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Inside Story of Nobel Laureate in Physics

Sir Chandrasekhara Venkata Raman
The Nobel Prize in Physics 1930
Born: 7 November 1888, Tiruchirappalli, India
Died: 21 November 1970, Bangalore, India
Affiliation at the time of the award: Calcutta University, Calcutta, India
Prize motivation: "for his work on the scattering of light and for the discovery of the effect named after him."

Beginning a Degree Course, aged 14:-

Science always attracts Raman a lot. He would demonstrate experiments to his younger brothers and sisters in vacation also. In 1904, he completed his degree, winning medals in physics and English. Raman graduated with a master's degree in physics, awarded with the highest distinction in 1907, aged 19

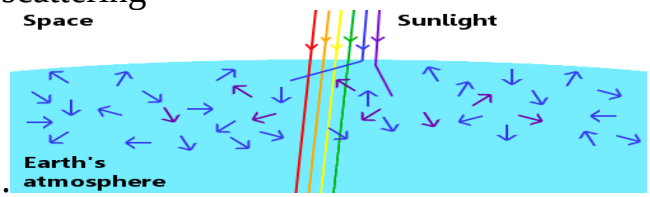
Nobel Prize Winner Mistakes 18-year Old Raman for a Professor of Physics:-

At Presidency College to study for his master's degree Raman was awarded a scholarship. He was given unlimited access to the laboratories, where he pursued investigations of his own design because his outstanding potential was recognized.

At 18, Raman had his first academic paper published in November 1906. He had initially given it to one of his professors to read, but the professor had not bothered. Raman sent his paper directly to Philosophical Magazine and it was accepted. Its title was "*Unsymmetrical diffraction-bands due to a rectangular aperture*:" it was about the behavior of light. Following the publication of his second paper in Philosophical Magazine, Raman received a letter from Lord Rayleigh, the eminent British physicist. Rayleigh, unaware that Raman was just a teenage student, sent his letter to "Professor Raman."

The Raman Effect: Raman and Rayleigh scattering: Lord Rayleigh, who had believed the teenage Raman's papers were the work of a professor, had been one of the great physicists of his day. He had won the 1904 Nobel Prize in Physics. His importance to Raman's story is that Rayleigh had been the first to explain why the sky is blue. He had then explained the sea's color by saying it was simply a reflection of the sky's color.

One day, in the summer of 1921, Raman was on the deck of a ship in the Mediterranean Sea enroute to the Congress of Universities of the British Empire at Oxford. He looked at the beautiful Rayleigh scattering



If Earth had no atmosphere, anyone who happened to be around in such circumstances would see a white sun and a black sky. However, this is not what we see, because sunlight interacts with the gases in Earth's atmosphere. Rather than coming straight to our eyes from the sun, sunlight is scattered in all directions by the atmosphere. Blue light is scattered most, meaning that it comes to our eyes from everywhere in the sky, therefore the sky looks blue. Yellow and red light are

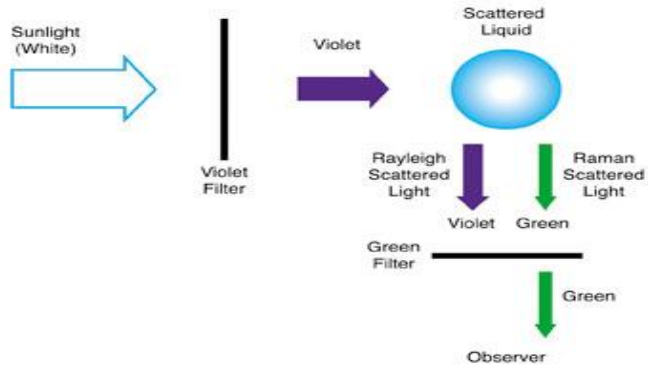
scattered least, so we usually see a yellow sun, and sometimes a red sun. Rayleigh scattering is elastic. This means that photons of light lose no energy when they interact with gas molecules. The light, therefore, stays the same color.

The Raman Effect:-

Raman and his students continued researching light scattering in gases, liquids, and solids. They used monochromatic light – sunlight that had been filtered to leave only a single color – and found that a variety of different liquids – sixty of them – did indeed change the color of the light. They first observed this in April 1923, but very weakly. In 1927, they found a particularly strong color change in light scattered by glycerol (then called glycerine):-Raman's team observed the effect in gases, crystals, and glass. The effect might have been mistaken for fluorescence, another phenomenon in which light has its color changed, but in Raman's work the light scattered by liquids was polarized, which ruled out fluorescence. What came to be known as the Raman effect – a color change accompanied by polarization – had never been seen before. The inelastic scattering at its heart was a further, very strong, confirmation of quantum theory. Only about 1 in ten million photons undergo inelastic scattering. Raman and his colleague K.S. Krishnan reported their discovery in March 1928 in *Nature.*

Raman Measures the Effect of Light Scattering:-

Analysis of light scattered by a liquid is not an easy task, and much of the early work in Calcutta was done by the visual observation of color rather than precise measurements of the light's wavelength as shown in Figure 1 at right.



