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Master One
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Discourse Analysis

# Scientific Discourse

## 1. Introduction

The modern age is pre-eminently the age of science. Science has conferred countless benefits on mankind. It has added immensely to man's comfort and conveniences. It made life worth living.

If we look around us, we shall find that we are indebted to scientific inventions and appliances in every branch of life. The building in which we live, the electric lighting that makes the night bright, our clothing, our numerous entertainments- all bear ample testimony to the power of science. Countless mills and factories are producing commodities at a tremendous rate. They provide employment to thousands of people. They add to the wealth of the world and thus confer benefit on mankind as a whole.

In fact, science has increased the means of comfort by helping in the progress of industries and agriculture, thus one may analyse Industrial and Agricultural English. Science helps in fighting disease and death. Wonderful cures make it possible for man to fight all sorts of diseases that seemed incurable in the past, and this is an excellent reason to study the English of Medicine. Science has wiped out the barriers of time and space. By means of railways, ships and planes it is possible for the people of one part of the world to visit the other part, and within this context it would be worth examining the English of Tourism. Science has revealed to us the secrets of the sky and of the planets, attempts are being made to reach planets other than the Moon and Mars, as a result scientific inquiry and curiosity would induce any discourse analyst to investigate English of Astronomy and Physics. Therefore, the analysis of scientific discourse is quite significant with regard to its specific features in terms of structure and style in addition to the large variety of the scientific discourse types.

In sum, it is hoped that in the near future science will enable the entire human race, irrespective of class, creed or nationality, to lead a fuller and happier life.

## 2. Stylistic Features of Scientific Discourse

The organization of scientific research articles obeys to a set of format which is followed by the entire scientific community. Introduction Section encapsulates background information with special reference to the established knowledge and findings from the previous researches. Method Section is essentially a listing of procedural formulae and step by step description of what was done in the laboratory. It also describes research apparatus,

experimental process and criteria of success. Result Section is concerned with research findings and overall observation made in the study. It illustrates research findings through tables, graphs and pictorials. Discussion Section interprets the significance of the research and justifies it by making references to the procedures adopted in the study. It also states the limitations of the findings.

### 2.1 Non-Figurative Language

Scientific text underlines the information without bothering about features that are characteristic of poetic texts, such as, connotative and symbolic meanings. In fact, the literary devices are not used at all in scientific texts, because scientists substantiate their ideas by logic, examples and experiments; thus the language of science has realistic and logical implication. Whatever findings are explored or tested by valid experiments are put in exact magnitude.

### 2.2 Non-Deviation from Linguistic Norms

The use of linguistic features is well maintained in scientific composition because any deviation from lexis and syntax in scientific text will, really, mar the easy grasp of the text, hence it is inadmissible. The reason is that in scientific composition, findings are more important than artistic and metaphoric presentation. Thus, to communicate well the findings worldwide is the prime objective of the scientists. Scientists believe in logic and reasons, they represent the truth which has universal appeal because it is pertinent to experiment and logic.

### 2.3 Use of Passive in Scientific Writing

Passive voice is one of the most well-known features of scientific writing, it is frequently used to create an impersonal scientific text. The technical writers in order to remain objective and impersonal choose passive form because the important idea is not who did something but what was done. They avoid using active voice because they feel it would be too strong and does not fit in their professional character. All the research methodologies and the research tools used for experiments in scientific research are put forth in passive voice.

### 2.4 Rhetorical Meaning in Scientific English

The quest for intellectual growth leads to new discoveries through which common words are charged either with new meanings or they are employed to represent newly established entities. This device is evolved to interpret and to reclassify the word in a different way from its normal practice in the natural spoken language. The common words when they are compounded and reformulated in the scientific domain, their meanings undergo complete

change. Sometimes scientists take ordinary words and give them special dress on varied occasions. When every day expressions are defined as technical terms, they are defined precisely and then become distinct from their general use. Innumerable examples of this type are given below:

Benign: General meaning is Amiable, Generous. In Medical Discourse it describes a tumour that does not invade and destroy the tissue in which it originates.

Conceive: Common meaning is to understand. In Medical Discourse is to become pregnant.

