

CHEMISTRY

Chief Editor – Jasjeet Kaur

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Dr. B . R . Ambedkar , NIT , Jal

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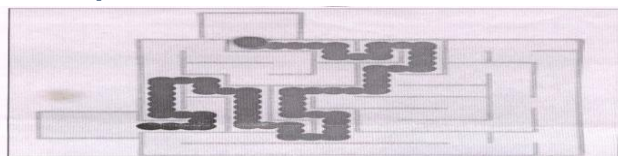
Professor Moin Uddin (Director Dr. B.R Ambedkar NIT Jalandhar)

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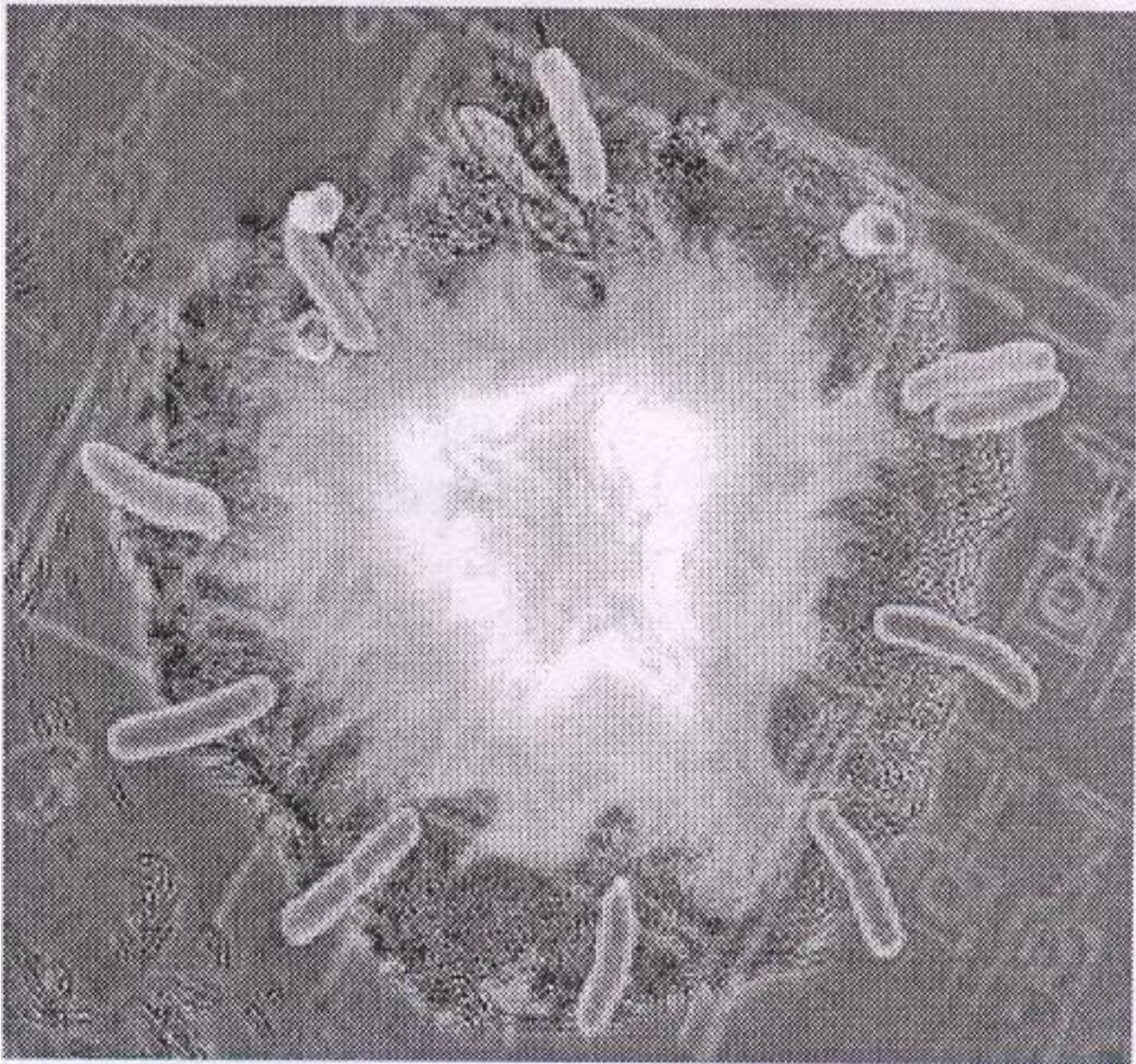
“ Diamond Jubille of Republic Day ” January 26 , 2010

