4.2 Populations

A **population** is the largest class to which we can generalise the results of an **investigation** based on a subclass. The population of interest (or **target population**) will **vary** in type and magnitude depending on the aims and **circumstances** of each different study or **investigation**. Within the limits set by the study in question, the population, in **statistical** terms, will always be considered as the set of *all possible* values of a **variable**. We have already referred to one study which is concerned with the vocabulary of 6-7-year-olds. The **variable** here is scores on a test for comprehension vocabulary size; the population of interest is the set of all possible values of this **variable** which could be **derived** from all 6-7-year-old children in the country. There are two points which should be **apparent** here. First, although as **investigators** our **primary** interest is in the **individuals** whose behaviour we are measuring, a **statistical population** is to be thought of as a set of values; a mean

vocabulary size calculated from a sample of observed values is, as we shall see in chapter 7, an estimate of the mean vocabulary size that would be obtained from the complete set of values which form the target population. The second point that should be apparent is that it is often not straightforward in language studies to define the target population. After all, the set of '6-7-year-old children in Britain', if we take this to refer to the period between the sixth and seventh birthdays, is changing daily; so for us to put some limit on our statistical population (the set of values which would be available from these children) we have to set some kind of constraint. We return to this kind of problem below when we consider sampling frames. For the moment let us consider further the notion of 'target' or 'intended' population in relation to some of the other examples used later in the book.

Utterance length. If we are interested in the change in utterance length over time in children's speech, and collect data which sample utterance length, the statistical population in this case is composed of the length values of the individual utterances, not the utterances themselves. Indeed, we could use the utterances of the children to derive values for many different variables and hence to construct many different statistical populations. If instead of measuring the length of each utterance we gave each one a score representing the number of third person pronouns it contained, the population of interest would then be 'third person pronoun per utterance scores'.

Voice onset time (VOT). In the study first referred to in chapter 1, Macken & Barton (1980a) investigated the development of children's acquisition of initial stop contrasts in English by measuring VOTs for plosives the children produced which were attempts at adult voiced and voiceless stop contrasts. The statistical population here is the VOT measurements for /p, b, t, d, k and g/ targets, not the phonological items themselves. Note once again that it is not at all easy to conceptualise the target population. If we do not set any limit, the population (the values of all VOTs for word-initial plosives pronounced by English children) is infinite. It is highly likely, however, that the target population will necessarily be more limited than this as a result of the circumstances of the investigation from which the sample values are derived. Deliberate constraints (for example a sample taken only from children of a certain age) or accidental ones (non-random sampling - see below) will either constrain the population of interest or make any generalisation difficult or even impossible.

Tense marking. In the two examples we have just looked at, the population values can vary over a wide range. For other studies we can envisage large populations in which the individual elements can have one of only a few, or even two, distinct values. In the Fletcher & Peters (1984) study (discussed in chapter 7) one of the characteristics of the language of children in which the investigators were interested was their marking of lexical verbs with the various auxiliaries and/or suffixes used for tense, aspect and mood in English. They examined frequencies of a variety of individual verb forms (modal, past, present, do-support, etc.). However, it would be possible to consider, for example, just past tense marking and to ask, for children of a particular age, which verbs that referred to past events were overtly marked for past tense, and which were not. So if we looked at the utterances of a sample of children of 2;6, we could assign the value 1 to each verb marked for past tense, and zero to unmarked verbs. The statistical population of interest (the values of the children's past referring verbs) would similarly be envisaged as consisting of a large collection of elements, each of which could only have one or the other of these two values.

A population then, for **statistical** purposes, is a set of **values**. We have **emphasised** that in linguistic studies of the kind represented in this book it is not always easy to **conceptualise** the population of interest. Let us **assume** for the moment, however, that by various means we succeed in **defining** our **target** population, and return to the problem of **statistical inference** from another direction. While we may be **ultimately** interested in populations, the values we observe will be from samples. How can we **ensure** that we have reasonable grounds for claiming that the values from our sample are **accurate estimates** of the values in the population? In other words, is it possible to **construct** our sample in such a way that we can legitimately make the **inference** from its values to those of the population we have determined as being of interest? This is not a question to which we can **respond** in any detail here. Sampling **theory** is itself the subject of many books. But we can **illustrate** some of the difficulties that are likely to arise in making generalisations in the kinds of studies that are used for exemplification in this book, which we believe are not untypical of the field as a whole.

Common sense would suggest that a sample should be representative of the population, that is, it should not, by overt or covert **bias**, have a **structure** which is too different from the **target** population. But more **technically** (remembering that the **statistical** population is a set of values), we need to be sure that the values that **constitute** the sample somehow reflect the **target statistical** population. So, for example, if the possible **range** of values for length of utterance for 3-year-olds is 1 to 11 morphemes, with larger utterances possible but very unusual, we need to **ensure** that we do not introduce **bias** into the sample by only collecting **data** from a conversational setting in which an excessive number of *yes-no* questions are addressed to the child by the interlocutor. Such questions would tend to increase the probability of utterance lengths which are very short - **minor** utterances like *yes*, *no*, or short sentences like *I don't know*. The difficulty is that this is only one kind of **bias** that might be introduced into our sample. Suppose that the interlocutor always asked open-ended questions, like *What happened?* This might increase the probability of longer utterances by a child or children in the sample. And there must be **sources of bias** that we do not even contemplate, and cannot control for (even **assuming** that we can control for the ones we *can* contemplate) ¹.

Fortunately there is a **method** of sampling, known as **random sampling** that can overcome problems of overt or covert **bias**. What this term means will become clearer once we know more about probability. But it is important to understand from the outset that '**random**' here does not mean that the events in a sample are haphazard or completely lacking in order, but rather that they have been **constructed** by a **procedure** that allows every **element** in the population a known probability of being selected in the sample.

While we can never be entirely sure that a sample is representative (that it has roughly the characteristics of the population **relevant** to our **investigation**), our best defence against the introduction of experimenter **bias** is to follow a **procedure** that **ensures random** samples (one such **procedure** will be described in **chapter 5**). This can give us reasonable confidence that our **inferences** from sample values to population values are **valid**. **Conversely**, if our sample is not **constructed** according to a **random procedure** we *cannot* be confident that our **estimates** from it are likely to be

close to the population values in which we are interested, and any generalisation will be of a dubious nature.