Mouse: Common meaning is a small fury animal with a long tail but used metaphorically in Computing.

Riddle: Usual meaning is a puzzle in which you ask question. In Agriculture it is a box with cross wires at the bottom used for separating out the larger stones from soil and sands.

The scientific words convey entirely different meanings within the ambit of scientific discourse. The process of building up a technical vocabulary involves the naming of the phenomena and then making the name technicalized. On the whole, it has become evident that the scientist in order to evolve a scientific terminology either coins a new word best suited to his purpose or takes the word from ordinary native speech and gives it a special sense for scientific use.

### 2.5 Use of Nominalization and Universality in Scientific Discourse

Another typical feature of scientific English is its nominalization which plays a key role in constituting technicality in scientific discourse. It frequently occurs in scientific texts thereby representing events and qualities of objects not as verbs, adjectives, and adverbs but as nouns. For example: The temperature (noun) increases (verb) sharply (adverb). A sharp increase of temperature. In this sentence the verb ‘increase’ has been nominalized and the adverb ‘sharply’ has become an adjective in theme position. Qualities can also be nominalized. For instance: ‘An electron moves in an orbit’ becomes ‘The orbital motion of an electron’.

One more prominent feature of scientific English is its universality. That is to say the terminologies used in scientific text are universally acceptable because they are based on experiment, reason and rationale. In fact, scientists use English and shun all such perception and interpretation that have no empirical validity. Scientists use English to realize universal sets of concepts, methods, and procedures which are independent of social and cultural influences. Indeed, scientific English is regarded as a powerful means to realize universal notions associated with scientific enquiry.

### 2.6 Use of Questions in Scientific Research Articles

Scientists are likely to face strong opposition while communicating their findings so they use different devices to fight their ideas as well to get their works published. Most prominent and useful among them is 'Interrogative Gambit' which is a typical device in scientific journals to popularize facts and findings. The use of questions in the organization of discourse is a very strong rhetorical device because it enables the writer to catch the readers' quick response and to make up their minds for the follow up. Questions are used to arouse readers' interest as discourse organizers. It has been found that questions are frequently used in the titles of scientific articles in order to draw readers' attention and to pinpoint the main topic of the research. The author will pose question or a series of questions in the first paragraph and the rest of the article will consist of the author's own answer to the questions asked at the beginning. This again is to arouse the reader's interest and to create anticipation. A series of questions that are put forth in the beginning introduce the main aspects of the problems to be addressed in the text. The use of questions also serves readers to move from old to new information and it calls to the readers' mind the information they already possess and prepare them for what is to follow. Examples of such techniques are given below:

(a) How are the scientists to face the challenge? (Magazine: Down to Earth). The rest of the article is basically a series of suggested answers to this question which represents the author's standpoint.
(b) Who has the right to know of an individual's genetic make- up? And what use may be made of this knowledge (Magazine: BMJ).
(c) Should we add laws against discrimination on the grounds of genetic make-up to those against discrimination on the grounds of race, religion and gender? (Magazine: The Lancet).

Interrogative forms are also used when the writer is addressing a highly complex subject. In this case no explicit answers are given. The issue is open to debate. In the above questions the writer has used a series of questions which stir readers' mind to think on several aspects of the subject which is for fraught with ethical and scientific problems.

(d) What is the role, if any, of the cell genome in the control of latency? (Magazine: The Lancet).
(e) Are there cellular sequences analogous to the latency associate transcripts? (Magazine: Scientific American).

Sometimes questions are used to point to the future with suggestion for debate or future research or as a kind of punch line to end the article. The use of questions in the last paragraph indicates gaps in present knowledge and makes an appeal to continue research in the field. There is no answer provided and thus the whole subject is left open. Hence it could be deduced that the use of questions in scientific texts creates anticipation, arouses interest, and challenges readers for thinking about the topic of the text.