The Raman Effect is a very weak effect:-

Only one in a million of the scattered light particles, or photons, actually exhibits the change in wavelength. This explains, in part, why the effect was not discovered earlier. In all of the early light-scattering studies, the excitation source was sunlight, which Raman has described as being plentiful in Calcutta, but it still lacked the desired intensity. The acquisition in 1927 by the IACS of a seven-inch (18 cm) refracting telescope enabled Raman to condense the sunlight and create a more powerful light source for his studies. By early 1928, mercury arc lamps were commercially available, and he switched to this even more intense light source. Raman knew that visual and qualitative observations alone would not be sufficient information. He methodically set out to measure the exact wavelengths of the incident and Raman scattering by replacing the observer with a pocket spectroscope. He ultimately replaced it with a quartz spectrograph with which he could photograph the spectrum of the scattered light and measure its wavelength. These quantitative results were first published in the Indian Journal of Physics on March 31, 1928.

The fundamentals of Raman's crucial experiment are outlined in Figure 2.

The significance of the effect: -

The universality of the phenomenon, the convenience of the experimental technique and the simplicity of the spectra obtained enable the effect to be used as an experimental aid to the solution of a wide range of problems in physics and chemistry. Indeed, it may be said that it is this fact which constitutes the principal significance of the effect. The frequency differences determined from the spectra, the width and character of the lines appearing in them, and the intensity and state of polarization of the scattered radiations enable us to obtain an insight into the ultimate structure of the scattering substance. As experimental research has shown, these features in the spectra are very definitely influenced by physical conditions, such as temperature and state of aggregation, by physico-chemical conditions, such as mixture, solution, molecular association and polymerization, and most essentially by chemical constitution. It follows that the new field of spectroscopy has practically unrestricted scope in the study of problems relating to the structure of matter. We may also hope that it will lead us to a fuller understanding of the nature of light, and of the interactions between matter and light.

Raman Effect as the Physicist's Tool:-

The significance of the Raman Effect was recognized quickly by other scientists. Professor R. W. Wood of Johns Hopkins cabled Nature to report that he had verified Raman's "brilliant and surprising discovery ... in every particular. It appears to me that this very beautiful discovery which resulted from Raman's long and patient study of the phenomenon of light scattering is one of the most convincing proofs of the quantum theory."

In the first seven years after its discovery, the Raman Effect was the subject of more than 700 papers in the scientific literature, mostly by physicists who were using the technique to study the vibration and rotation of molecules and relating those phenomena to the molecular structure. Then, as noted by Raman biographer G. Venkataraman, there was a decline in interest, as "the first bloom of novelty had worn off and physicists were satisfied that they understood the origin of the effect." At the same time, chemists became interested in the Raman Effect as an analytical tool. In James Hibben's words, "The Raman Effect became the adopted child of chemistry."

By the late 1930s the Raman Effect had become the principal method of nondestructive chemical analysis for both organic and inorganic compounds. The unique spectrum of Raman scattered light for any particular substance served as a "fingerprint" that could be used for qualitative analysis, even in a mixture of materials. Further, the intensity of the spectral lines was related to the amount of the substance. Raman spectroscopy could be applied not only to liquids but also to gases and solids. And unlike many other analytical methods, it could be applied easily to the analysis of aqueous solutions. The use of Raman spectroscopy as a basic analytical tool changed sharply after World War II. During the war, infrared spectroscopy was enhanced by the development of sensitive detectors and advances in electronics. Infrared measurements quickly became routine operations, while Raman measurements still required skilled operators and darkroom facilities. In his 1928 talk in Bangalore, Raman concluded, "We are obviously only at the fringe of a fascinating new region of experimental research which promises to throw light on diverse problems relating to radiation and wave theory, X-ray optics, atomic and molecular spectra, fluorescence and scattering, thermodynamics, and chemistry. It all remains to be worked out."Seventy years

later scientists are still actively working out the results and practical applications of Raman's deceptively simple experiment

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Green House Gas and Its Effect on Artic Landscape

Greenhouse gases are emitted from various human activities which drive into observed results of climate change. These greenhouse gases are emitted from vehicular emission, industries and agriculture sectors, commercial and residential areas. The pollutants released from these areas include carbon dioxide, organic chemicals called chlorofluorocarbons (CFCs), methane, nitrous oxide, ozone and many others. Carbon dioxide is not potent pollutants but is released in a very large amount emitted into air by combustion of fossil fuels.

Greenhouse effect on earth

Some incoming sunlight is reflected by Earth's atmosphere and surface, but most is absorbed by the surface, which is warmed. Infrared (IR) radiation is then emitted from the surface. Some IR radiation escapes to space, but some is absorbed by the atmosphere's greenhouse gases (especially water vapour, carbon dioxide, and methane) and reradiated in all directions, some to space and some back toward the surface, where it further warms the surface and the lower atmosphere. The past changes in the atmosphere temperature happened very slowly. However, the recent warming trend is happening much faster than it ever has .Which results into melting of the polar ice caps that ultimately results in destruction of habitat as well as the biodiversity present there. Polar bears have become a symbol of global warming, because the artic landscape is one of the first to observe the impact of rising temperatures. Warming temperature and melting of polar ice force the animals like polar bear to move farther south in search of food and many other resources.

Encyclopedia Britannica, Inc.
www.nationalgeographic.org/encyclopedia/greenhouse-effect

Article By-
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How are Vaccines Developed?