How are the samples **constructed** in the studies we consider in this book? Is generalisation possible from them to a **target** population?

4.3 The **theoretical solution**

It will perhaps help us to answer these questions if we introduce the **notion** of a **sampling frame** by way of a non-linguistic example. This will **incidentally clarify** some of the difficulties we saw earlier in attempts to **specify** populations.

Suppose **researchers** are interested in the birth weights of children born in Britain in 1984 (with a view **ultimately** to comparing birth weights in that year with those of 1934). As is usual with any **investigation**, their **resources** will only allow them to collect a subset of these measurements - but a fairly large subset. They have to decide where and how this subset of values is to be collected. The first decision they have to make concerns the **sources** of their information. Maternity hospital records are the most **obvious** choice, but this leaves out babies born at home. Let us **assume** that health visitors (who are **required** to visit all new-born children and their mothers) have **accessible** records which can be used. What is now **required** is some well-motivated limits on these records, to **constitute** a sampling frame within which a **random** sample of birth weights can be **constructed**.

The most common type of sampling frame is a list (actual or **notional**) of all the subjects in the group to which generalisation is intended. Here, for example, we could **extract** a list of all the babies with birth-dates in the **relevant** year from the records of all health visitors in Great Britain. We could then choose a simple **random** sample (**chapter 5**) of n of these babies and note the birth weights in their record. If n is large, the mean weight of the sample should be very **similar** (**chapter 7**) to the mean for all the babies born in that year. At the very least we will be able to say how big the discrepancy is likely to be (in terms of what is known as a 'confidence **interval**' - see **chapter 7**).

The problem with this solution is that the **construction** of the sampling frame would be extremely time-consuming and costly. Other **options** are **available**. For example, a sampling frame could be **constructed** in two or more stages. The country (Britain) could be divided into large **regions**, Scotland, Wales, North-East, West Midlands, etc., and a few **regions** chosen from this **first stage sampling frame**. For each of the **selected regions** a list of Health Districts can be drawn up (**second stage**) and a few Health Districts chosen, at **random**, from each **region**. Then it may be possible to look at the records of all the health visitors in each of the chosen Districts or perhaps a sample of visitors can be chosen from the list (**third stage**) of all health visitors in each district.²

The **major constraint** is of course **resources** - the time and money **available** for **data** collection and **analysis**. In the light of this, sensible decisions have to be made about, for example, the number of Health Districts in Britain to be included in the frame; or it may be necessary to limit the inquiry to children born in four months in the year instead of a complete year. In this example, the sampling frame **mediates** between

the population of interest (which is the birth weights of all children born in Britain in 1984) and the sample, and allows us to generalise from the sample values to those in the population of interest.

If we now return to an earlier linguistic example, we can see how the sampling frame would enable us to link our sample with a population of interest. Take word-initial VOTs. Our interest will always be in the individuals of a relatively large group and in the measurements we derive from their behaviour. In the present case we are likely to be concerned with English children between 1;6 and 2;6, because this seems to be the time when they are learning to differentiate voiceless from voiced initial stops using VOT as a crucial phonetic dimension. Our resources will be limited. We should, however, at least have a sampling frame which sets time limits (for instance, we could choose for the lower limit of our age-range children who are 1;6 in a particular week in 1984) ; we would like it to be geographically well-distributed (we might again use Health Districts) ; within the sampling frame we must select a random sample of a reasonable size.³

That is how we might go about selecting children for such a study. But how are language samples to be selected from a child? Changing the example, consider the problem of selecting utterances from a young child to measure his mean length of utterance (mlu - see chapter 13). Again it is possible to devise a sampling frame. One method would be to attach a radio microphone to the child, which would transmit and record every single utterance he makes over some period of time to a tape-recorder. Let us say we record all his utterances over a three-month period. We could then attach a unique number to each utterance and choose a simple random sample (chapter 5) of utterances. This is clearly neither sensible nor feasible - it would require an unrealistic expenditure of resources. Alternatively, and more reasonably, we could divide each month into days and each day into hours, select a few days at random and a few hours within each day and record all the utterances made during the selected hours. (See Wells 1985 : chapter 1 , for a study of this kind.) If this method of selection were to be used it would be better to assume that that child is active only between, say, 7 am. and 8 p.m. and select hours from that time period.

In a similar way, it will always be possible to imagine how a sampling frame could be drawn up for any finite population if time and other resources were unlimited. The theory which underlies all the usual statistical methods assumes that, if the results obtained from a sample are to be generalised to a wider population, a suitable sampling frame has been established and the sample chosen randomly from the frame. In practice, however, it is frequently impossible to draw up an acceptable sampling frame - so what, then, can be done?

4.4 The pragmatic solution

In any year a large number of linguistic studies of an empirical nature are carried out by many researchers in many different locations. The great majority of these studies will be exploratory in nature; they will be designed to test a new hypothesis which has occurred to the investigator or to look at a modification of some idea already studied and reported on by other researchers. Most investigators have very limited resources and, in any case, it would be extravagant to carry out a large and expensive study unless it was expected to confirm and give more detailed information on a hypothesis

which was likely to be true and whose implications had deep scientific, social or economic significance. Of necessity, each investigator will have to make use of the experimental material (including human subjects) to which he can gain access easily. This will almost always preclude the setting up of sampling frames and the random selection of subjects.

At first sight it may look as if there is an unbridgeable gap here. Statistical theory requires that sampling should be done in a special way before generalisation can be made formally from a sample to a population. Most studies do not involve samples selected in the required fashion. Does this mean that statistical techniques will be inapplicable to these studies? Before addressing this question directly, let us step back for a moment and ask what it is, in the most general sense, that the discipline of statistics offers to linguistics if its techniques are applicable.

What the techniques of statistics offer is a common ground, a common measuring stick by which experimenters can measure and compare the strength of evidence for one hypothesis or another that can be obtained from a sample of subjects, language tokens, etc. This is worth striving after. Different studies will measure quantities which are more or less variable and will include different numbers of subjects and language tokens. Language researchers may find several different directions from which to tackle the same issue. Unless a common ground can be established on which the results of different investigations can be compared using a common yardstick it would be almost impossible to assess the quality of the evidence contained in different studies or to judge how much weight to give to conflicting claims.