Chhapte Chhapte – Chase acid , solve maze- Published in Nature Jan

21,2010



An acid-seeking chemical blob can propel itself through a maze , always choosing the shortest way out. Bartosz Grzybowski and his team at Northwestern University in Evanston , Illinois , created this system by lacing a droplet of organic solvent with a surfactant , 2-hexyldecanoic acid , that diffuses to the liquid's surface. The surfactant reacts with base , and in a pH gradient this results in unequal surface tensions at the droplet's edge , which drive it acid-wards. The authors diffused acid through a maze of silicone channels already filled with basic solution . They then set their droplet loose , it darted down the channel with the steepest pH gradient (pictured) , which was also the shortest route to acid-soaked exit. (Source : Nature 463 , 272(21 January 2010)



Background Picture : Bacterial clocks chime in unison (A burst of light from a colony of bacteria with coupled genetic clocks).

Source : Nature 463 , 272(21 January 2010)

EDITOR'S CHOICE : “ MOLECULAR NETWORKS & SYSTEMS CHEMISTRY ”

- ❖ Systems chemistry deals with complex dynamic phenomena such as chemical self-replication & chiral symmetry breaking as well as integration of dynamic subsystems into higher ordered supersystems. It's the study of complex systems or networks , of molecules . Chemists can investigate how interactions between members propagate through networks, allowing complex behavior to emerge.
- ❖ There are two main questions being asked by the chemists .The first is how the complex networks of molecules found on the prebiotic Earth might have crossed the threshold of life. Research into this area seeks possible mechanisms for how the biochemical building blocks of life were selected , and how biomolecules developed to have only one handedness(chirality).The second question is how collections of molecules self-assemble into complex structures , and how secondary interactions between molecules and competition for molecular building blocks lead to complex behavior within self-assembling systems. Increased interest is being shown in this research area .
- ❖ Systems Chemistry deals with complex behavior of molecules There are two types of chemical systems that exhibit complex behaviour. The first involves systems of molecules undergoing thermodynamically controlled reactions which approach equilibrium in a complex way. In these systems, numerous interactions between the molecules may act together to determine the most stable set of products from the network as a whole. The second category involves set of kinetically controlled reactions in which one reaction's products modulate another reaction's rate within the system. Biological systems exhibit both thermodynamic and Kinetic properties. Complex self-assembly processes operating under thermodynamic control are used to construct many of the complex forms of biomolecular systems.
- ❖ Many advanced materials such as Composites , consist of systems of intermingled basic materials (metals , ceramics , polymers) that interact in complex ways. Understanding the chemical nature of these interactions is essential for tuning and designing the properties of advanced materials. Synergistic drug interactions – interplay between different drugs in the body that can cause biological effects not seen when the drugs are taken individually – likewise emerge from complex networks of drug molecules and biomolecules. Retrosynthetic methodology that can be used to reverse-engineer chemical systems. This would facilitate the design of links between the members of chemical networks , in the same way that sequences of chemical bonds may be planned and constructed in the synthesis of complex organic molecules.