### 2.7 Use of Hedges in Scientific Research Articles

Hedging, the expression of tentativeness and possibility is often held to be an important feature of scientific discourse. Hedging can be applied when information such as exact reference or precise numerical in unobtainable or unnecessary in view of the needs of the readers. Therefore, a relatively low degree of exactitude partly accounts for the occurrence of hedging devices, for example, by using epistemic modal auxiliaries, tentative reporting verbs, tentative nouns and the like. Thus hedging can be used to adjust scientific activities according to the non-specialist audience. So the use of hedges to express ideas is a crucial means of achieving a close fit between the scientist's statement and consensus of readers', especially his relationship to a layman. Today's scientists are urged to use a style of writing which projects both personal modesty and honesty (i.e. arrogance and exuberance are not well regarded by the scientific community).

In order to reach this goal a scientist has a variety of linguistic devices available which generally go under the rubric of hedges. The following are some essential samples of hedging taxonomy:

(a) Epistemic main verbs such as: to indicate, to suggest, to propose, to tend, to seem, to appear, etc. Example: The previous researches suggest that the worms living in the host body whether alive or dead appear to release certain metabolites. (Metabolic Process of Worms. IMA magazine).
(b) Epistemic modal auxiliaries such as may, might, can, could, etc. Example: while particular antibodies may play a crucial role in the pathogenesis of disease. (Remedy in Pathogenesis of Disease. Scientific American magazine).
(c) Epistemic adverbs such as hypothetically, probably, likely, etc. Example: In the absence of randomized trials these data probably provide reliable estimate of outcome for patients treated with observation and delayed hormone therapy. (The New England Journal of Medicine).

## 3. Characteristics of Scientific Style

(a) It Presents Facts: it deals with the application of scientific generalizations to specific situations. Therefore, the methodology of science with its demand for objectivity, systematic investigation and exact measurement, has several linguistic consequences:

- There is overriding concern for impersonal statements.
- Logical exposition.
- Precise description.
- Emotional comments, humour, figurative expression and other aspects of personal language are avoided.

(b) Graphic Representation: in the digital age, with its greater ease of processing data and integrating images with text, more and more articles are representing complex information in the form of graphs, schematic diagrams, three-dimensional models

and graphs (portrayed in two dimensions), photographs, and so forth. In fact, the mathematical expression of relationship promotes an extensive use of numerals, operators, letters and other special symbols which are frequently used in word-like or sentence-like combinations (formulae, equations, etc.). In sum, a large part of scientific expression consists of representations that are wholly or partly non-linguistic (non-verbal expressions) in character such as: physical models, charts, pictures, maps, graphs and diagrams.

(c) Specialized Terminology: because the experimental article represents activity among experts within a discourse community of scientists, it uses the specialized vocabulary developed by particular fields. Consequently, the large technical vocabulary is undoubtedly its most significant feature, reflects the specialized subject matter of scientific domains. Every day words are too vague for many scientific purposes, so new ones have to be invented. This novel vocabulary is largely based on borrowings from Latin or Greek. It contains many compound expressions, some of which (in such fields as chemistry) can be extremely long and unpronounceable, requiring abbreviation for practical use (a familiar example is TNT, trinitrotoluene). Scientific vocabulary requires continual updating in the light of the process of discovery. Science in fact is the main birth place of new words in a language. In a Comprehensive English dictionary, the vast majority of the words would be scientific or technological terms.

(d) It is Accurate and Truthful: it does not guess and it tells the whole truth.

(e) It is Disinterested: its purpose is to inform, not to achieve selfish purposes or to persuade a reader; facts alone do not make writing scientific.

(f) It is Systematic and Logically developed.

(g) It is not Emotive: its appeal is to reason and understanding, not feelings. When it generalizes, it does so in accordance with the laws of inductive reasoning. It avoids high-level abstraction with emotional appeal.

(h) It excludes Unsupported Opinions.

(i) It is Sincere: it tells the truth and avoids language that would make a reader question its sincerity.

(j) It is not Argumentative: it reaches its general conclusions on the basis of facts.

(k) It is not Directly Persuasive: it is concerned with facts, with the general laws that may be derived from the study of facts, and with the application of general laws to specific problems. If it persuades, it does so by logical reasoning.

(l) It does not Exaggerate: because it is objective and it does not distort facts.

(m) Its grammar: the grammar of scientific language contains several distinctive features such as: sentences are often too long and have complex internal structure; the best known grammatical feature is the use of the passive voice.

