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INSIDE THIS ISSUE….

ANKUR

…….Sprouting of thoughts

Ankur is symbol of new beginning towards growth. And Ankur is here to introduce budding writers. It would represent interesting articles in Botany, Bioinformatics and Climate Change Impacts Management. Each seed has the innate potential to grow - blossom, and display its magnificence after its dormancy has been broken. Same way this news letter would provide a platform to young researchers to share news and views, promote awareness about the subjects and generate interest in related issues. Ankur would be taken care of by a team of dedicated Student Editors who would select and edit articles for online publication.

We wish Team Ankur all the best for this endeavour.

FROM EDITOR'S DESK….

Ankur is now four years old. This newsletter is intended to be published twice in a year. The growth and development of Ankur is a reflection of the growth and progress of the students of the department. This news letter will serve to reinforce and allow increased awareness, improved interaction and integration among all of us.

The journey began four years ago and now Ankur has blossomed and is spreading the fragrance to everyone around with the message of technology playing a critical role in addressing major challenges the world faces. In this issue, we focus on emerging technologies.

Editorial Team

Dr.Archana Mankad

Dr.Hitesh Solanki

Dr.Himanshu Pandya

Dr.Nainesh Modi

Ms.Miral Prajapati

Patron's Message.....

Ankur provides an educative and informative interface for the members. It gives an opportunity to share significant and salient relevant information to the readers. This issue focusses on **EMERGING TECHNOLOGIES**. As the thrust of research evolves, the dynamic science emerges as a foundation to newer technologies that are now shaping various aspects of our lives. Be it healthcare or environment protection technology has provided solutions to the challenges emerging as a result of development.

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CYBORG ROSE

DR. ARCHANA MANKAD

Scientists have created a kind of cyborg flower: living roses with tiny electronic circuits threaded through their vascular systems. The miniscule electronic polymers are inserted into the plant, then almost magically self-assemble thanks to the rose's internal structure."In a sense, the plant is helping to organize the electronic devices," said study co-author Magnus Berggren, an organic electronics researcher at Linköpin University in Sweden. The strange cyber plants could one day make it possible to tell flowers when to bloom to avoid an impending frost, or when to put out hormones to prevent a drought.

Berggren and his colleagues have actually been trying to make electronic plants for about a decade. The team focused on rose bushes because they have all the elements of a tree — such as bark, leaves, petioles and tried different electronic ingredient. Some spurred the plant to release toxic compounds, essentially poisoning the plant. Others clogged the xylem, or the vascular tissue, used to transport water inside a plant. The team decided to keep trying with other materials. Lead author Eleni Stavrinidou, a postdoctoral researcher in Berggren's lab, cut the stems of roses and then placed the roses in a solution with a variant of the organic polymer poly (3,4-ethylenedioxythiophene) called PEDOT-S, which has good electrical conductivity when hydrated.

Here’s how it’s done: first, the researchers introduce a synthetic polymer called PEDOT-S into the rose through its stem. The plant sucks up the polymer using xylem. Once inside xylem channels, the polymer self-assembles into a “wire” that conducts electrical signals, while still allowing water and nutrients to move around. By connecting these wires with naturally-occurring electrolytes in the plant’s tissue, the researchers are able to create an electrochemical transistor, as well as a digital logic gate, a basic component of computer systems. The researchers also introduced a variant of PEDOT-S into the leaves, where it forms “pixels”; groups of electrochemical cells separated by leaf veins. When a voltage is applied, these pixels change color like a display. The first cyborg plant is the culmination of two decades of work.“Now we can really start talking about ‘power plants’—we can place sensors in plants and use the energy formed in the chlorophyll, produce green antennas, or produce new materials,” Berggren said. “Everything occurs naturally, and we use the plants’ own very advanced, unique systems.”The strange cyberplants could one day make it possible to tell flowers when to bloom to avoid an impending frost, or when to put out hormones to prevent a drought.

Reference: Electronic plants by Eleni Stavrinidou, Roger Gabrielsson, Eliot Gomez, Xavier Crispin, Ove Nilsson, Daniel T. Simon and Magnus Berggren, Linköping University Post Print, 2015.