Returning to the question of applicability, we would suggest that a sensible way to proceed is to accept the results of each study, in the first place, as though any sampling had been carried out in a theoretically 'correct' fashion. If these results are interesting - suggesting some new hypothesis or contradicting a previously accepted one, for example - then is time enough to question how the sample was obtained and whether this is likely to have a bearing on the validity of the conclusions reached. Let us look at an example.

In chapter 11 we discuss a study by Hughes & Lascaratou (1981) on the gravity of errors in written English as perceived by two different groups: native English-speaking teachers of English and Greek teachers of English. We conclude that there seems to be a difference in the way that the two groups judge errors, the Greek teachers tending to be more severe in their judgements. How much does this tell us about possible differences between the complete population of native-speaking English teachers and Greek teachers of English? The results of the experiment would carry over to those populations - in the sense to be explained in the following four chapters - if the samples had been selected carefully from complete sampling frames. This was certainly not done. Hughes and Lascaratou had to gain the cooperation of those teachers to whom they had ready access. The formally correct alternative would have been prohibitively expensive. However, both samples of teachers at least contained individuals from different institutions. If all the English teachers had come from a single English institution and all the Greek teachers from a single Greek school of languages then it could be argued that the difference in error gravity scores could be due to the attitudes of the institutions rather than the nationality of the teachers. On the other hand, all but one of the Greek teachers

worked in Athens (the English teachers came from a wider selection of backgrounds) and we might query whether their attitudes to errors might be different from those of their colleagues in different parts of Greece. Without testing this argument it is impossible to refute it, but on common sense grounds (i.e. the 'common sense' of a researcher in the teaching of second languages) it seems unlikely.

This then seems a reasonable way to proceed. Judge the results *as though* they were based on random samples and then look at the possibility that they may be distorted by the way the sample was, in fact, obtained. However, this imposes on researchers the inescapable duty of describing carefully how their experimental material - including subjects - was actually obtained. It is also good practice to attempt to foresee some of the objections that might be made about the quality of that material and either attempt to forestall criticism or admit openly to any serious defects.

When the subjects themselves determine to which experimental group they belong, whether deliberately or accidentally, the sampling needs to be done rather more carefully. An important objective of the Fletcher & Peters (1984) study mentioned earlier was to compare the speech of language-normal with that of language-impaired children. In this case the investigators could not randomly assign children to one of these groups - they had already been classified before they were selected. It is important in this kind of study to try to avoid choosing either of the samples such that they belong obviously to some special subgroup.

There is one type of investigation for which proper random sampling is absolutely essential. If a reference test of some kind is to be established, perhaps to detect lack of adequate language development in young children, then the test must be applicable to the whole target population and not just to a particular sample. Inaccuracies in determining cut-off levels for detecting children who should be given special assistance have economic implications (e.g. too great a demand on resources) and social implications (language-impaired children not being detected). For studies of this nature, a statistician should be recruited before any data is collected and before a sampling frame has been established.

With this brief introduction to some of the problems of the relation between sample and population, we now turn in chapter 5 to the concept of probability as a crucial notion in providing a link between the properties of a sample and the structure of its parent population. In the final section of that chapter we outline a procedure for random sampling. Chapter 6 deals with the modelling of statistical populations, and introduces the normal distribution, an important model for our purposes in characterising the relation between sample and population.

¹ We have passed over here an issue which we have to postpone for the moment, but which is of considerable importance for much of the research done in language studies. Imagine the case where the population of interest is utterance lengths of British English-speaking pre-school children. We have to consider whether it is better to construct a sample which consists of many utterances from a few children, or one which consists of a small number of utterances from each of many children. We will return to this question, and the general issue of sample size, in chapter 7.

² The **analysis** of the **data** gathered by such **complex** sampling **schemes** can become quite complicated and we will not deal with it in this book. Interested readers should see **texts** on **sampling theory** or **survey design** or **consult** an experienced survey statistician.

³ The **issues** raised in the first footnote crop up again here; measurements on linguistic **variables** are more **complex** than birth weights. We could again ask whether we should collect many word-initial plosives from few children, or few plosives from many children (see **chapter 7**). A **similar** problem arises with the sample chosen by several stages. Is it better to choose many **regions** and a few Health Districts in each **region** or vice versa?

SUMMARY

In this **chapter** the basic problem of the **sample-population** relationship has been discussed.

1. A **statistical population** was **defined** as a set of all the values which might ever be included in a particular study. The **target population** is the set to which generalisation is intended from a study based on a sample.
2. Generalisation from a sample to a population can be made formally only if the sample is collected **randomly** from a **sampling frame** which allows each **element** of the population a known chance of being **selected**.
3. The point was made that, for the **majority** of linguistic **investigations**, **resource constraints** prohibit the collection of **data** in this way. It was argued that **statistical theory** and **methodology** still have an important **role** to play in the planning and **analysis** of language studies.

(Statistics in Language Studies by Anthony Woods, Paul Fletcher & Arthur Hughes)

Overseas Students in Higher Education

The United Kingdom's higher education system has changed **dramatically** during the past **decade**. Government has decreed that the life and work of universities and colleges should become increasingly accountable to public scrutiny. The system must **demonstrate** that public funds are used responsibly and effectively to **promote** high quality teaching and **research**. Increasingly **funding** for both **research** and teaching is being **linked** to the quality of provision. **Institutions** are being encouraged to **rely** less **exclusively** upon **funding sourced** from taxation and to **seek** other means of raising their **income** by becoming more entrepreneurial within the wider educational marketplace.

It is the pressures upon higher education which, in part, provide the impetus for this book. One of the **distinctive** ways in which **institutions** are aiming to **expand** their activities and increase their **income** is by developing **significantly** the courses that they offer for **overseas** students. There have been **dramatic** increases in the numbers of undergraduate and postgraduate **overseas** students within the system. As this **aspect** of university and college activity has burgeoned it has become **apparent** that the quality of the teaching and learning offered to **overseas** students must be **maintained** and **enhanced** and also become subject to audit. The central aim of this

book is to draw upon the developing literature, expertise and experience which focus upon the delivery of courses for overseas students and to offer a useful resource for those academic staff who have a measure of responsibility for teaching and sustaining the quality of overseas students' learning experiences. In addition, it is hoped that the book will be of interest to overseas students who are contemplating or embarking upon programmes of study in the United Kingdom.