## 4. Case Study: The English of Science and Technology

### 4.1 Categories of Science and Technology Texts

It is established that the English used in empirical sciences particularly is characterized by some essential features, namely:

- Text Structure;
- Coordination and Subordination;
- Words and Terms;
- Style Form;
- Layout.

Accordingly, scientific texts are commonly classified into four (4) categories:

- Argumentative Texts;
- Referential Texts;
- Reports;
- Instructive Texts.

#### 4.1.1 Argumentative Texts

These are texts in which two (2) positions or two (2) opinions are set up against one another. The author attacks the opponent's ideas by reporting them briefly and then providing evidence of the contrary. The aim is of course to prove and support a thesis with scientific evidence.

#### 4.1.2 Referential Texts

These texts simply describe a phenomenon (e.g. the making of the universe) and they are usually based on the logical cause and effect structure. Unlike in argumentative texts, the author does not participate ideologically or emotionally in what he/she is describing. His/her aim is just to be as clear as possible. The objective is to describe a phenomenon with evidence and clarity.

#### 4.1.3 Reports

Generally, reports are texts written in order to describe an event, therefore, they are developed on a time sequence structure, for example the phases of a laboratory experiment. The goal is to describe in details the time sequence procedures or steps of an event.

#### 4.1.4 Instructive Texts

These texts tell the reader how to perform an action, for instance how to connect a printer to a computer, thus they are based on a series of imperative forms. The intention is obviously to give the instructions for a specific task such as the user's handbook.

### 4.2 Essential Features of Science and Technology Texts

There are four (4) principal traits, respectively, Coordination and Subordination; Lexis; Style Form; and the Layout.

#### 4.2.1 Coordination and Subordination

In scientific texts subordinate sentences are almost non-existent. The main principle is coordination. Therefore, the usage of coordinating conjunctions, such as and; but; or; neither…nor; either…or; is both logical and indispensable.

#### 4.2.2 Lexis

In everyday language we use words which are often vague and general in their meaning. However, in a scientific/technical context if you need to mention an object, you must use the one and only term that describes it. Such terms do not have synonyms and new terms are usually created on the model of existing ones, derived from the classic Greek or Latin languages.

#### 4.2.3 Style Form

Technical writing is formal and impersonal, in addition, all technical texts are also informative. On the other hand, the linguistic structures in terms of syntax and lexicon which are commonly used in technical discourse are summarized as follows:

- The frequent use of passive form since in a scientific context the emphasis is on the action rather than on who does it.
- The high rate of comparative forms.
- Pre-modification: that is the use of modifiers (adjectives, adverbs, nouns) in order to provide accurate details.
- The interaction between written texts and pictures, graphs and charts.
- The vocabulary is usually formal and specific.

#### 4.2.4 The Layout

- The title for instance is often in bold print and capitalized.
- Paragraph Division: a paragraph usually contains several sentences about a main idea, it is something, a unit which is clear to see.

## 5. Linguistic Characteristics of Scientific Discourse

The linguistic characteristics of scientific discourse are principally divided into two categories: the essential features which single out this type of discourse and the general features that can also concern other kinds of discourse. The five important characteristics are summarized in the following:

(a) Impersonal: it avoids the use of the first person singular (I) or plural (Us), which is to convey its objective nature.

(b) Objective: it does not issue personal opinions; that is, it avoids the use of subjective elements. It is based on observations about the results obtained through scientific tests.
(c) Concise: it expresses what the scientist wants to say using only the amount of words needed.
(d) Precise: it indicates exactly what is meant through the use, for example, of connectors to do simple phrase sequencing, just like simple verb tenses.
(e) Clear: it is understandable for the type of audience to which it is addressed. The accuracy with which the facts or evidence are exposed is what gives scientific discourse probative value and veracity.