Vaccines contain tiny fragments of the disease-causing organism or the blueprints for making the tiny fragments. They also contain other ingredients to keep the vaccine safe and effective. These latter ingredients are included in most vaccines and have been used for decades in billions of doses of vaccine. Each vaccine component serves a specific purpose, and each ingredient is tested in the manufacturing process. All ingredients are tested for safety.

Antigen

All vaccines contain an active component (the antigen) which generates an immune response, or the blueprint for making the active component. The antigen may be a small part of the disease-causing organism, like a protein or sugar, or it may be the whole organism in a weakened or inactive form.

Preservatives

Preservatives prevent the vaccine from becoming contaminated once the vial has been opened, if it will be used for vaccinating more than one person. Some vaccines don't have preservatives because they are stored in one-dose vials and are discarded after the single dose is administered. The most commonly used preservative is 2-phenoxyethanol. It has been used for many years in a number of vaccines, is used in a range of baby care products and is safe for use in vaccines, as it has little toxicity in humans.

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Stabilizers

Stabilizers prevent chemical reactions from occurring within the vaccine and keep the vaccine components from sticking to the vaccine vial. Stabilizers can be sugars (lactose, sucrose), amino acids (glycine), gelatin, and proteins

(recombinant human albumin, derived from yeast

Surfactants

Surfactants keep all the ingredients in the vaccine blended together. They prevent settling and clumping of elements that are in the liquid form of the vaccine. They are also often used in foods like ice cream.

Residuals

Residuals are tiny amounts of various substances used during manufacturing or production of vaccines that are not active ingredients in the completed vaccine. Substances will vary depending on the manufacturing process used and may include egg proteins, yeast or antibiotics. Residual traces of these substances which may be present in a vaccine are in such small quantities that they need to be measured as parts per million or parts per billion.

Diluent

A diluent is a liquid used to dilute a vaccine to the correct concentration immediately prior to use. The most commonly used diluent is sterile water.

Adjuvant

Some vaccines also contain adjuvants. An adjuvant improves the immune response to the vaccine, sometimes by keeping the vaccine at the injection site for a little longer or by stimulating local immune cells. The adjuvant may be a tiny amount of aluminium salts (like aluminium phosphate, aluminium hydroxide or potassium aluminium sulphate). Aluminium has been shown not to cause any long-term health problems, and humans ingest aluminium regularly through eating and drinking

How are vaccines developed?

Most vaccines have been in use for decades, with millions of people receiving them safely every year. As with all medicines, every vaccine must go through extensive and rigorous testing to ensure it is safe before it can be introduced in a country's vaccine programmed. Each vaccine under development must first undergo screenings and evaluations to determine which antigen should be used to invoke an immune response. This preclinical phase is done without testing on humans. An experimental vaccine is first tested in animals to evaluate its safety and potential to prevent disease. If the vaccine triggers an immune response, it is then tested in human clinical trials in three phases.

Phase 1

The vaccine is given to a small number of volunteers to assess its safety, confirm it generates an immune response, and determine the right dosage. Generally in this phase vaccines are tested in young, healthy adult volunteers.

Phase 2

The vaccine is then given to several hundred volunteers to further assess its safety and ability to generate an immune response. Participants in this phase have the same characteristics (such as age, sex) as the people for whom the vaccine is intended. There are usually multiple trials in this phase to evaluate various age groups and different formulations of the vaccine. A group that did not get the vaccine is usually included in phase as a comparator group to determine whether the changes in the vaccinated group are attributed to the vaccine, or have happened by chance.

Phase 3

The vaccine is next given to thousands of volunteers – and compared to a similar group of people who didn't get the vaccine, but received a comparator product – to determine if the vaccine is effective against the disease it is designed to protect

against and to study its safety in a much larger group of people. Most of the time phase three trials are conducted across multiple countries and multiple sites within a country to assure the findings of the vaccine performance apply to many different populations.

During phase two and phase three trials, the volunteers and the scientists conducting the study are shielded from knowing which volunteers had received the vaccine being tested or the comparator product. This is called "blinding" and is necessary to assure that neither the volunteers nor the scientists are influenced in their assessment of safety or effectiveness by knowing who got which product. After the trial is over and all the results are finalized, the volunteers and the trial scientists are informed who received the vaccine and who received the comparator.

When the results of all these clinical trials are available, a series of steps is required, including reviews of efficacy and safety for regulatory and public health policy approvals. Officials in each country closely review the study data and decide whether to authorize the vaccine for use. A vaccine must be proven to be safe and effective across a broad population before it will be approved and introduced into a national immunization programmed. The bar for vaccine safety and efficacy is extremely high, recognizing that vaccines are given to people who are otherwise healthy and specifically free from the illness.

Further monitoring takes place in an ongoing way after the vaccine is introduced. There are systems to monitor the safety and effectiveness of all vaccines. This enables scientists to keep track of vaccine impact and safety even as they are used in a large number of people, over a long time frame. These data are used to adjust the policies for vaccine use to optimize their impact, and they also allow the vaccine to be safely tracked throughout its use. Once a vaccine is in use, it must be continuously monitored to make sure it continues to be safe.