The expansion in overseas students numbers has been noteworthy during the past decade. In 1973 there were 35,000 international students in HIEs in the UK. This was followed by a decline in the early 1980s, and by dramatic growth in the early 1990s so that by 1992 numbers had risen to 95,000 (CVCP 1995a: 2.2). This increase can be accounted for by a decline in the real cost of courses for overseas students, steady per capita growth in the principal consuming countries, and the expansion of the student base in UK institutions (ibid.). Currently one third of overseas students are postgraduates, and international students are concentrated in three main academic areas: Engineering, Technology, Social Science, and Business and Finance (ibid: 2.3).

Within the global context (setting aside the USA's dominant 70 per cent share) the UK is a major player in the provision of courses for overseas students and has 17 per cent of the total overseas student population, with one third from the European Union (CVCP 1995a: 5.3). It should be noted that it is predicted that the global supply of overseas student places will increase, and expected that the UK will endeavour to expand its volume in response to constraints in home student numbers, the higher fees international students command and the move to increase postgraduate numbers (ibid: 5.5).

Overseas students are having a significant impact upon the economies of UK higher education institutions. In broad terms their economic impact arises from the export of educational services from the UK so that student fees and expenditure represent an injection into the circular flow of income (CVCP 1995a: 3.2-3.3); even discounting EU students, funded at undergraduate level and paid for by the UK Treasury, the value of fees of fully funded overseas students was £310 million in 1992-3 (ibid: 3.31). In addition, their expenditure on UK-produced goods and services is estimated to be at least £405 million in 1992-3 (ibid.: 3.32). In total this sums to twice the value of UK exports of coal, gas and electricity in the same year (ibid: 3.33). In terms of the benefit to institutions themselves, on average 5.1 per cent of 'old' university income depends on international students and 2.2 per cent in 'new' universities. There are also, of course, non-economic benefits arising from overseas student provision such as the promotion of the English language and culture and fostering understanding between races. In such circumstances it is hardly surprising that the government is keen to promote the export of educational services as a means of promoting economic growth (see for example DTI 1995).

According to a wide ranging recent survey, the main reasons why overseas students decide to study in the UK rather than anywhere else are: that the English Language is spoken; UK qualifications are recognised by the home government and companies; the standard and quality of education in the UK; the international reputation of UK education; the presence of well known universities; and that students are already used to the English system of education (Allen and Higgins 1994: 22, table 20). The

two main reasons they decided to go to their current institution rather than elsewhere in the UK were the academic reputation of the institution (for 27.8 per cent) and the content of the course (for 20.8 per cent) (ibid: 39, table 27).

Given the importance that overseas students attach to the quality of UK institutions and the courses they offer, it is essential that quality is maintained. There have, however, in recent years been concerns that the rapid expansion in overseas courses could have an effect upon quality. For instance an editorial in the Times Higher Education Supplement (1994) opined that there was a danger that the recruitment of overseas students was being driven too much by the pursuit of money to support an under-funded system and too little by genuine educational considerations. The need to maintain quality has been recognised within the system and the Committee of Vice-Chancellors and Principals (CVCP) has recently issued a relevant Code of Practice (CVCP 1995b). The introduction by the Chairman of the CVCP demonstrates higher education's determination to maintain high standards and quality control. As he says: 'The Committee of Vice-Chancellors and Principals seeks to encourage the commitment of institutions to providing value for the investment made by and on behalf of their international students by developing and applying consistent procedures in the recruitment and support of such students.'

It is evident that higher education institutions must pay particular attention to the quality of the teaching and learning which they offer for overseas students. With the establishment of a quality assurance system which ensures that higher education teaching is scrutinised on a regular basis and that external assessors' ratings are published (see for example HEFCE 1996; HEQC 1995), institutions have become very much more aware of the importance of teaching and concerned to enhance academic staff expertise in this crucial aspect of their roles. Many institutions now provide formal training in teaching methods and linked higher education teaching qualifications for their staff (SEDA 1996), and have established staff and educational development units to offer appropriate advice and support. There is an ever growing body of literature which brings together the pertinent research and expertise on teaching and learning in higher education and offers academic staff a valuable resource (see for example Brown and Atkins 1988; CVCP 1992a; Ramsden 1992; Wilkin 1995). There is, however, within the available corpus very little mention of overseas students and the special problems they present when studying in the UK environment (but see Makepeace 1989; and Ballard and Clancy 1991 for an Australian example). It is an apposite time, therefore, to make available for the wider academic community the burgeoning body of information on teaching and learning which has a direct bearing upon overseas students studying in the UK higher education system. This book comprises invited chapters from colleagues who have experience and a particular interest in working with overseas students. The aim is not to supply 'tips for teachers' but rather to bring to tutors' attention theoretical perspectives, empirical studies, informing principles and experience which have a bearing upon overseas students' learning in the UK as the host country. It is hoped that the information will help sensitise academic staff to the problems encountered by both students and tutors and also offer interpretive frameworks which will aid reflection upon practice and develop proposals for improving practice.

In education there is no easy distinction between an entity known as 'theory' and another referred to as 'practice'. Theory should have some bearing upon the 'real

world' of practice and our actual practices are always informed by either covert or overt **theoretical assumptions**. As we all know, there is nothing so practical as a good **theory**. The **contributors** to the book have, depending upon their substantive subject matter and the manner in which they treat their topics, given different emphases to **theoretical** and practical matters. We have used this consideration as the **principle** for arranging the **sequence** of **chapters**. We begin with those that place a greater **stress** upon **policy issues** which may inform and guide educational practices and we move on to those which give a greater **emphasis** to practical considerations. We divide the **chapters** up into two **sections**, Part I, 'Principles: **perspectives** and **orientation**' and Part II, 'Practice: supporting learning', but we are well **aware** that the division between them is **somewhat arbitrary**.