The general features are briefly summed up in the following points:

(a) Low level of periphrasis: it is also called circumlocution; it is mainly the use of a longer expression instead of a shorter one with a similar meaning. It is an unnecessary use of words in relation to scientific discourse, in addition, the scientist does not use rhetorical ornaments.
(b) Frequent use of acronyms, ranging from an explicit level (name) to an airtight level (figuratively having no weak points or flaws).
(c) Use of univocal vocabulary (monosemic language) to avoid different interpretations. The technicalities and neologisms that it uses do not tolerate other forms such as polysemy (the ability of words, signs, symbols to have multiple meaning), synonymy (a list of synonyms, sameness of meaning), and homonymy (same sounds, spelled the same but with a different meaning). However, it creates neologisms by composition and derivation.
(d) The scientist borrows lexical items and uses graphics and drawings for his/her explanations.
(e) It makes strict reference to the object or subject of which it deals. It uses a denotative language and refuses to use oblique (not straightforward, indirect) language.
(f) It uses discursive elements such as: definition, description, demonstration, enunciation (announcement, proclamation), explanation and characterization, without involving personal positions.
(g) In the writing the present tense prevails together with the indicative mode. It uses abundant nouns and very few adjectives.
(h) It is universal, therefore, there are no particularisms in the use of scientific terms, as in the exemplifications and the methodological conventions themselves.
(i) Previously the scientific language had an almost total dependence on Latin and to a lesser extent on Greek. At present, English is the language most used in scientific discourse, although at the beginning of the 20$^{th}$ century it was German along with Latin.
(j) It reports on a specific topic.
(k) It is aimed at an expert audience in the subject matter.
(l) It can be difficult to understand for whose are not experts in the subject.

(m) It uses language codes and a specific terminology.
(n) It displays high density of terminological specialization.

Additionally, scientific language can be classified according to the different types of words used. There are scientific words that were created specifically for the use of science, for example, 'photosynthesis', 'electrolysis', and 'mitosis'. Also, there are words of everyday use that are employed in scientific language to refer to certain phenomena or actions in science, but are equally used in other contexts; for example, 'exercise', 'repel', 'natural' or 'contract'.

Scientists do not speak in a language other than they use to communicate in their daily lives. The difference is that in their work they use a special and specific terminology to deal with scientific issues. They use generic terms with specific meanings for science and specialized terms of scientific jargon. Therefore, according to the provenance of the technicalities that it employs, scientific discourse can be classified into:

(a) Words of the common language with different meaning: for example; 'mass', 'force', 'power', 'inertia', 'matter', 'protocol', 'routine'.
(b) Terms of Greek or Latin origin (simple or compound): for example; 'headache', 'anatomy', 'polygenic', 'petrology'.
(c) Words formed with Latin or Greek roots: for instance; 'anorexia', 'pustule', 'atom'.
(d) Neologisms (the creation or coinage of new words) such as: 'Anglicism' (standard stress) and 'Gallicisms' (pavilion).

## 6. Major Functions of Scientific Discourse

The scientific discourse fulfils some very precise functions as a vehicle of science. As it has been already indicated, it is specific, exact and objective; thus its main tasks are respectively summarized as follows.

### 6.1 Transmit Information

Scientific discourse transmits specific knowledge to a public and represents at the same time a specific scientific discipline. The transmission of knowledge can take many forms that achieve particular speech acts that might be displayed in the following:

#### 6.1.1 Listing Properties

Sample: 'Mars is a terrestrial planet with two small satellites- Phobos and Dermos. It has an equatorial diameter of 6790 kilometres. Temperatures and pressures on Mars are low. It has a maximum temperature of about -22 C and a minimum temperature of approximately -100 C. The atmosphere is thin and consists mainly of carbon dioxide (95 percent). It has permanent white caps of water ice and orange-red desert regions. There is no evidence of life on Mars'.

### 6.1.2 Enumerating Properties

Sample: ‘There are thirteen families of snakes. They all have a number of important characteristics. Firstly, their body is thin and cylindrical and has no separate tail. Secondly, the body is covered with hard, smooth scales. Thirdly, there are no external limbs. Snakes have small circular eyes, a thin tongue and small pointed teeth’.

### 6.1.3 Spatial Relations

Sample: ‘The Ear. Man has two ears. Each ear has four main parts:

1 The lobule is outside the skull.

2 The outer ear contains the eardrum, a thin membrane of skin. Sound waves enter the ear and produce vibration in the eardrum.

3 The middle ear is next to the outer ear. It contains three bones which transmit sound waves to the inner ear.

4 The inner ear is next to the outer ear. It contains the cochlea. Inside the cochlea is the corti, the organ of hearing’.