Source : Refer- nature vol 462/10 dec, 2009

Systems chemistry workshop , Venice October 3-4,2005

[www.rsc.org/esr/chemical society reviews.](http://www.rsc.org/esr/chemical_society_reviews)

CHEM-STORY: “Copenhagen: the chemists' view”

- ❖ The Copenhagen meeting , held from 7 to 18 December , was the conference of the parties (COP) to the United Nations Framework Convention on Climate Change , signed at the Earth Summit in Rio de Janeiro in 1992. Negotiators have been meeting each year for a COP . Since 1995 but twelve years after taking their first tentative steps with Kyoto Protocol , countries are now aiming to restructure the global academy and to lock in , deep cuts in greenhouse gas emissions for decades to come.
- ❖ According to Intergovernmental Panel on Climate Change (IPCC) findings , the humans cause climate change. Climate change has several impacts and it is not too costly to reduce emissions. A sustainability Institute has developed a user friendly climate modeling software that can be run on a laptop computer to help negotiators assess the ultimate impact of any given emissions scenario. Negotiators can manually adjust the emissions and other parameters to analyze their own proposals as well as those with other countries, the model spits out forecasts for variables such as future temperatures and sea level rise. Some delegates are less interested in detailed climate projections than in the next election in their home country but were happen to be alive at a time when people are trying to make common decisions about how to protect our common planet.
- ❖ Experts advise the nations to limit average global warming to 1.5 °C or preferably less. Experts are developing integrated climate models that include social and economic forces . Physical modeling will remain a core activity as scientists seek to clarify & provide more detail about potential impacts of greenhouse gases.
- ❖ The Question: How the world intends to respond to climate change?. Some impacts can be avoided by reducing greenhouse gas emissions and others can be managed with enough money.
- ❖ Forest protection strategy called REDD could make a difference in COP 15 , not just as a way to address emissions from tropical deforestation , but also to create a new kind of synergy among Nations . Publishing papers in Nature or Science is one thing but the goal must be to translate results into digestible form. Science is a tool to reach sustainable development.

Source: www.nature.com/road to Copenhagen.

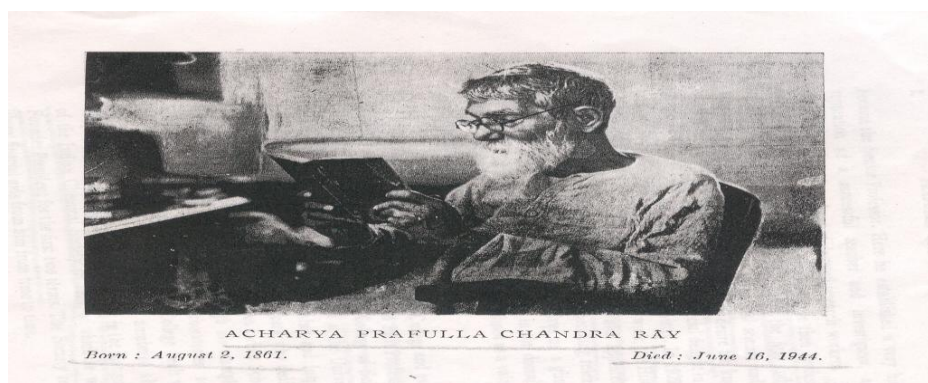
CHEM-WEB-WISE: “ORGANIC PAD”

- ❖ Organic pad is an innovative and user friendly programme that has been designed to allow students to draw Lewis structures by using natural user interface of a tablet PC.
- ❖ Lewis structures can convey a great deal of structural information that can be used to predict and explain the physical and chemical properties of substances they are meant to represent.
- ❖ In recent decades almost two dozen articles have appeared in the research literature describing innovative ways of teaching Lewis structure to the students.
- ❖ With the advent of tablet PC's students now have the ability to draw free- form chemical structures using an interface that closely mimics the use of pen and paper organic pad molecules are represented as computer science graphs, where atoms are nodes and bonds are edges. Upon starting organic pad, users are presented with a blank workspaces, using the draw tool, students can use the tablet PC styles to write ink storks, including atom symbols, bonds, electron dots and charges. For example, the letter 'C' is about to be converted into carbon atom. Students can use draw tool to add electron pairs & negative or positive charges to their Lewis structures. The push tool can be used to add curved arrows to illustrate organic reaction SN² reaction mechanism also undergoes 3-dimensional capabilities. Organic pad is a tutorial mode that allows the students to receive individualized feedback on the Lewis structure they draw. It facilitates student teacher interactions in the class room. It tallies all correct and incorrect responses and displays it visually for the instructor in the form of a pie chart. At any point, the instructor can click on the name of the student connected to the system and see the structure they have drawn. Further the instructor can communicate privately with the student and offers suggestions when the student appears to be struggling. Therefore, organic pad allows students to create free form Lewis structures as they would with the pen and paper. Users are able to draw Lewis structures in the manner that they wish and help students become more proficient in their structure drawing abilities.