ALGAL TECHNOLOGY

DR. HITESH SOLANKI

Biofuels are one of the potential options to reduce the world‘s dependence on fossil fuels. Algae may offer this opportunity. The basic concept of using algae as a renewable feedstock for biofuels production has been known for many years. All of the elements for the production of lipid based fuels from algae are possible because algae can be grown in large outdoor cultures and harvested. The algal biomass contains a certain percentage of lipids that can be harvested to further result in biodiesel.

The technology has a lot of potential in terms of production from Microalgae which include a wide variety of photosynthetic microorganisms capable of fixing CO2 from the atmosphere and water to produce biomass more efficiently and rapidly than terrestrial plants. Numerous algal strains have been shown in the laboratory to produce more than 50 percent of their biomass as lipid also called triglycerides, the anticipated starting material for biodiesel fuels.

An additional benefit of growing algae as a biofuels feedstock is that they can be cultivated on otherwise non-productive (i.e., non-arable) land that is unsuitable for agriculture that does not further tax already limited resources. In the future, an algal-based bio refinery could potentially integrate several different conversion technologies to produce biofuels including biodiesel, green diesel and green gasoline1 (generated by catalytic hydroprocessing and catalytic cracking of vegetable oils, respectively), aviation fuel, ethanol, and methane, as well as valuable co-products including oils, protein, and carbohydrates.

Approximately 9,000 tonnes of algal biomass is produced commercially today, mainly for the production of high-value, low volume food supplements and nutraceuticals. Proposed commercial algal biofuels production facilities employ both open (ponds) and closed (tubes, also known as photobioreactors) cultivation systems. Commercial algal growth will require the development of strains and conditions for culture that allow rapid production of algal biomass with high lipid content and minimal growth of competing strains. The potential oil yields for algae are significantly higher than yields of oil seed crops Therefore, a smaller area is potentially required to produce triglyceride-rich oil from microalgae than from other types of biomass. In addition, a significant engineering research effort is needed to develop and prove out cost-effective algal harvesting techniques. Extraction of Algal Oils involves some form of solvent extraction (though other methods such as mechanical extraction have been proposed), but any process option is likely to be complicated by the high water content of algal biomass. Once the algal oil is recovered, downstream processing to biodiesel or green diesel is well understood. Wet processing of microalgae may also emerge as a possibility to avoid significant dewatering costs if the appropriate processes can be developed.

Reference:Current Status and Potential for Algal Biofuels Production byAl Darzins, Philip Pienkos&Les Edye 2010

FOOD NANOTECHNOLOGY

DR.HIMANSHU PANDYA

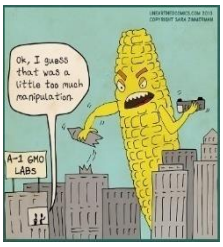
Nanotechnology has begun to find potential applications in the area of functional food by engineering biological molecules toward functions very different from those they have in nature, opening up a whole new area of research and development. Of course, there seems to be no limit to what food technologists are prepared to do to our food and nanotechnology will give them a whole new set of tools to go to new extremes. Food is nanofood when nanoparticles, nanotechnology techniques or tools are used during cultivation, production, processing, or packaging of the food. It does not mean atomically modified food or food produced by nanomachines.

Recent research has begun to address the potential applications of nanotechnology for functional foods and nutraceuticals by applying the new concepts and engineering approaches involved in nanomaterials to target the delivery of bioactive compounds and micronutrients. Nanomaterials allow better encapsulation and release efficiency of the active food ingredients compared to traditional encapsulating agents, and the development of nano-emulsions, liposomes, micelles, biopolymer complexes and cubosomes have led to improved properties for bioactive compounds protection, controlled delivery systems, food matrix integration, and masking undesired flavours. Nanotechnology also has the potential to improve food processes that use enzymes to confer nutrition and health benefits. For example, enzymes are often added to food to hydrolyze anti-nutritive components and hence increase the bio-availability of essential nutrients such as minerals and vitamins. To make these enzymes highly active, longlived and cost-effective, nanomaterials can be used to provide superior enzyme-support systems due to their large surface-to-volume ratios compared to traditional macroscale support materials.