### 6.1.4 Comparing Members of a System

Sample: ‘All flowering plants are composed of four organs- roots, stems, leaves and flowers. The central part of the plant is the stem. The roots are attached to the bottom of the stem and usually grow underground, some plants have one single root, others have many small roots. The leaves are connected to the sides of the stem. Some leaves are long and thin, others are fat and round. Some leaves are single, others are compound. The flower is attached to the top of the stem. Flowers contain the plant’s reproductive organs. Most plants have the male and female organs in the same flower. Some plants have separate male and female flowers’.

## 6.2 Express Arguments

The second function goes to the concrete, exposing the subject in question and developing each one of the arguments without adornments. Some samples of argumentative scientific discourse are presented as follows:

### 6.2.1 Addition and Equivalence

Sample: ‘Computers in Space Navigation. In space navigation it is necessary to make complex calculations. Computers are able to perform extremely complex calculations. A rocket has to follow a precise path. In other words, it has to leave the earth’s orbit at a

precise moment. A computer can perform the complex calculations which are necessary to work out the rocket's path precisely. Any errors in the rocket's path must be corrected immediately. A computer can control the rocket's progress. That is, it can both detect errors and correct them'.

### 6.2.2 Causal Relations

Sample: 'An Example of Biological Feedback: Taking a Glass of Water. The action of taking a glass of water requires a series of muscular actions. The memory contains a record of the necessary sequences. Consequently, the brain can send the necessary control signals through the nervous system. The control signals stimulate the arm muscles. As a result, the muscles move the arm in the necessary direction. The hand approaches the glass. At the same time, the eye observes the progress of the hand. The eye sends information about the hand's progress to the brain. This information is compared with the memory's record of the action. Decision elements in the brain can send signals to correct any errors. Consequently, the muscular actions will change. These operations are repeated in many cycles. Finally, the glass is reached'.

### 6.2.3 Chronological Development

Sample: 'The Earth Before Man. For about 4000 years there was life on earth. Primitive organic structures (such as bacteria and algae) appeared in the sea more than 3500 million years ago. The age of fish began in the mid Palaeozoic era, about 400 million years ago. The Devonian period was a time of great topographical change. Mountains were formed. The oceans moved. The movement exposed mud, which was rich in organic materials. Vegetation grew and then the first insects appeared. After insects developed, amphibians appeared. Reptiles developed during the carboniferous period and became the dominant form of life. Some reptiles evolved into primitive birds, others into early mammals. At the end of the Mesozoic era the surface of the earth broke up into separate land masses and many reptiles disappeared. The first men appeared 600000 years ago'.

## 6.3 Meta-linguistics

Scientific texts and technicians create and recreate their own terminology. For this reason, they must often explain the meaning of the terms to avoid ambiguities or distortions. Some of the words of scientific terminology have no meaning in the language dictionaries.

### 6.3.1 Micro-Level Intertextuality

Sample: Physical Sciences. 'Alkali Metals. The metallic elements lithium, sodium, potassium, rubidium, caesium, and francium, belonging to group IA of the periodic table. They tend to be soft silvery metals, which are univalent, electropositive, and highly reactive. Their oxides and their salts are typical ionic crystalline solids containing M+ ions'.

Sample: Life Sciences. ‘Cystolith. A crystalline aggregate of calcium carbonate that is deposited on a cellulose peg in certain plant cells known as idioblasts and fills the lumen of the cell’.

Sample: Medicine. Fracture. ‘Volkmann’s ischemic paralysis; antecubital fascia; Cooper Method; Kocher Method; silver fork deformity; Russel traction’.

Measles: ‘engorged; mucoid fluid; Koplik’s spots; splenomegaly; leukopenia; epithelial cells; proteinuria’.

Appendicitis: ‘colicky; periumbilical; epigastrium; Mc Burney’s point; referred tenderness; psoas stretch’.

Pneumonia: ‘tachypnea; splinting; Gram stain; WBC; RBC; pneumococcal organism’.

Sample: Agriculture. Plant Breeding. ‘Population with desirable combinations of genes and gene frequencies; mating systems; hybridization; germ; plasm; Gregor Mendel’.