(Overseas students in higher education by David McNamara and Robert Harris)

Teaching English with Video

So far we have discussed what there is in the way of video **equipment** and materials and we have looked at how we can use the machine. It's time now to turn our attention to how video can fit into our teaching as a whole. This **chapter** examines reasons for using video in language teaching and considers when and how we could introduce it into the syllabus and into the lesson.

Video is not the only resource we have at our **disposal** in the language classroom. It takes its place among a **range** of other **aids** we use quite regularly, so we have to decide what its strengths are. What does it do particularly well in the **context** of language teaching?

If your students want to study spoken English, you will spend part of the time in the classroom working on examples of the spoken language. Most language courses use dialogue or a narrative to present the language of the unit. We use examples in the textbook, and often on audio, which gives them the greater realism of different voices and sound effects. When, with video, we can add moving pictures to the soundtrack, the examples of language in use become even more realistic. These examples are more **comprehensive** too, because they put before us the ways people **communicate visually** as well as verbally. So video is a good means of bringing 'slices of living language' into the classroom.

In many language classrooms today there are times when we want to get our students talking to us and to each other. We want to give them the opportunity to put their own language into practice in a genuine effort to **communicate**. So we look for situations where our learners will really have something they want to say to each other. The right video material can do this in a **range** of ways: its vivid presentation of settings and characters can be used to set the scene for **roleplay**; it can present a case with such **impact** that it sparks off fierce **debate**; we all make our own **interpretations** of what we see and so video can be a stimulus to genuine **communication** in the classroom by bringing out different opinions within the group.

We all send and receive **visual** signals when we talk to each other. These help us decipher what is being **communicated**. It must therefore help learners when they listen to a foreign language if they can see as well as hear what is going on. And

video's moving pictures also help learners **concentrate** because they provide a **focus** of attention while they listen. Both these forms of support suggest that video is a good **medium** for extended listening to the foreign language. The more **exposure** learners have to the language, the better they are likely to learn it. In some situations, the classroom is the only place learners can hear the foreign language spoken, so video becomes a means of giving them a 'language bath' in the classroom.

In our homes we associate the small screen with entertainment. We expect to enjoy the experience of viewing. Learners bring the same expectations to the experience of viewing video in the classroom and we can encourage this **positive attitude** by using video in a **flexible** way. It is a **medium** of great variety, with a wealth of different kinds of software which we can use to ring the changes in our teaching. This book suggests many ways in which we can use video in a different way to viewing television. We can also at times use it just like television. Video helps us provide a richer and more **varied language environment** within which learning can take place. The combination of variety, interest and entertainment we can **derive** from video makes it an **aid** which can help develop **motivation** in learners.

The **integration** of video into your syllabus will depend on the kind of video installation you have. If you have video playback **available** in your classroom whenever you want it, along with a good choice of materials, you can afford to use it in a variety of ways. In some lessons you might use it for five minutes. In others it could be the springboard for a two-hour session. If you only have **access** to the machine once a month in a special video room, you will want to make it the centre of attention for that session. Whatever **access** you have, it is much better to plan video sessions into the syllabus. If it is left as an **optional** extra, it's too easy to forget about it or to decide not to bother. It helps everyone get started if there are notes **indicating** where and how video materials would fit into the syllabus.

On what basis can this syllabus **integration** be organised? There isn't always an **obvious link** between the materials you have and the syllabus in use.

The **link** through language is the most **obvious** and most **straightforward** one to make if your syllabus is based on linguistic **items** such as language **structures** or **functions**. **Published** materials for ELT normally reflect **trends** in language teaching and the current language-**focussed series** can generally be **linked** to the syllabus through the language **functions** or **structures** they present. In non-ELT materials you can look for situations which are likely to **feature** highly **predictable** language: scenes set in restaurants or shops, at parties, the reception desk or the dining table can sometimes be picked out of a longer programme and used in **isolation** to give an example of particular language **functions** in operation. (However you might be surprised at how often these settings don't include the language you expect to hear.)

Once you've found a video **sequence** you could use to present **specific** language **items**, you then have to decide when you will introduce it in your teaching of a unit. There are several possibilities:

- it could be used to present language - either for the introduction of new **areas** of language or to **supplement** what has been taught by other means and methods;

- it could be used to check whether students are already familiar with the language and can use it confidently, to help the teacher diagnose problems;
- it could be used to stimulate learners to produce the language themselves through **roleplay** or discussion.

We return to these uses in the last part of this **chapter**, when we look in detail at **roles** for video in the lesson.

Topics are a **feature** of some language syllabuses. A unit of work might be based around a **topic** like ecology or the leisure interests of young people in Britain or the education systems of different countries. A video programme about the same **topic** could be a welcome addition to that unit. It could put a different **perspective** on the **topic**; it could introduce new information; it could invite comparison of the ways the same subject can be treated in different **media** or from different points of view.

Another way of **linking** through **topic** is by means of subject matter introduced in the textbook for language practice. For example, talking about the **jobs** people do is often used to practise describing daily routines. There may be video materials on your shelves showing people at work which you could use to extend practice of this kind. An exercise in describing places could be based on a video **sequence** which showed a particular town. All of this uses video to introduce variety and interest to classroom work.

Your syllabus may include slots for the development of certain skills such as listening to **lectures** or writing reports. You could think of using video material occasionally as an **input** to these activities. A video recording of a meeting could give practice in taking notes of main points. A documentary programme could form the basis for discussion in the weekly slot for **communicative** activities. Viewing an interesting story **requires** the exercise of listening skills.

You do not always have to have a **specific link** to other **items** on the syllabus. Some sets of video material are self-contained and come with their own activities: a serial story, a training **series** for management skills, a set of business meetings. Any of these could **create** their own regular slot on the timetable: a Sherlock Holmes story once a month, perhaps, or a weekly session for the Business English group to view the next episode of Bid for Power. **Alternatively** a **range** of different video materials could be used in a **period** earmarked for video. The important thing is that the slot be timetabled in, so that even where video provision is very limited, everyone is encouraged to think about how they can use what there is.

This brings us on to thinking about how you can **integrate** video into your lesson. The rest of this **chapter** looks at how you might do this, using examples from a **range** of video materials, ELT and non-ELT. The Video Plans in this **chapter** are taken from Teacher's Guides and other print support produced for **published** video materials. Although the suggestions are for a **specific** piece of video, they have been **selected** because the ideas are transferrable to other materials.