Reference: Nanowerk

GENETICALLY MODIFIED ORGANISMS

DR. NAINESH MODI



Genetically modified organisms (GMOs) seem like a great idea at first—just use recombinant DNA technology to add or replace a gene with another gene. With such targeted modifications, we could make our food crops resistant to insects, herbicides, and drought. We could make ourselves resistant to cancer, heart disease, and neurodegenerative diseases—right? Unfortunately, it isn't as simple as we might wish, either technically or ethically. Sorting GMOs from wild-types requires extensive testing and labeling. The potential risks of GMOs are unknown, and we are still debating even how to assess the risks. Almost anyone who uses GMOs needs to test for the presence of genetic modification (GM) to identify GMOs. Most of these tests are PCR-based, but some also use ELISA or other tests. Two common targets of screening for GMOs are the 35S promoter from the cauliflower mosaic virus, and the NOS terminator from *Agrobacterium tumefaciens*. Though PCR is the standard method for GMO detection and quantification, David Lee, a research scientist at National Institute of Agricultural Botany (NIAB), has been investigating alternative methods such as "loop-mediated isothermal DNA amplification (LAMP)". LAMP can amplify GM DNA sequences directly from plant tissues without prior purification of the DNA. Dr Lee has also developed an alternative quantification method that he calls "QUIZ" (quantitation using informative zeros), which applies statistical methods to estimate the numbers of DNA molecules in a sample. It is possible to establish the GMO content of a sample by counting the numbers of GM molecules in relation to a standard genomic target (reference). "QUIZ's major advantage is that it does not need to use calibration standards to do the quantification required by the industry standard (real-time PCR)," says Lee.

Widening the tool set for cro0p protection, Syngenta Biotechnology—which commercialized the first GM corn to protect against an insect called European Corn Borers—is adding chemical help to the genetic mix. In many cases, their products not only protect against a broad range of insect pests, but also provide herbicide tolerance. Additionally, they use the best germplasm, which often has other yield benefits for the customers—for example, for soybean the product could have enhanced tolerance against fungus, improved drought tolerance, or an improved nutritional profile through oil content."

Reference:David Lee, Maurizio La Mura, Theo R Allnutt, and Wayne Powell , Detection of genetically modified organisms (GMOs) using isothermal amplification of target DNA sequences.BMC Biotechnol.2009; 9: 7. Published online 2009 Feb 2. doi: 10.1186/1472-6750-9-7,PMCID: PMC2656497

TISSUE CULTURE TECHNOLOGY FOR PRODUCTION AND CONSERVATION OF PLANTS

MIRAL PRAJAPATI

The *in vitro* culture has a unique role in sustainable and competitive agriculture and forestry and has been successfully applied in plant breeding for rapid introduction of improved plants. Plant tissue culture ,now an important emerging technology, has become an integral part of plant physiology having a great impact on both agriculture and industry, through providing plants needed to meet the ever increasing world demand. Significant contributions to the agricultural sciences advancement in recent times have been achieved. Interventions of biotechnological approaches for *in vitro* regeneration, mass micropropagation techniques and gene transfer studies in tree species have been encouraging. *In vitro* cell and organ culture offers an alternative source for the conservation of endangered genotypes. Germplasm conservation worldwide is increasingly becoming an essential activity due to the high rate of plant species disappearance and the increased need for safeguarding the floristic patrimony of the countries. Tissue culture protocols can be used for preservation of vegetative tissues when the targets for conservation are clones instead of seeds, to keep the genetic background of a crop and to avoid the loss of the conserved patrimony due to natural disasters, whether biotic or abiotic stress. The plant species which do not produce seeds - sterile plants or recalcitrant seeds that cannot be stored for long period of time can successfully be preserved via *in vitro* techniques for the genetic resources maintenance. Cryopreservation plays a vital role in the long-term *in vitro* conservation of essential biological material and genetic resources. It involves the storage of *in vitro* cells or tissues in liquid nitrogen that results incryo-injury on the exposure of tissues to physical and chemical stresses. Successful cryopreservation is often ascertained by cell and tissue survival and the ability to re-grow or regenerate into complete plants or form new colonies. It is desirable to assess the genetic integrity of recovered germplasm to determine whether it is 'true-to-type' following cryopreservation. The fidelity of recovered plants can be assessed at phenotypic, histological, cytological, biochemical and molecular levels, although, there are advantages and limitations of the various approaches used to assess genetic stability. Cryobionomics is a new approach to study genetic stability in the cryopreserved plant materials.