**Conclusion**

Today the world is becoming increasingly influenced by science. Science has come to relieve us of our hardships and ignorance. It serves us in all walks of our life. It has increased our comforts and lessened miseries. It has given a new shape to our civilisation. In fact, the uses of science in our daily life are numberless. Nobody will deny that it has raised life to a standard where comfort, health, and security are enjoyable. Consequently, apart from the specialism of the discourse analyst, we do strongly believe that all these factors represent an excellent and convincing reason for the serious and continuous study of scientific discourse.

## Workshop Session

**Task One:** Indicate the etymology and the meaning in General English of the following scientific terms.

- Deoxyribonucleic acid.
- Biotechnology.
- Cycloheximide.
- Chromosome.
- Diploid.
- Enzyme.
- Liposuction.

**Task Two:** Compare the text below written respectively in journalistic language and then in scientific discourse. What are the major differences on the linguistic and stylistic levels?

**Journalistic Text.**

'Recent newspaper reports indicate that there is proven evidence that the consumption of the artificial sweetener Aspartame can accelerate type 2 diabetes in the human body. This type of diabetes is caused by insulin deficiency, since the body is not able to produce insulin to process blood sugar.'

**Scientific Text.**

'Proven evidence suggests that consumption of the artificial sweetener Aspartame, causes insulin resistance and type 2 diabetes.'

**Task Three:** Put forth the two essential functions of the following scientific passages.

**Passage A:** 'Insect Anatomy. The body of an insect consists of three main parts: the head, the thorax and the abdomen. The head contains the insect's brain, eyes and mouth. It also carries the antennae. The thorax is the central part of the body. It bears the legs and wings. There are three pairs of legs and two pairs of wings. The insect's abdomen contains its digestive and reproductive organs.'

**Passage B:** 'The Solar System. The solar system consists of a star (the sun), the planets and a number of other bodies, such as satellites and asteroids. The sun is the centre of the solar system. The planets revolve around it. There are nine planets in all. They are as follows: Mercury, Venus, Earth, Jupiter, Saturn, Uranus, Neptune and Pluto. Some planets have satellites. The Earth has one satellite. It is called the Moon.'

**Task Four:** Indicate at least ten (10) major characteristics of scientific discourse in the following text.

## Chelation in Medicine.

Finding new drugs for the treatment of human diseases is still largely fortuitous. Most of the drugs in current use were discovered by accident or by trial and error, and the cases in which a clear connection has been found between a drug's action in the body and its chemical and physical properties are few. One class of drugs for which such a connection has been established, however, is the group known as the chelating agents. These substances are characterized by their ability to seize and 'sequester' metal atoms. Since their various actions as drugs are apparently based at least in part on this property, it offers a promising foundation for the development of a rational pharmacology. The promise is being vigorously explored in laboratories all over the world.

Chelation is a common chemical phenomenon and is associated with many familiar substances. Among the well-known natural chelates are haemoglobin (containing iron), chlorophyll (containing magnesium) and vitamin B-12 (containing cobalt). Among the common substances that can act as chelating agents are citric acid, aspirin and a host of other compounds, natural and synthetic. The phenomenon of chelation was recognized many years ago and put to use in various applications, although it was then poorly understood. In 1935 a German chemist, F. Munz, patented a compound called ethylenediaminetetra-acetic acid (EDTA) that had a remarkable affinity for calcium. It soon found commercial use in the textile industry as an agent for preventing the precipitation of calcium from the water used in the manufacture of fibers.

It was only a little more than a dozen years ago, however, that chemists in general became aware of the fundamental importance of chelation and began to devote intensive study to its possible commercial and medical applications. The medical potential of chelating agents was demonstrated in 1951 when EDTA saved the life of a child suffering from lead poisoning. Since then the investigation of the medical uses of chelating agents has produced a voluminous literature, and chelate drugs have been developed for the treatment of a wide range of diseases.