Reference –

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Existence of Tiger Facts and Reality

It has recently been announced that there are 2226 tigers in the country. However, despite the increase in the number of tigers, their habitat has not increased. Also, their corridors are not safe. Therefore, the tiger conservation authority, the forest department and the government have a big responsibility to maintain this number in the same habitat and secure the tiger corridor.

The tiger is a semi-nocturnal animal native to the cold region. The tiger's native habitat is Siberia. About 50% of the world's tigers are found in India. Migrating from cold regions like Siberia, the tigers came to Asia and the Indian subcontinent. In tropical regions like the Sundarbans, tigers inhabit hot and dry climates like Kanha, Bandhavgad in Central India and Tadoba-Melghat-Pench in Vidarbha. The tiger's habitat is also changing with the changing times and conditions. The last few decades have seen tigers in one way or another. The existence of tigers is important not only as part of the nature chain but also for the conservation of the lush forests of our region as well as the conservation of biodiversity.

Tigers are being counted with the help of sophisticated technology like camera trapping. So we are succeeding in counting the tigers accurately. Therefore, the number of tigers currently announced should be considered almost accurate. The number 2226 should be considered as the baseline of the existence of tigers. According to experts working in the field of tigers, three to three and a half thousand tigers can live in India. Therefore, experts say that there is a huge scope for the growth of another one thousand tigers. However, should the current increase in the number of tigers be considered satisfactory? Certainly not. Because, there are currently 41 tiger projects in the country. This is where the tigers live. Considering the last few years, the tiger habitat has not increased. That is, even though the number of tigers is the same, the number of tigers in it has increased significantly. If another tiger goes into a tiger's habitat, he doesn't like it. Therefore, this natural matter should be considered very seriously, says Sanjay Karkare, a wildlife researcher.

Although the tiger reserve is safe, human-animal conflict is still raging here. It has not yet been resolved. Deforestation or encroachment in the buffer zone is also a key issue. The responsibility for proper management of the house now rests with the Tiger Conservation Authority, the wildlife, the forest and the government. If this management falters, the number of tigers will decline again, warn tiger researchers. The path that a tiger uses to move from one habitat to another is called a corridor. At present, these corridors are surrounded by various problems. Corridors are in a lot of

trouble due to various reasons like water, dams, highways, transportation, mines, and power projects. Although tigers are safe in tiger sanctuaries, they are extremely vulnerable when they come across these corridors. That is why they fall prey to various reasons from hunting. The insecurity of the corridor is increasing day by day. The planned Nagpur to Jabalpur highway falls within the Tiger Corridor. Numerous debates are currently underway in this regard. If this highway happens, the question of the existence of tigers will become very serious.

The tribal brothers in the tiger project need to be taken into confidence. The question arises as to what is the livelihood of these tribals as the houses in the project are being evacuated. Therefore, with the help of tribals, the forest and wildlife department should strengthen the protection of tigers. Where two state borders or an international border meet in a tiger reserve or a corridor, the question of authority arises. If there is a crime or a calamity at that place, that place does not come under our jurisdiction; it is easily taken from the sacred government departments. As a result, it affects the very existence of tigers. The conflict between the wildlife and the forest department is well known. The Satpuda area in Jalgaon, Buldhana is a tiger corridor. There is a demand to declare a tiger project here. If that happens, the corridor will be safer and tiger habitat will increase, says wildlife researcher Vinod Patil.

In the last four years, 274 tigers have died from poaching, according to the Center for Science and Environment in New Delhi. 113 tigers have been killed at the tiger project and 105 outside the project. Which tigers were counted or have information. There was always talking of them. But, what about tigers that are not counted but are hunted, who complains about them and what is noticed?

Over the past few years, tourism at the Tiger Project site has grown significantly. However, the guidelines given for this tour are not followed. The excitement of the tourists is such that all that is left is to take a photo on the back of a tiger. The villages in the project were relocated for the protection of tigers and now what exactly is being achieved by bringing in tourists?

Assuming there are currently 1,500 females and 500 males, the number of tigers in the upcoming tiger census should go up to 4,000. Considering the last few years, the reproductive process of tigers has also been affected. Only if tiger habitat is maintained will the forest and its biodiversity be preserved. If the tiger is destroyed, it will not take long for all this wealth to be destroyed. Therefore, as the number of tigers has increased, it is necessary to think more about the increased responsibility than celebrating. Effective planning and strict enforcement of laws and regulations will pave the way for tiger protection. Only then will the tigers have real 'good days'.

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Unorganized Sector and Its Contribution to Economy

Six garment units in Tirupur (Tamil Nadu) responsible for providing the bread to approximately 200 workers were shut down and sealed during the lockdown as the region became Hotspot for the spread of Covid 19 during the first lockdown in 2020. Textile industry in Karnataka providing employment to approximately six to eight lakh employees had faced the similar problem of closing down during lockdown-period and the workers in this industry had remained vulnerable due to the dread of losing jobs (Shrivastava, 2021). Thousands of such workers from unorganized sector across all the states are exposed to the crisis of losing livelihoods resulting to loss of housing, lack of healthcare and absence of proper education. They have been the part of India's informal economy where about 60% are workers from unorganized sector responsible for approximately 40% Gross Domestic Product contribution works (Kumar, 2020). Unlike the formal economic sector, the economic activities from the unorganized sector are neither monitored by government not taxed as it has not been part of Gross National Product (GNP) of India. As own account workers or self-employed businessmen or contract laborers or home-based workers etc., the presence of unorganized sector workers has been seen in every sector of developing Indian economy. Non-corporate organizations involving the sectors like construction, transport, manufacturing, trade, hospitality, business and other such services which are majorly responsible for employment of informal sector workers. The vital portion of Indian economy in context of the savings, investment, value addition, etc. is constituted by the non-corporates and unincorporated (popularly known as *Bhagidari*) organizations. The data shows that 12%-14% of the GDP share comes from corporate sector while the same coming out of unincorporates is approximately 30%. Even in case of manufacturing activities in the Indian economy, non-corporate sector involving unregistered manufacturing group as well as the partnership proprietorship groups contributes up to 40% in the national income (Baruah, 2017).