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STATUS OF PHYTOREMEDIATION IN WORLD SCENARIO

JAHNAVI PANDYA

The burning issue of today's environment problem is the release of toxic contaminants from various man made sources resulting in contamination of natural resources of earth and leading to scarcity of clean water and loss of soil fertility. To overcome these drawbacks, the concept of using plant to clean up contaminated environment is not new. About 300 years ago, plants were proposed for use in the treatment of waste water land and water pollution by heavy metals is a worldwide issue. Therefore has been an increasing concern with regard to accumulation of heavy metals in environment as they pose big threat to both human health and natural environment. In central and eastern European countries about 1.7 million sites were contaminated with heavy metals and need reclamation. In developing countries particularly India, china, Pakistan, Bangladesh, soil and water pollution is also severe where small industrial units are pouring their untreated effluents over near agricultural fields. The use of plants species for cleaning polluted soils and water named as phytoremediation has gained increasing attention since last decade, as an emerging cheaper technology. This article reviews the status of phytoremediation in global prospects.

Phytoremediation refers to a diverse collection of technologies that use either naturally occurring or genetically engineered plants for remediating contaminated environments. Plant systems and their rhizosphere microbial communities are used to remove, degrade, or stabilize environmental contaminants. Phytoremediation technologies currently fall into the following general categories:

- Enhanced rhizosphere biodegradation
- Phytoextraction, including rhizofiltration
- Phytoextraction and phytovolatilization
- Phytodegradation
- Phytostabilization

PHYTOEXTRACTION

The current approaches for the phytoremediation of metals-contaminated environmental matrices are extraction of the metal from the matrix into plant shoots for recycling or less expensive disposal, volatilization of the metal from the matrix, and stabilization of the metal within the matrix into biologically unavailable forms. Phytoextraction is the uptake of contaminants, particularly toxic metals and radionuclides, by plant roots and the translocation of these contaminants into plant shoots and leaves. The shoots and leaves are then harvested for disposal leaving soil in place that meets or exceeds regulatory levels. Specially selected plants, known as hyperaccumulators, can extract and accumulate exceptionally high levels of toxic metals from soil.

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PLANT BIOACTIVES AND INDUSTRIALIZATION

ANCY J. FERNANDES

Food is the essential part of every living organism. Phytochemical processing is an area of engineering that is critical to the growing multimillion dollar global business of healthcare in pharmaceutical, nutraceutical, fortified food grains and herbal based industries [1]. Herbal bioactives or phytochemicals that are found to be important towards the cure of a certain diseased condition need to be isolated and can incorporated to the food products to make it healthy. The herbal related market includes herbs used as food or food additives, cosmetic ingredients, and herbal medicines. There is a growing trend of people moving from synthetic allopathic drugs to herbal cures.

The growing knowledge of consumers about traditional medicines and have realized that effective herbal cures are the results of thousands of years of herbal healing framework developed through trial and error, observation, and study. Also, there have been some high profile natural based cures such as Taxol for breast cancer and the Bintangor plant for AIDS. In several countries, traditional healing methods have been incorporated into the modern health system for example in Germany, herbs which are proven to be safe and effective are readily incorporated into the medical system. Whereas in Japan, doctor prescribed phytomedicines can be claimed under national health insurance [2]. The issue in manufacturing herbal products and medicines is its standardisation. Standardisation is the process of producing herbal extracts or phytochemicals in which product potency is guaranteed through consistency in active compound content level. This process requires high knowledge in phytochemical analysis and process technology to ensure the quality assurance required.

Due to excessive industrialization and increasing population growth the available products are often in the form of synthetic chemicals that are similar to the actual plant supplement. The nutritional value of the product is now less focused but towards the end if one realizes the real reason for various lifestyle diseases ultimately due to the consumption of adulterated food products. Plant produces a wide range of bioactive components that are essential for us, identifying the reason of their formation and its practical application in food industry for better quality food items is the biggest challenge to the industries.