Is video better suited to one stage of a lesson rather than another? With materials **designed to highlight** language **items**, we have an **indication** of how materials **designers approach** the question of video's **role** in the lesson.

I will look at this in relation to the traditional stages of a language lesson, presentation, practice, reinforcement, and to the elicitation stage some teachers introduce before presentation.

(a) Video for elicitation

There are times when you want to encourage talk within the classroom group, with students drawing on their own language resources to express thoughts they want to communicate. There are also times when you need to find out how much your students know or can do with language. You may have a new group for whom you have to work out a syllabus, or you may want to check to see whether a revision session is necessary or not. For all of these reasons you may want to hear your students talking with as little prompting as possible from you. Students often find that their ability to produce language which is appropriate for a particular situation is less than they had expected. The technique of getting them to supply the missing dialogue after a silent viewing of a scene provides a good opportunity for you and them to find out what language they have at their command and how flexibly they can use it. When this is your purpose you might use a short sequence for as little as five or ten minutes at the beginning of a lesson.

(b) Video at the presentation stage

In a sense all video material is presenting examples of language. I use the term here in the language teaching sense of the presentation of new language items which will be the focus for the next unit of work. How appropriate is video for this stage of a unit? In language teaching we are accustomed to using dialogues which present very restricted examples of language. This is acceptable in the textbook, and can even be made to work on audio, but it is more difficult when we can see real people in a real setting on video. The scene looks awkward and unconvincing if the language is so controlled and repetitive that the interaction becomes quite unnatural. Because of this the language in video materials, even for elementary level, tends to be a little more varied than it would be in the textbook. Most ELT series are intended to supplement what is in the textbook not to replace it and they are intended to be used to consolidate the learning of language that has already been presented in another form.

The Follow Me course is one which does aim to introduce new language items through video. This is done within the programme itself by using very restricted examples of language and by recycling these examples through the programme and through the course in a range of different short scenes. The fact that Follow Me was designed for broadcast meant that it had to do its own presentation, as it were, for home viewers. A teacher with a video machine in the classroom has the choice of when to use video material and could for example use a sequence with an appropriate setting to establish a context before new language items are introduced.

It's very unlikely that video will be your only means of presenting language so you do have a choice. Assuming that all the materials you have are equally suitable for your students, the main distinguishing feature of the video materials is likely to be that they provide the most realistic examples of the language in use. Your choice therefore could be boiled down to whether you want to start with the 'real thing' on video, as an

example of what the unit is about, or whether you want to keep the most realistic example for later, to reinforce what has gone before.

(c) Video used for reinforcement

This is a good use of video because it capitalises on video's naturalism to present more realistic examples of language, and the visual support video offers can lighten the additional language load. Video Plan 6 on page 53 is taken from materials intended to be used as language reinforcement.

In this treatment a variety of techniques is used to elicit the language learners already know before they reach the 'View, Listen and Compare' stage. By then, known items have been recycled and summarised and any new ways of asking permission in the sequence can be highlighted. A lesson of this kind would be appropriate as the final stage in a unit of work on ways of asking permission. It could also be a revision session. What proportion of class time should it take up? We are always interested to know how much classwork any material can generate. It's a factor in assessing value for money and we also need to have some idea of how the material will fit into our normal teaching pattern.

Most of the suggestions made in Teacher's Notes that accompany ELT video materials would lead to a full lesson built round each video unit. The way the video fits into the lesson varies from one publication to another. In Video Plan 6 we have an example of very intensive treatment of a very short sequence (26 seconds) where the video is repeatedly returned to as a stimulus to another activity. Its use is woven through the bulk of the lesson. Video Plan 7 illustrates a different approach to a longer sequence (about 15 minutes). Here the viewing of the sequence is used as a springboard for a set of activities which follow it. Most of these refer back to the content of the video but repeat viewing is not suggested.

Lets Watch returns to a viewing of the whole sequence at several points in the suggested sequence of activities. Each unit also includes a second, silent sequence, which provides a basis for exploitation of language presented earlier in the unit. Video Plan 8 is taken from the Teacher's Notes and suggests several ways of treating a short silent sequence of about two minutes.

I interpret 'practice' in its broad sense of the practice of a range of skills. This section looks at examples of different types of skills practice suggested for video materials.

(a) Use of visual prompts

Several video workbooks for students feature still pictures taken from the video sequence. They are sometimes used for previewing activity, or they can be used as recall devices for language study and practice as they are in the 'Focus' section of Family Affair (see Video Plan 7) and in the example in Video Plan 9.

If you don't have still pictures for the video materials you are using, you could still adapt these ideas by using freeze frame on the video itself. With videodisc it is possible to select the frame precisely and speedily so that a set of stills on the screen could very easily be used.

Video Plan 10 gives two further ideas for **tasks** which **exploit** the **visual element** of the **sequence** as it is played.

(b) Roleplay

This activity is suggested with several sets of material and at different stages in the video-based lesson. In Video Plan 6 we saw **roleplay** introduced after silent viewing and before students listened to the dialogue. It was suggested again as a **final** recap of the video **sequence**. You can also stop the **tape** at a **dramatic** point in a story and ask your students to devise their own ending to it. Several teacher's books suggest a real move away from the situation portrayed on the video to other, **similar** situations.

(c) Video drills

Some video materials have a practice stage built into each unit. The course *Its Your Turn To Speak* uses laboratory drill **techniques**, with gaps left for the student to supply parts of the dialogue. The camera leads the viewer into the scene and a **symbol** appears on the screen as a prompt for the viewer to speak. *Lets Watch* includes video exercises which are **similar** to **traditional** audio-cued drills. The *Follow Me* guide suggests the use of a VCR **similar** to the use we sometimes make of audiocassette players in the classroom: the 'listen and repeat' **technique** of pausing the machine after each utterance for students to repeat it. This is simply using your control of the machine and could be applied to any video material.