The unorganized sector has the socio-economic role in context of employment opportunities and poverty reduction. Non-corporate sectors generate many income-generating employment opportunities for both skilled and non-skilled workers while contributing huge opportunity for Indian economy to grow (Tambekar, 2020). Apart from the workers coming under purview of the acts like Company Law, 2013; Indian Factories Act, 1948; The Employees Provident Fund and Miscellaneous Provisions Act, 1952; the Central and State Sales Tax Acts; Mines and Minerals (Regulation and Development) Act, 1957; the Contract Labor Act, 1970; State-established Shops and Establishment Act, etc., all other workers have to remain unregistered with the non-beneficiary status for any schemes promoted by the governance bodies (Vikkraman & Basakran, 2009).

Characteristics pointed out by Bagwan (2021) like Heterogeneity in professional actions, comparatively easy entry to the unorganized sector, least capital investment, minimum requirement of skill-set, lack of awareness of labor-rights have been attracting the large workforce in unorganized sector throughout rural and urban India. These workers dominate labor

market of India by forming about 90% of Indian workforce.

Even it has been observed that there is quite less and restricted capital formation in unorganized manufacturing industry due to failure in accessing organized finance sources. This results in borrowing from non-regulated, unorganized credit market at much higher rates of interest. It shades the attention towards need of government intervention in promoting, financing and regulating the unorganized sector while facilitating them to create more capital (Gupta, Chand, & Kumar, 2021). Commercial banks, private and public finance institutions, co-operative societies need to be encouraged and incentivized to offer credit to unorganized sector by various schemes and programmes. It would impact the capital formation in the said sector positively which could help further for betterment of unorganized sector workers through trickled down growth experienced by unorganized sector (Desai, 2020).

Impacts of the unorganized sector on Indian economy and society high enough to ignore their disparity in context of unorganized sector workers' social, economic and political disparity and lack of participation. Lack of proper coverage and ineffective implementation of labor laws, inadequate attention by trade unions, use of primitive technology, limited exposure to education, healthcare and social welfare schemes, inferior working conditions, Lack of statistical information around workers from this sector, lack of regulatory framework and property rights. The central and state governments must recognize their responsibility of improving standard of living of these workers and the welfare of unorganized sector, thereby. The unorganized sector, taking into consideration of the significance and contribution of the unorganized sector in economic growth and development of the country, must emphasize on bringing the workers together under the umbrella of labor legislation while providing them right to minimum wages to improve their livelihood while treating them at par with the employees of formal sector.

Considering wide-spread dominance of unorganized sector and its impact on economic development and growth, terming the sector as "Unorganized" would be seemed as inappropriate as they are well-organized from the point of impacting national economic, social, political and organizational front. Now, the ball of converging the organized sector with organized sector remains in the court of policymakers and governance bodies to maintain the bold characters like Heterogeneity in professional actions, easy entry to the unorganized sector requirement of less capital investment while removing hurdles vulnerability and weakness of the sector and its participants.

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Basics of Networking

Why we need computer networks?

Computer networks help users on the network to share the resources and in communication. Can you imagine a world now without emails, online newspapers, blogs, chat and the other services offered by the internet?

The following are the important uses and benefits of a computer network.

File sharing: Networking of computers helps the network users to share data files.

Hardware sharing: Users can share devices such as printers, scanners, CD-ROM drives, hard drives etc. Without computer networks, device sharing is not possible.

Application sharing: Applications can be shared over the network, and this allows implementing client/server applications.

User communication: Networks allow users to communicate using e-mail, newsgroups, and video conferencing etc.

Network gaming: A lot of network games are available, which allow multi-users to play from different locations.

Voice over IP (VoIP): Voice over Internet Protocol (IP) is a revolutionary change in telecommunication which allows to send telephone calls (voice data) using standard Internet Protocol (IP) rather than by traditional PSTN.

What is a Computer Network?

A computer network is a group of computers or computer like devices connected together to share the network resources like files, data, software, printers, network services etc. A typical computer network consists of users working in workstation computers (also called as clients, or desktops), running client Operating Systems like Windows 7 or Windows 8/8.1 or Windows 10 and store their files inside a central networked file server.

Computer networks with speed of 10 Gbps (Giga bits per second) are becoming common. These high-speed networks are highly redundant also. If one path to destination is lost, within a fraction of a second another path to destination is found, up and running. Today's computer networks are designed not only for file transfer or printing, but a variety of different traffic types like voice, video, torrents etc.