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QUANTITATIVE STRUCTURE ACTIVITY RELATIONSHIP

RIKIN D. PATEL

Chemo informatics is the application of informatics approaches to resolve chemical problems. All areas of chemistry from analytical chemistry to drug design can be assistance from chemo informatics methods. Quantitative Structure–Activity Relationships (QSAR) has been adapted to cover correlations independent of actual physicochemical properties. QSAR started with similar correlations between chemical reactivity and structure. Preferably, the activities and properties are connected by some mathematical function, F: Biological activity = F (Physicochemical Properties). Biological activity can be any measure such as C, Ki, IC50, ED 50and Km.Physicochemical properties can be broadly classified into three general types: Electronic, Steric and Hydrophobic. QSAR are models designed to predict both the physicochemical and biological properties of a molecules. SAR is a qualitative association between a chemical substructure and the potential of a chemical including the substructure to show some biological effect. Aquantitative structure-activity relationships a statistically established correlation relating a quantitative parameter derived from chemical structure, or resolute by experimental chemistry to exhibit a quantitative measure of biological activity. Proficient systems are manufactured upon experimental toxicity results with rules obtained from the data. The guidelines may be based on statistical inference and converted into QSAR e.g., TOPKAT, on proficient decision and take the form of SARs explaining reactive chemistry e.g., Derek for Windows, or it may be a fusion of the two e.g., TIMES. The benefits of using QSAR methods include relative low cost, speed, and potential to abate animal testing. Today most of the molecular discoveries are the results of an iterative, three-phase cycle of design, synthesis and test. Examination of the results from one iteration delivers information and knowledge that allows the next cycle of discovery to be started and further improvement to be achieved. A basic feature of this analysis stage is the construction of some form of model which permits the observed properties to be related to the molecular structure. Such models are frequently referred as Quantitative Structure Activity Relationships. Quantitative structure-activity relationships studies are of great importance in modern chemistry and biochemistry. The idea of QSAR is to transform searches for compounds with desired properties using chemical insight and knowledge into a mathematically quantified and computerized system. QSAR methods are characterized by two assumptions with respect to the relationship between chemical structure and the biological properties of compounds. The properties assumed to be physicochemical such as partition coefficient or sub structural such as presence or absence of certain chemical features. The other hypothesis is that one can mathematically describe the relationship between biological properties as one wish to optimize the molecular property calculated from the structure. QSAR's basic mathematical form is represented by the following equation. Biological Activity = f (Physicochemical Property).

"On one side, we have the starting data for a certainendpoint, at the basis of the model. On the other side, we have a specific use"

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INSIGHTS ON TECHNOLOGICAL EVOLUTION FOR CHEMOPREVENTION

PUJAN NAINESH PANDYA

'Change': An obvious word which comes to the mind when we talk about development and sustainability in the different walks of life. In an era which is experiencing a fast technological and informational evolution, the ideas of ancient medicinal sciences ranging from Chinese herbal medicines to those described in Ayurveda are proving to be more effective and efficient in curing a wide array of diseases and disorders. With the current advancements in several biotechnology and bioinformatics related techniques, research in the field called Genomic Medicine is gaining a positive thrust. On exploring a particular human genome it is now possible to gain better insights into faulty expression of certain genes using the wide range of information. Aberrant expression of certain proteins, enzymes etc. provides a better and a clear transcript to the related diseases and disorders. Technological advancements are no longer limited to a particular field of science but encompass a wide range of expertise from the inter-related science and research arena. With the advent of novel technologies it is now possible to target and prevent many diseases- one such being Cancer and the related anomalies. Preventive measures to treat cancer can be started at an early age if the genetic makeup of the individual has been precisely studied and the related cancer genes are diagnosed early using the related hereditary and genomic data. It then becomes easier to prevent and/or target the genetic expression of an individual before its onset or at an early stage. Plants and the related secondary metabolites are the compounds which have an effective role to play in chemoprevention. Ranging from the catechins in tea to curcumin and the related compounds used in the culinary science, each of them has a specific chemopreventive role. Combinations of different extracts from plant resources have proved to be effective on many cancer cell lines. Personalized combinatorial dosages using varied chemopreventive compounds are being actively pursued to expand the research with more chemopreventive options to deal with cancer's nature of pervasive resistance to treatments.Novel targets and biomarkers relating to the highly complex network of cancerous genes, its protein targets and the molecular patterns are being targeted upon with the chemopreventive approach. The huge genome and proteome data, tools for analysis of different targets and the emerging technological advancements in its research is effectively evolving by leaps and bounds which surely will pave a path for better developments and help cut the mustard.