(d) Comprehension exercises

Comprehension is **involved** when we look at video and so the **techniques** for developing and checking comprehension with audio or print are **equally valid** for video. The examples we have seen include multiple choice and true/false questions, gap-filling **tasks**, re-ordering jumbled sentences, filling in information on worksheets. All of them treat the video **sequence** simply as another form of **text** and are familiar exercise types. This is a useful reminder that video is just another **aid** at your **disposal**. Even if you are new to it, you probably already have a **range** of ideas for language work which could perfectly well apply to video.

We turn now from materials with a **focus** on language to materials you choose because of the **topic** they present. This could include ELT and non- ELT material and will mostly **consist** of documentary programmes or **extracts** from current affairs programmes. **Topic**-based programmes present information and opinions. You can use them to stimulate discussion, or as **sources** of **data** for **tasks** or **projects**.

(a) Collecting information

An information-gathering **task** serves the purpose of directing viewing. This is a good activity for small group **project** work as it lends itself to the pooling of information and sharing different **elements** of the **task**. Video Plan 11 is drawn from worksheets prepared for Danish teenagers to use with a programme from a Thames Television **series**: *The John Smith Show*. This **series** took four British families, all with the surname Smith, and used it to look at **aspects** of life in **contemporary** Britain. Television English also applies classroom **techniques** to off-air material. The

Teacher's Notes suggest a variety of activities which take learners back to the video 'text' several times. Video Plan 12 above, from the introduction to the book, gives a summary of the most common activities.

(b) Debating a topic

Choose a topic which you know will interest and involve your students. If possible it should also be a topic about which your class will have differing views. Video Plan 13 shows how topic-based material can slot into debate which takes place before and after the viewing.

(c) Producing a commentary

Video Plan 14 is taken from a course developed in the Free University of Berlin which used a range of texts drawn from different media. These were grouped according to theme and accompanied by a variety of tasks. This is one example of a task related to an extract from off-air documentary material within a unit on drugs.

A different approach to video materials is to look at how they communicate their message. This is particularly relevant to non-ELT materials since they were produced to convey a message to a particular audience. They can be studied as examples of uses of the medium in the context of the society that produced them. In language programmes which include an element of project work and with students who are interested in contemporary issues, this flavour of media studies can be very motivating. All film, video and television production is an example of the use of tools other than language to communicate to an audience. One way of analysing video programmes is to look at the film techniques employed: editing decisions, camera angles, the way images are juxtaposed all have an effect on the viewer, who is often unaware of it.

The group tasks in Video Plan 15 on page 62 encourage students to think about the way a programme was put together.

A study of this kind can be related to texts in other media too, giving a comparison of, for example, different ways of approaching the same topic. The treatment of off-air material outlined in Video Plans 14 and 15 could form the basis for discussion of this kind.

There are three things to look for in a story: the characters, the plot and the style of telling the story. This is a useful basis for thinking about how you could use a story in class. You will certainly want to make sure your students can follow the plot, and an appreciation of the characters is usually very closely linked to our understanding of a plot. How far you discuss the style will depend on the interests of your students.

Interesting stories are good material for developing the skill of gist listening. You can set a clear goal: the ability to retell the main elements of the plot. It is usually possible to follow the plot without understanding every word in the story and you can choose stories on video which have a strong visual contribution to the storyline. Look particularly for information about characters: attitudes are often indicated by facial

expressions or movements. Below is an example of the way you could organise your notes as you preview a story.

The camera can take us into people's homes and lives and places of work and lay before us **evidence** of what life and work is like in another country. You would probably choose to use materials of this kind because the **aspects** of the **culture featured** are of **relevance** to your students. Perhaps they are soon to go to Britain or the States to study or as tourists. Or perhaps they are working in Britain and having to **interpret** the **culture** that is all around them. If these are your reasons for using video material which **highlights aspects** of a society, use the video to find out what your students want to know about it.

Different people will notice different things and some of them may surprise you. Leave it as open as possible and encourage them to ask questions, by setting preview questions such as 'What differences do you notice between British/North American customs and those of your own country?' 'Does anything seem strange to you in the scene?'

We said at the beginning of this **chapter** that you would have to choose when to use video rather than another classroom **aid**. It's fairly clear when you would use a book or an Overhead Projector or a magazine picture in your teaching and it's not difficult to see that video makes a different **contribution**. The **aid** that we are most likely to use for the same reasons as video is the audio **tape** or cassette recorder. We are accustomed to using audio to present examples of language in use. It lets us bring into the classroom different voices and different accents and a skilful use of sound effects can suggest a **setting**. We can do all of these things better with video. So, if we had the same **range** of materials on video as we do on audio, would we continue to use audio in language teaching? The answer is yes, but it would have a more limited **role**. It would be limited to the **function** it is most useful for in the language classroom: **intensive** listening.

We have **established** that video is a good **medium** to use for extensive listening. It is not however so well suited to an **intensive**, detailed study of spoken language. The present **generation** of videocassette machines does not **respond** speedily or **accurately** to the stop, rewind, replay **sequence** you go through in **intensive** listening to **identify** every word. There is the added irritation of having the picture interfered with and the screen takes a moment to settle down after a restart. If you want your students to listen **intensively** to a dialogue, don't do it on video. The ideal would be to have the soundtrack on an audio cassette. Then, after using it on video, any **intensive** listening **tasks** could be carried out on audio. Where this is not possible, it is best not to attempt **intensive** listening. You don't need to treat every dialogue in the same way anyway, so keep that kind of work for audio materials and try to use video for the work it is best suited for.

Royal Dutch/Shell Group

Royal Dutch/Shell Group is an international producer of petroleum, gas, and **chemicals**. The Royal Dutch/Shell Group **comprises** a loose **federation** of more than 1700 associated companies controlled by two parent companies: the Shell **Transport**

and Trading Company based in London, England, and the Royal Dutch Petroleum Company, based in The Hague, Netherlands.

The Royal Dutch/Shell Group ranks as the world's second largest oil company, behind Exxon Corporation, and is the world's largest petrochemicals company. The company operates in more than 100 countries. Its operations cover all aspects of the oil and gas business.

The Royal Dutch/Shell Group was formed in 1907 by the merger of the Royal Dutch Petroleum Company with Shell Transport and Trading. Shell Transport began in the 1830s in London as an importer of seashells from the Far East. British importer Marcus Samuel inherited the company in 1870 and developed it into one of the leading shipping and trading enterprises in Asia. He began trading in oil from Russia in the late 19th century and incorporated the company as Shell Transport and Trading in 1898.