Computer networks are required for network communication and network resource sharing (printers, scanners, storage spaces etc.). To build and connect computer networks, we need computers (Clients and Servers) and special network infrastructure devices like switches, routers, firewalls, servers etc.

Computer networks are built using network infrastructure devices.

Network Infrastructure devices are the physical components used to build the computer network. Depending on the size of the enterprise network, different models of different capacity and quantity of network infrastructure devices are used in the network.

It is necessary to understand and perceive below network device icons, because network topology diagrams use these icons to represent network devices. These icons were originally designed by Cisco Systems, but accepted globally as standard network topology device icons today.

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Monsoon Edible Vegetables

Takala

Botanical Name - *Cassia tora/ Senna tora*
Family - Fabaceae
Sub-Family - Caesalpinaceae
Common names
Sanskrit - Chakramarda, Taga
Bengali & Oriya - Chakunda
Gujrati - Kawaria
Marathi - Takala
Tamil - Tagarai
Malyalam - Chakramandrakam,takara


Habit


Inflorescence

Taakla (originally described by Linnaeus as *Cassia tora*) is a plant species in the family Fabaceae and the subfamily Caesalpinaceae. Its name is derived from its Sinhala name tora. It grows wild in most of the tropics and is considered a weed in many places. Its native range is in Central America. Its most common English name is sickle senna or sickle wild sensitive-plant. Other common names include sickle pod, tora, coffee pod and foetid cassia.

Morphology:-

Senna tora is an herbaceous annual foetid herb. The plant can grow 30–90 centimetres (12–35 in) tall and consists of alternative pinnate leaves with leaflets mostly with three opposite pairs that are obovate in shape with a rounded tip. The leaves grow up to 3–4.5 centimeters long. The stems have distinct smelling foliage when young. The flowers occur in pairs in axils of leaves with five petals and pale yellow in colour. The stamens are of unequal length. The pods are somewhat flattened or four angled, 10–15 cm long and sickle shaped, hence the common name sickle pod. There are 30–50 seeds within a pod.

Recipe:-

Takla chutney

Ingredients - Takla leaves, cumin, raw coconut, green chillies
Preparation - Wash, pluck leaves and tender shoots. Stir fry in a little oil till cooked. Let cool. Dry roast cumin lightly. Grind together the cumin, taakla, fresh grated coconut and green chillies. Lemon/yougurt may be added if desired.

Kurdu

Botanical Name - *Celosia argentea*
Family - Amaranthaceae
Common Names:
Silver Cockscomb, Flamingo Feathers
Hindi - Gadrya, Garke, Garkha
Kannada - Anne soppu, Hanne soppu
Marathi - Kurdu, Kurda, Morachendya
Nepali - Seto change, Sitavarka
Rajasthani - Garkha, Imarti
Sanskrit - Mayurasikha, Rudrajata
Tamil - Makili-k-kirai, Pannai keerai
Mizo - Zamzo


Habit


Inflorescence

Celosia argentea is an erect, usually much-branched, annual plant growing 40-200 cm tall. This species is one of the most promising leaf crops for cultivation in poor or variable growing conditions. It is sometimes cultivated in western tropical Africa, and a few other areas of the tropics, for its edible leaves. It is also widely cultivated as an ornamental plant from the tropics to warm temperate areas, especially in southern Europe where it is often used in summer bedding schemes. There are two main forms, one with green leaves and one with red.

Morphology:

Erect annual herb, 0.4–2 m. tall, simple or much branched with the branches ascending. Stem and branches obviously striate and often sulcate, quite glabrous. Leaves oblong-lanceolate to narrowly linear, acute or obtuse, glabrous, shortly mucronate with the excurrent midrib; leaves from the centre of the stem 2–15 × 0.1–3.2 cm., attenuate below into a slender indistinct petiole; superior and branch leaves smaller, obviously reduced; small-leaved sterile shoots often present in the leaf axils. Inflorescences dense, (sometimes laxer below), spicate, many-flowered, 2.5–20 × 1.5–2.2 cm., silvery or pink, at first conical but later cylindrical, on long peduncles up to 20 m. or more at the ends of the stem and branches.

It grows abundantly wild in monsoons. Its use as a vegetable is common in some parts of Maharashtra. Ayurvedic physicians recommend the seeds of this plant for treating kidney stones.

Recipe:

Ingredients - Coarsely chopped/crushed groundnuts and kurdu leaves and tender stems, finely chopped crushed garlic and green chillies.

Preparation - Heat oil, add the chopped ingredients and when they are cooked (i.e they no longer smell raw) add green chillies, turmeric, salt. Cook till tender.

In-case, the leaves are old and tough, boil and drain them first and then proceed.