A chelating agent is a molecule that is capable of seizing and holding a metal ion in a clawlike grip (the term comes from the Greek word 'chele', meaning 'claw'). Like a claw, the structure forms a ring in which the ion is held as if by a pair of pincers. The pincers consist of a 'ligand' atoms (usually nitrogen, oxygen or sulphur), each of which donates two electrons to form a 'co-ordinate' bond with the ion. In most cases the metal ion can be grasped by more than one molecule, so that the ion is held in a set of rings. Each ring is usually composed of five or six members consisting of single atoms or groups of atoms.

**Task Five**: Here is a dialogue between two doctors in relationship to a patient in coma. Would you please pick up all the scientific words (English of Medicine) and explain them in General English, then indicate the most striking observation of the whole conversation in terms of the style of communication.

Doctor 1: 'Let's talk for a few minutes about coma.'

Doctor 2: 'Alright, let's try and classify the problem.'

D 1: 'We have to consider poisoning?'

D2: 'Probably the most common are alcoholic and barbiturate.'

D1: 'One must also consider epilepsy, pneumonia, and septicaemia of various kinds.'

D2: 'What can you tell me about cerebral lesions?'

D1; 'We have to consider trauma and various vascular lesions.'

D2: 'Well, we have also to envisage the possibility of haemorrhage, thrombosis, and embolism. That's about all I can think of.'

D1: 'I think we should also keep brain tumour, encephalitis, and meningitis in mind.'

D2: 'What do you think the patient really has?'

D1: 'I can't be quite sure of an exact diagnosis but the case may imply a tear in the middle meningeal artery.'

D2: 'Let's see if the neurosurgery resident has come yet.'

D1: 'Certainly, let's find out if he agrees with us.'

**Task Six:** Reading Comprehension. Read the scientific text below then answer the questions that follow.

## Numbers and Mathematics

It is said that mathematics is the base of all other sciences, and that arithmetic, the science of numbers, is the base of mathematics. Numbers consist of whole numbers (integers) which are formed by the digits 0, 1, 2, 3, 4, 5, 6, 7, 8, and 9 and by combinations of them. For example, 247- two hundred and forty- seven- is a number formed by three digits. Parts of numbers smaller than 1 are sometimes expressed in terms of fractions, but in scientific usage they are given as decimals. This is because it is easier to perform the various

mathematical operations if decimals are used instead of fractions. The main operations are: to add, subtract, multiply and divide; to square, cube or raise to any other power; to take a square, cube or any other root and to find a ratio or proportion between pairs of numbers or a series of numbers. Thus, the decimal, or ten-scale, system is used for scientific purposes throughout the world, even in countries whose national systems of weights and measurements are based upon other scales. The other scale in general use nowadays is the binary, or two-scale, in which numbers are expressed by combinations of only two digits, 0 and 1. Thus, in the binary scale, 2 is expressed as 010, 3 is given as 011, 4 is represented as 100, etc. This scale is perfectly adapted to the 'off-on' pulses of electricity, so it is widely used in electronic computers: because of its simplicity it is often called 'the lazy schoolboy's dream'!

Other branches of mathematics such as algebra and geometry are also extensively used in many sciences and even in some areas of philosophy. More specialized extensions, such as probability theory and group theory, are now applied to an increasing range of activities, from economics and the design of experiments to war and politics. Finally, a knowledge of statistics is required by every type of scientist for the analysis of data. Moreover, even an elementary knowledge of this branch of mathematics is sufficient to enable the journalist to avoid misleading his readers, or the ordinary citizen to detect the attempts which are constantly made to deceive him.

**Comprehension.**

1 What is the relationship of mathematics to the other sciences?

2 What is the science of numbers called?

3 Name a two-digit integer.

4 Name two ways of expressing parts of the number 1 (unity).

5 Name the common arithmetical operations. Using actual numbers, give examples of each.

6 What are the two number-systems commonly used throughout the world?

7 Give examples of numbers in the binary system.

8 What are the advantages of each system?

9 Name some other branches of mathematics.

10 What branch of mathematics is very useful to the ordinary citizen? Why?

**Word Study.**

Find words in the passage which mean approximately the same as:

Entire; usually; in the place of; system of measurement; widely; be put to use in; lastly; kind; simpler; cause someone to make a mistake by giving wrong or incomplete information; continually; discover; action of trying to do something; a group of measurements; arranged in an orderly way to form a whole.

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