Source : www.rsc.org/cecp

CHEMIST OF THE MONTH : “Acharya Prafulla Chandra Ray”

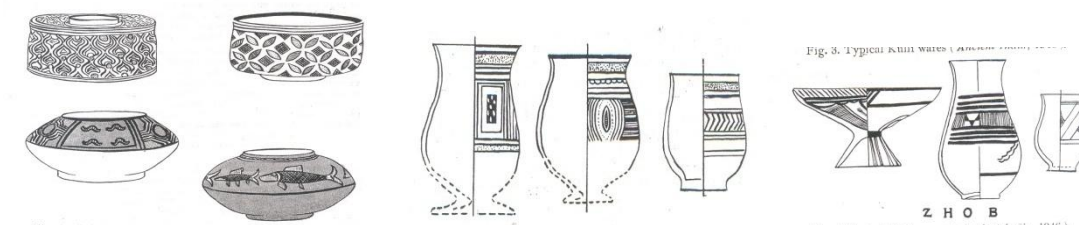
“He is remembered as father figure in Chemistry fraternity in India & abroad alike”



- ❖ Acharya Prafulla Chandra Ray was born in a cultured and rich family in the district of Khulna, now in Bangladesh, on 2 , August 1861. After his preliminary education in his father’s village school upto the age of nine, when the family migrated to Calcutta, he joined the Hare school and subsequently the Albert school. For his further studies he joined the metropolitan institution, now known as Vidyasagar college, and used to attend lecture on Physics and Chemistry at the Presidency College, Calcutta. In 1882 he obtained the Gilchrist scholarship which enable him to proceed to the United Kingdom and joined the University of Edinburgh in the Faculty of Science . There he came under the influence of Professor Crumbrown in Chemistry which became his favourite subject.He obtained his D.Sc. degree in 1888 and became the recipient of several scholarships in the Edinburgh university.
- ❖ Ray was appointed Assistance Professor of chemistry at the Presidency College , Calcutta in 1889. He and his colleage Jagdish Chandra Bose , the then Professor of Physics at the Presidency College , were the first Indian teacher to initiate research work in natural science and inspires young minds with a spirit of enquiry, desire for knowledge and quest for truth.In 1916 he retired from the Presidency College and assumed charge as the Head of the Department and Palit Professor of Chemistry in the newly started University college Of Science , Calcutta . He took a leading part in the inauguration of the Indian Chemical Society in 1924 , of which he was founder President for the first two terms. Prafulla Chandra received many honours in life. He was the recipient of Honorary degrees Of D.Sc of the University Of Durham , Dacca , Calcutta and Banaras . He was elected General President of the Indian Science Congress in 1920 , and in 1934 became an Honorary Fellow of the Chemical Society , London. Ray was also held in great respect as a pioneer of chemical industries in india.In about 1900 he founded the Bengal Chemical and Pharmaceutical works , which was converted into a limited concern in 1902. No truer picture of his life can possibly be depicted in words than that presented by the following quotation from what sir Edward Thorpe wrote in Nature as early as 1919:
- ❖ “ Her (India’s) elevation will not come in Sir Prafulla Chandra Ray’s time . A small spare man , in feeble health , and a confirmed dyspeptic , he will be spent in her service. But the memory of these services will survive ”.