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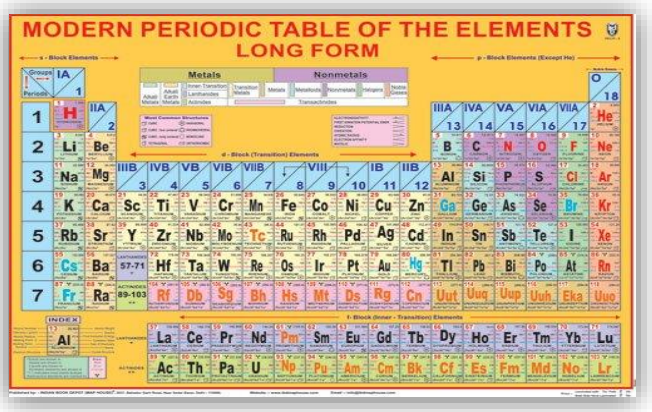
Interesting History of Development of Modern Periodic Table of Elements

Modern Periodic Table (Long Form)

- Based on 'Modern Periodic Law'
- Elements are arranged in increasing order of atomic number
- 18 vertical columns called 'Groups'
- 7 Horizontal rows called 'Periods'
- Position of Element in periodic table relates to its electronic configuration



It is the one element which graces the walls of classrooms and laboratories. Hanging presence of it is adorning the universities to industries. It is a wall-paper sets in laptops of chemistry departments. It has taken a prominent location in the chemistry staff rooms. It is found in the each and every general chemistry book, chemistry text books and practical chemistry books. It is one of the most powerful icons of science. It displays the essence of chemistry in the periodic pattern. It is a saffron for chemists and chemistry lovers. Yes, rightly identified, nothing else, it is a '***Periodic Table of Elements***'

Periodic Table is a single chart that consolidates much of our knowledge of chemistry. The roots of tracing the periodic system of classification are firmly planted since 1770. Throughout its long history, the periodic table has been disputed, altered and improved as science has progressed and as new elements have been discovered. But despite the dramatic changes that have taken

place in science over the past century after the development of the theory of relativity and quantum mechanics, there has been no remarkable change in periodic system and periodic table. At some moments, new findings initially raised question to theoretical base of the periodic table, but each time scientists eventually managed to incorporate the results while preserving the fundamental structure of periodic table. It is praiseworthy to quote that periodic table is thus notable both for its historical roots and for its modern relevance. The term "periodic" reveals the fact that the elements show patterns in their chemical properties in certain regular intervals. Periodic table is not just simplification provided about arrangement of element, also a scientific pattern of writing the elements to learn the properties of all 118 known elements at a glance. The periodic table allows chemists to function by mastering the properties of a handful of typical elements.

In the modern table of 118 elements, each element is placed across rows in order of increasing atomic number. There are seven rows, each making up one period. The lengths of periods are varying. The first has two elements, the next two eight each, then 18 and 32, respectively, for the next pairs of periods. Vertical columns make up groups, which are 18 in number, based on similar chemical properties, related to the number of electrons in the outer shell i.e. electrons in valence shell of the atoms.

Need To Classify Elements?

Elements are the fundamental unit of various compounds and mixtures. In 1789, only 33 elements were known. By 1865, the number of identified were

doubled to 66. At present 118 elements are known. It includes natural as well artificially synthesized elements. Efforts to synthesize new elements are continuing. As the numbers of elements are ever increasing, it is very difficult to study chemistry of all these elements and their innumerable compounds individually. To overcome this difficulty, scientists developed a systematic classification chart to organise these elements and can be visualize them at a glance. Not only that it would rationalize known chemical facts about elements, but even predict new ones for undertaking further study.

Land Marks in Development of Periodic Table

330 B.C. Aristotle –

Four element theory: – Earth, Fire, Water, Air

1770 to 1789 Antoine Lavoisier –

He wrote the first list of elements containing 33 members. Based on their properties, elements are classified into different groups namely gases, non-metals, metals and earths.

1828 Jons Jakob Berzelius -

Developed a table of atomic weights, introduced letters to symbolize elements.

1829 Johann Döbereiner (Döbereiner's Law of Triads)-

It was the first systematic attempt to classify the elements. Johann Wolfgang Döbereiner, a German chemist, tried to arrange the elements with similar properties into groups. He grouped together the elements having similar chemical properties into group of three. So he called these groups 'triads'. Döbereiner showed that when the three elements in a triad are arranged in the order of increasing atomic masses, the atomic mass of the middle element is approximately arithmetic mean of atomic masses of the other two elements in the triad.

Examples of Döbereiner Triads:

Name of the Element	Atomic Mass	Name of the Element	Atomic Mass
Triad - 1		**Triad - 2**	
Lithium (Li)	07	Calcium (Ca)	40.1
Sodium (Na)	23	Strontium (Sr)	87.6
Potassium (K)	39	Barium (Ba)	137.4
Triad - 3		**Triad - 4**	
Chlorine (Cl)	35.5	Beryllium (Be)	9.01
Bromine (Br)	79.9	Magnesium (Mg)	24.31
Iodine (I)	126.9	Calcium (Ca)	40.08

Döbereiner could identify very few such triads from the elements known at that time. Hence, this system of classification into triads was not found to be useful.

1864 John Newlands (Newlands Law of octave) –

In 1866, John Newlands, an English scientist, stated a Law of Octaves. Which states that when the elements are arranged in the order of increasing atomic masses, every eighth elements have properties similar to first. He started with the element having the lowest atomic mass element Hydrogen and ended at Thorium which was the 56th element. It was found that every eighth element had properties similar to that of the first. He compared this to the octaves found in music. Therefore, he called it the 'Law of Octaves'. It is known as 'Newlands' Law of Octaves'. In Newlands' Octaves, the properties of Lithium and Sodium were found to be the same. Sodium is the eighth element after lithium. Similarly, Beryllium and Magnesium resemble each other. But this law and classification has limitations. This law was applicable to elements only up to calcium, as after calcium every eighth element did not possess properties similar to that of the first.