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ENZYME EXTRACTION AND PURIFICATION FROM MICROORGANISMS

SUHANI GIRISH PAREKH

The existence of enzymes has been known for well over a century. All enzymes are proteins that function as a catalyst to speed up a chemical reaction. Enzymes have commercial importance due to its various uses. Micro organisms represent an attractive source of enzymes as they can be cultured in large quantities in a short period. Most micro organisms liberate enzymes either intracellularly or extracellularly in the medium. Extraction and purification of enzymes require stages of clarification for separation of the enzyme from the solids comprising the raw materials, enough concentration and purification to separate it from other soluble contaminants. In case of intracellular enzymes the microorganisms to be used as source is to be separated from the medium and cell disruption becomes important to obtain the enzyme. Centrifugation is the process which is largely used. The cells are centrifuged at a given RPM in a decided time span. The rpm and time span vary according to the raw material used. The supernatant is collected and the cells pellets are again centrifuged to obtain further enzyme from the cells. In case of extracellular enzymes, in a flask containing medium loopful of cells are inoculated and precultured in Shaker for a specified rpm and time. Aliquot of this culture is again inoculated in a different flask for enzyme production. Like this by performing several rounds of inoculations, enzyme can be extracted. For enzyme purification, protein precipitation plays an important role. Proteins are soluble in water and this characteristic is used in purification. The process of salting out is used for precipitation. At increased salt concentration, there will be less and less water available for the protein to dissolve and proteins will precipitate. Ammonium sulphate is the most commonly used salt. In this way enzyme can be purified. The sample thus obtained is subjected to SDS page electrophoresis for qualitative determination of purified protein from the sample obtained. This technology is slowly emerging as enzymes are commercially important and so extensively produced at industrial scale. There are many enzymes that are not yet identified extracted or purified from the source micro organisms. There are many micro organisms that can help in various ways may be in food preservation, biodegradation, antibiotics production, waste treatment, bio products etc. If such enzymes can be purified from microorganisms that can help in the above mentioned fields or even others, this will be a boon to both the mankind and the environment altogether.

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MOLECULAR DYNAMIC SIMULATION

SHETTY SHILPA S.

Computational Molecular Engineering (CME) is an innovative discipline within the broad spectrum of simulation based engineering and high performance computing, targeting at acclimating molecular force field methods developed with the help of soft matter physics and thermodynamics societies to the requirements of industrial users in chemical and process engineering(Van Gunsteren and Berendsen, 1990).Molecular Mechanics force fields are the foundation of bimolecular simulations, being used to compute the potential energy of a system of particles. The role of solvent is main in simulation to determine the internal motion of proteins at different temperatures, particularly below the glass transition temperature, since experimentally it may be difficult to capture the dynamics related to the internal motion of proteins. Parameterization includes a definition of chemical bonding, atomic angles and dihedral angles, along with partial atomic charges for calculation of the electrostatic interaction energies, calculation of appropriate van der Waals atomic radii, etc. Many of biomolecular force fields are offered for simulations, the common one were AMBER, CHARMM, and GROMOS. Molecular dynamics simulations provide connection between structure and dynamics by enabling the study of the conformational energy landscape accessible to protein molecules. In recent years, some widely used MD simulation packages such as NAMD, GROMACS, and AMBER, have all noticeably improved algorithmic complexity and parallel performance, to deliver up to 10-100 ns per day on workstation in the cluster. MD simulation can be done at NMR timescales to calculate order parameter and residual dipolar coupling of proteins. NMR spectroscope do the measurement of order parameters which gives an atomistic report of fluctuations in protein structure over pico and nanoseconds. The contrast between NMR spectroscopy and MD simulations can be used to understand experimental results and to improve the quality of simulation associated force fields and integration methods. With time, many inventive alternative approaches to classical MD simulation have been established such as Monte-Carlo sampling of conformational space, steered MD, Brownian dynamics, normal vibration modes analysis, hybrid Quantum Mechanics or Molecular Mechanics (QM/MM), coarse-grained dynamics, simulated annealing, molecular docking simulations and other non-dynamic methods, all important to spectacular applications and growths in biomolecular simulation (Nair and Miners, 2014).Molecular Dynamics is a computer simulation where atoms and molecules can interact for a specific period under the known laws of physics, such as general molecular system comprise of the great number of particles. It is impossible to find the properties of such complex system analytically. This problem can be ignored by using numerical methods. It characterizes an interface between laboratory experiments and theory and which can be understood as virtual experiments. It is helpful to maintain the relationship between molecular structure, movement and function. MD is a focussed discipline and computer simulation based on statistical mechanics (Okimoto*et al.*, 2009).