ALCHEMY – Chemistry in Ancient time

- ❖ Chemistry in Ancient India, had its origin in the development of practical arts to meet the demand for the necessities of life. The two great human instincts, self – preservation and an urge for knowledge are responsible for its birth & growth. The earliest evidence of chemical knowledge possessed by the ancient Indians has been brought to light by findings of archaeological excavations in Baluchistan, Sind & Punjab. Ruins of ancient civilization have been unearthed at Mohenjo-Daro & Harappa furnish much information about chemical knowledge acquired by Indus Valley people with reference to practical arts like pottery, brick making and the extraction & working of metals.



- ❖ Acharya PC Ray has shown that there are four successive stages in which Chemistry may be said to have developed in Ancient India. These are Ayurvedic Period (Pre-Buddhist era to circa 800 A.D), Transitional Period (800A.D – circa 1100 A.D), Tantric Period(800A.D – 1300 A.D), Iantro-Chemical Period (1300 A.D – circa 1550 A.D). Prehistoric Indian Period (Circa 4000 BC – 1500 B.C) shows close relationship with Bronze Age Culture of neighbouring regions of Western Asia. People in these ancient settlements were acquainted with art of making potteries of burnt Clay & painting them with various designs. Classification based on colour of the wares, has been made with subdivisions named after the sites of occurrence as shown : I) Buff-ware Cultures II) Red-ware cultures.
- ❖ The houses in Amri-Nal settlements were made of stone and mud bricks with the refinement of white plaster over the inner faces of the walls. In a cemetery at Nal a flat copper axe was found. The colour of the Amri-Nal pottery body is a very fine soft buff or pink. Polychrome pottery vessels have been found at Nal with red, blue, green and yellow paint. Copper axes and chisels, found in Nal Cemetery on analysis said to contain:
 - Copper ... 93.05%
 - Lead 2.14%
 - Nickel 4.80 %
 - Arsenic trace
- ❖ Prehistoric people were acquainted with the art of making baked or burnt clay pottery, as well as painting the same with two or more colours. This implies the construction of open and closed kilns. They also knew the art of extracting copper from the copper ores and of working the metal into various articles by hammering, cutting and rolling. Closed pottery kilns with their reducing atmosphere served satisfactorily for the smelting of the copper ores for which the temperature needed does not exceed 700 – 800°C. Development of art of painted and polychrome pottery, and that of smelting copper from copper ores, it may be said that these prehistoric people of the fourth and third millennium B.C laid the foundation of chemistry and of metallurgy in India.

CHEM HUMOUR: New element found

- ❖ The recent hurricane and gasoline issues helped prove existence of a new element. A major research institution announced discovery of the heaviest element yet known to science. The new element has been named '**Governmentium**'.
- ❖ Governmentium (Gv) has one **Neutron**, 25 **assistant Neutrons**, 88 **deputy Neutrons**, and 198 **assistant deputy Neutrons**, giving it an atomic mass of 312.
- ❖ These 312 particles are held together by forces called **Morons**, which are surrounded by vast quantities of **Lepton** like particles called **Peons**. Since Gv has no electrons, it is inert. However it can be detected, because it impedes every reaction with which it comes into contact. A minute amount of Gv causes one reaction to take over four days to complete, when it would normally take less than a second!
- ❖ Gv has normal half life of 4 to 5 years, it does not decays but instead undergoes a reorganization in which a portion of the **assistant Neutrons** and **deputy Neutrons** exchange places. In fact, Governmentium's mass will actually increase over time, since each reorganization will cause more **Morons** to become **Neutrons**, forming **Isodopes**.
- ❖ This characteristic of **Moron promotion** leads some scientists to believe that Gv is formed whenever **Morons** reach a certain quantity in concentration. This hypothetical quantity is referred to as '**Critical Morass**'.
- ❖ When catalyzed with money, Gv becomes Administratium-an element which radiates just as much energy as Gv since it has half as many **Peons** but twice as many **Morons**.

Courtesy : Dr. Sujit Kumar Sinha (Textile dept , NIT , Jal)

CHEMQUIZ

QUESTION : Name the metal which becomes liquid when you hold it in your hand???

CHEMYCAL RXNS

- ❖ In this column constructive comments & criticism from the readers will be published from next month.
- ❖ All the sources quoted in this paper are available with chief editor, anyone can get access to that.