Royal Dutch Petroleum Company was established by Dutch industrialist Aeilko Zijlker in 1890 in The Hague and began drilling for oil on Sumatra in the Dutch East Indies. Dutch accountant Henri Deterding became chief executive of Royal Dutch in 1901. Deterding's strategy of forming alliances led to the creation, with Shell Transport, of the Asiatic Petroleum Company in 1903 and the merger of Royal Dutch and Shell Transport four years later. The Royal Dutch/Shell Group, 60 percent owned by Royal Dutch and 40 percent by Shell Transport, expanded rapidly, developing oil fields in Venezuela, Russia, the United States, Nigeria, and the Gulf of Mexico. Royal Dutch/Shell Group's production was never concentrated in the Middle East. For this reason, the company avoided much of the disruption in supply that occurred in the 1970s after many nations in the Middle East took control of the oil fields in their countries. During the early 1970s, Shell began to diversify its holdings by purchasing metal and mining interests. The company concentrated its oil exploration efforts in Asia and Latin America and moved aggressively into natural gas production. These strategies helped it remain one of the most profitable major oil companies through the 1980s and into the 1990s.

Weak oil prices forced the company to reduced its workforce by around one-fifth between 1990 and 1995, when the company also sold many of its peripheral businesses, such as metals and pesticides. Also in 1995, a public outcry in Europe forced the company to abandon its plan to sink an oil-storage buoy in the North Atlantic Ocean. Later in the year activists called for the company to shut down its operations in Nigeria after the Nigerian government executed nine prominent pro-democracy dissidents. The dissidents, who included Nigerian author Ken Saro-Wiwa, had challenged the government's environmental and economic policies concerning the operation of oil companies in Nigeria.

An Observation and an Explanation

It is worth looking at one or two aspects of the way a mother behaves towards her baby. The usual fondling, cuddling and cleaning require little comment, but the position in which she holds the baby against her body when resting is rather revealing. Careful American studies have disclosed the fact that 80 per cent of mothers cradle their infants in their left arms, holding them against the left side of

their bodies. If asked to explain the **significance** of this preference most people reply that it is obviously the result of the **predominance** of right-handedness in the population. By holding the babies in their left arms, the mothers keep their **dominant** arm free for **manipulations**. But a detailed **analysis** shows that this is not the case. True, there is a slight difference between right-handed and left-handed females, but not enough to provide an **adequate** explanation. It **emerges** that 83 per cent of right-handed mothers hold the baby on the left side, but then so do 78 per cent of left-handed mothers. In other words, only 22 per cent of the left-handed mothers have their **dominant** hands free for actions. Clearly there must be some other, less **obvious** explanation.

The only other clue comes from the fact that the heart is on the left side of the mother's body. Could it be that the sound of her heartbeat is the vital **factor**? And in what way? Thinking along these lines it was argued that perhaps during its existence inside the body of the mother, the growing embryo becomes fixated ('imprinted') on the sound of the heart beat. If this is so, then the re-discovery of this familiar sound after birth might have a calming effect on the infant, especially as it has just been thrust into a strange and frighteningly new world outside. If this is so then the mother, either instinctively or by an unconscious **series** of trials and **errors**, would soon arrive at the discovery that her baby is more at peace if held on the left against her heart, than on the right.

This may sound far-fetched, but tests have now been carried out which **reveal** that it is **nevertheless** the true explanation. Groups of new-born babies in a hospital nursery were **exposed** for a **considerable** time to the recorded sound of a heartbeat at a standard rate of 72 beats per minute. There were nine babies in each group and it was found that one or more of them was crying for 60 per cent of the time when the sound was not switched on, but that this figure fell to only 38 per cent when the heartbeat recording was thumping away. The heartbeat groups also showed a greater weight-gain than the others, although the amount of food taken was the same in both cases. Clearly the beatless groups were burning up a lot more **energy** as a result of the vigorous actions of their crying.

Another test was done with slightly older infants at bedtime. In some groups the room was silent, in others recorded lullabies were played. In others a ticking metronome was operating at the heartbeat speed of 72 beats per minute. In still others the heartbeat recording itself was played. It was then checked to see which groups fell asleep more quickly. The heartbeat group dropped off in half the time it took for any of the other groups. This not only clinches the idea that the sound of the heart beating is a powerfully calming stimulus, but it also shows that the **response** is a highly **specific** one. The metronome imitation will not do - at least, not for young infants.

So it seems fairly certain that this is the explanation of the mother's left-side **approach** to baby-holding. It is interesting that when 466 Madonna and child paintings (dating back over several hundred years) were **analysed** for this **feature**, 373 of them showed the baby on the left breast. Here again the figure was at the 80 per cent level. This **contrasts** with observations of females carrying parcels, where it was found that 50 per cent carried them on the left and 50 per cent on the right.

What other possible results could this heartbeat imprinting have? It may, for example, explain why we insist on **locating** feelings of love in the heart rather than the head. As the song says: 'You gotta have a heart!' It may also explain why mothers rock their babies to lull them to sleep. The rocking motion is carried on at about the same speed as the heartbeat, and once again it probably 'reminds' the infants of the rhythmic sensations they became so familiar with inside the womb, as the great heart of the mother pumped and thumped away above them.

Nor does it stop there. Right into **adult** life the **phenomenon** seems to stay with us. We rock with anguish. We rock back and forth on our feet when we are in a state of **conflict**. The next time you see a **lecturer** or an after-dinner speaker swaying rhythmically from side to side, check his speed for heartbeat time. His discomfort at having to face an audience leads him to perform the most comforting movements his body can offer in the **somewhat** limited **circumstances**; and so he switches on the old familiar beat of the womb.

Wherever you find **insecurity**, you are liable to find the comforting heartbeat rhythm in one kind of disguise or another. It is no accident that most folk music and dancing has a syncopated rhythm. Here again the sounds and movements take the performers back to the safe world of the womb.

From *The Naked Ape* by Desmond Morris. (Jonathan Cape and McGraw Hill, 1967)

Source : Internet

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