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VERTICAL FARMING

NIKITA SAPRA

Vertical farming is the practice of producing food in vertically stacked layers, such as in a skyscraper, used warehouse, or shipping container. The modern ideas of vertical farming use indoor farming techniques and Controlled-Environment Agriculture (CEA) technology, where all environmental factors can be controlled. These facilities utilise artificial control of light, environmental control (humidity, temperature, gases...) and fertigation. Some vertical farms use techniques similar to greenhouses, where natural sunlight can be augmented with artificial lighting and metal reflectors. Modern usage of the term "vertical farming" usually refers to growing plants in layers, whether in a multi-story skyscraper, used warehouse, or shipping container.

Advantages: Several potential advantages of vertical farming have been discussed. Many of these benefits are obtained from scaling up hydroponic or aeroponic growing methods.

Protection from weather-related problems: Crops grown in traditional outdoor farming suffer from the often suboptimal, and sometimes extreme, nature of geological and meteorological events such as undesirable temperatures or rainfall amounts, monsoons, hailstorms, tornadoes, flooding, wildfires, and severe droughts. The protection of crops from weather is increasingly important as global climate change occurs.

Increased crop production: Unlike traditional farming in non-tropical areas, indoor farming can produce crops year-round. All-season farming multiplies the productivity of the farmed surface by a factor of 4 to 6 depending on the crop. With some crops, such as strawberries, the factor may be as high as 30.Furthermore, as the crops would be sold in the same infrastructures in which they are grown, they will not need to be transported between production and sale, resulting in less spoilage, infestation, and energy required than conventional farming encounters.

Impact on human health: Traditional farming is a hazardous occupation with particular risks that often take their toll on the health of human labourers. Such risks include: exposure to infectious diseases such as malaria and schistosomes, exposure to toxic chemicals commonly used as pesticides and fungicides, confrontations with dangerous wildlife such as venomous snakes, and the severe injuries that can occur when using large industrial farming equipment. Whereas the traditional farming environment inevitably contains these risks. Currently, the American food system makes fast, unhealthy food cheap while fresh produce is less available and more expensive, encouraging poor eating habits. These poor eating habits lead to health problems such as obesity, heart disease, and diabetes.

Conservation of resources: Each unit of area in a vertical farm could allow up to 20 units of area of outdoor farmland to return to its natural state, and recover farmlands due to development from original flat farm lands. Vertical farming would reduce the need for new farmland due to overpopulation, thus saving many natural resources, currently threatened by deforestation or pollution. Deforestation and desertification caused by agricultural encroachment on natural biomes would be avoided. Because vertical farming lets crops be grown closer to consumers, it would substantially reduce the amount of fossil fuels currently used to transport and refrigerate farm produce. Producing food indoors reduces or eliminates conventional plowing, planting, and harvesting by farm machinery, also powered by fossil fuels.

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LESSONS FROM NATURE

Dr. Archana Mankad

Plants grow from seeds and they also grow from stems through vegetative propagation but they need water, sunshine and air to grow; they need care and monitoring .So if you want to grow roses you have to invest in the specific requirements to produce a quality rose. For a commercial grower this investment will fetch high value returns and goodwill, so he will continuously be careful of his investment.

Relationships also need nurturing. They need care and monitoring. There is an investment of love to get love. If we take our relationships for granted and don't take care we are bound to mess up. The result can be sometimes dangerous.

Nurture relationships with care and love.

GLIMPSES OF ACTIVITIES OF GUJARAT UNIVERSITY BOTANICAL SOCIETY (GUBS)

The Team GUBS for the year 2016-17 is led by Dr.Nainesh Modi.