Table of Newland Octave: -

Several new elements were discovered, whose properties did not fit into the Law of Octaves. Cobalt and Nickel were placed in same slot and these are placed in the same column as fluorine, chlorine and bromine which have very different properties than these elements. Iron, which resembles cobalt and nickel in properties, has been placed far away from these elements. With the discovery of noble gases, the Law of Octaves became irrelevant.

Newlands Octave Table

H	Li	Be	B	C	N	O
F	Na	Mg	Al	Si	P	S
Cl	K	Ca	Cr	Ti	Mn	Fe
Co & Ni	Cu	Zn	Y	In	As	Se
Br						

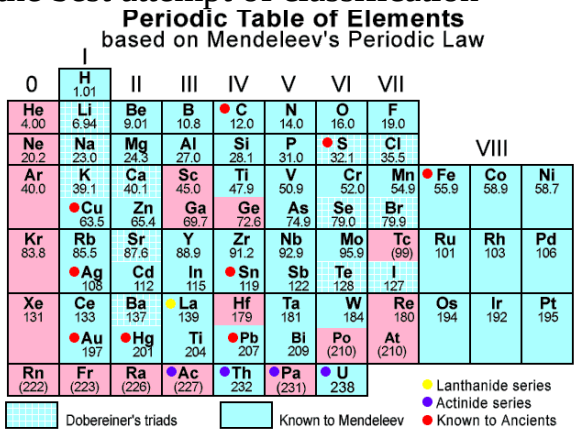
1869 Mendeléev's Periodic Table

The main credit for classifying elements on the basis of certain assumption pertaining to the periodic nature of properties of elements goes to a Russian Chemist Dmitri Ivanovich Mendeléev.

He had sorted out the elements with similar properties and prepared their cards, then these cards were pinned together on a wall and develop one table. He observed that most of the elements got a place in the table and elements were get arranged in the order of their increasing atomic masses. It was also observed that there occurs a periodic recurrence of elements with similar physical and chemical properties. On this basis, Mendeléev stated a periodic law, which was stated as '**the properties of elements are the periodic function of their atomic masses'**. This law is known as Mendeléev Periodic Law. On the basis of this law Mendeléev developed a Periodic Table contains vertical columns called 'groups' and horizontal rows called 'periods'. Each group was divided into sub group A and B. Elements in same sub group resembles in their properties. He had left 3 vacant spaces in the periodic table. He called them as eka boron, eka aluminium and eka silicon. These elements were discovered subsequently as Scandium, Gallium and Germanium respt.

There are some demerits of this table like Elements having similar chemical properties are placed in different groups. e.g. mercury led and barium are placed in different groups. Some elements of different properties are found in same group. E.g. copper, silver and gold were placed in group of alkali metals. Isotopes were not placed separately.

Despite of these limitation, this was the best attempt of classification



Discovered the Noble Gases

1913 Henry Moseley

Henry Moseley showed that the atomic number (symbolised as Z) of an element is a more fundamental property than its atomic mass. Accordingly, Mendeléev's Periodic Law was modified as **the properties of elements are the periodic function of their atomic number'.** This is known as modern periodic law. This law was adopted as the basis of 'Modern Periodic Table'

In the modern periodic table elements are arranged in the order of increasing atomic number, Prediction of properties of elements could be made with more precision when elements were arranged on the basis of increasing atomic number. All the anomalies of Mendeléev Periodic Table are removed in Modern Periodic Table.

Modern Periodic Table contains 18 verticle columns called 'groups' and 7

horizontal rows called 'periods'. Each period starts with alkali metal and ends with noble gas. First period is shortest period, second and third periods are short periods, fourth and fifth periods are long periods, sixth period is longest period and seventh period is incomplete period.

Elements are placed in different groups according to their electronic configuration. Periodic Table is divided into four blocks namely 's' Block (includes normal elements), 'p' Block (includes normal elements and noble gas) 'd' Block (includes transition elements) and 'f' Block (includes inner transition elements). Lanthanide and Actinide Serries are placed at the bottom of the main table.

1944 Seaborg

The prediction of the chemical properties, method of isolation, and placement of many heavier elements in the periodic table of the elements was helped greatly by an important organizing principle described by Seaborg and known as the actinide concept. This was one of the most significant changes in the periodic table since Seaborg recognized that the 14 elements heavier than actinium (89) are closely related to it and belong to a separate group in the periodic table, the actinide elements.

Now a days we are using this complete 'Modern Periodic Table' (Long Form). With the help of this periodic table one can describe periodic trends and similarities in physical and chemical properties of the element in very lucid manner.

The Periodic Table is arguably the most important concept in chemistry, both in principle and in practice. It is the everyday support for students, it suggests new avenues of research to professionals, and it provides a succinct organization of the whole of chemistry. It is a remarkable demonstration of the fact that the chemical elements are not a random cluster of entities but instead display trends and lie together in families. An awareness of the Periodic Table is essential to anyone who wishes to disentangle the world and see how it is built up from the fundamental building blocks of the chemistry, the chemical elements.

Glenn T. Seaborg

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