The Office Bearers for Gujarat University Botanical Society (GUBS) for the year 2016-17 are as follows:

PRESIDENT	MS. MIRAL PRAJAPATI Botany	Ph.D
VICE-PRESIDENT	MS. VINAL PATEL Botany	M.Sc SEM III
SECRETARY	MS. RIDDHI RATHORE Botany	M.Sc SEM I
JT SECRETARY	MR. IMANUEL COLACO Bioinformatics	M.Sc SEM III
JT SECRETARY	MS. PRERANA TIWARI Climate change impacts management	M.Sc SEM III
TREASURER	MS. CHARVI PANDYA Botany	M.Phil
CAPTAIN-BOT	MR. DHRUV PANDYA Botany	M.Sc SEM III
CAPTAIN-BOT	MS. SANJUKTA RAJHANS Botany	M.Sc SEM I
CAPTAIN- BIN	MS. DIVYANI PANCHAL Bioinformatics	M.Sc SEM III
CAPTAIN-BIN	MS. TITHI TRIVEDI Bioinformatics	M.Sc SEM I
CAPTAIN- CLI	MS. TANVI RATHOD Climate change impacts management	M.Sc SEM III
CAPTAIN –CLI	MS. RACHANA PATEL Climate change impacts management	M.Sc SEM I

The Inauguration function was held on Saturday 13th august by Prof.R.J.Verma Professor & Head, Department of Zoology. The new team was coroneted with badges and the new students were formally welcomed. The new team initiated many interactive sessions as part of icebreaking and for better communication.

GUBS Team -2016-17

The students of Climate Change Impacts management led by Dr .Megha Bhatt visited the GPCB labs and WASMO labs.

Selected Semester III students also got a unique opportunity to get the training at **GVK EMRI-Emergency Management and Research Institute** at Ahmedabad that pioneers in Emergency management services in India. They received a certificate and demonstrated their learning experience with their classmates.



The Department organized a Seminar on **Bioinformatics Leads in Gujarat: Proteogenomics-2016** on 24th September 2016. The goal of seminar was to integrate and visualize complex types of data by leveraging existing network and pathway knowledge and experimental data, thereby, enabling new biological hypothesis generation and experimental validation. Participants and Invited Faculty from various academic and research institutes like Gujarat State Biotechnology Mission (GSBTM), Gandhinagar, Anand Agricultural University, Anand, IladeviCataract and IOLResearch Institute, Ahmedabad, Gujarat Cancer Research Institute (GCRI), Ahmedabad, N. V. Patel Science College (NVPAS) Vidyanagar, KSVP (Gandhinagar) and different departments of Gujarat University participated in this seminar. The morning was abuzz with registration and hot spicy batetawadas for breakfast along with Tea and Coffee.

The event was inaugurated by Dr. M. N. Patel, Vice Chancellor, Gujarat University& President of the function andShri S. N. Tyagi IFS, Mission Director, GSBTM and Chief Guest of the function. Dr. M. N. Patel also launched the much awaited International Journal named International Association of Biologicals and Computational Digest (iABCD.org), developed by Department of Botany, Bioinformatics and Climate Change Impacts Management.


The first technical session was delivered by Dr. Prakash Koringa, Professor, Anand Agricultural University on Next generation sequencing. He also shared projects works and

results, which were conducted under his guidance. Dr. Koringa motivated the participants to answer his questions during the lecture and gave away gifts to those who gave correct answers. The next session was a lecture by Dr. PratibhaParihar, Head, Department of Bioinformatics, NVPAS, Vidyanagar. She covered almost all of protein modelling and simulation in theory and practical approach. After the lecture there was the lunch break and alongside participants who were supposed to present posters presented their work in front of evaluators.Theparticpants enjoyed piping hot very delicious lunch which included a paneer vegetable, Moong dal halwa and cutlets besides, another mixed vegetable, Puris, fry dal, jeera rice and fried papad. The third technical session was taken by Dr. Dipali Dhawan, Lab Director at Pan Genomics. She covered not only structure aspects of genomics but also functional aspects of genomics. She also mentioned the different types of laboratory test conducted in PanGenomics lab at genomics level. After her talk, Dr. Jayashankar Das, Sector Specialist, GSBTM took charge and gave brief idea about Bioinformatics present scenario in industrial perspectives. Then, Panel Discussion witnessed some queries and questions from the research scholars and they were answered by Dr. Rakesh M. Rawal, Senior Scientific Ofiicer, GCRI, Dr.KaidJohar SR. Head, Basic Research Iladevi Cataract and IOL research centre and Dr.Jayashankar Das. After the completion of all scientific sessions, the best poster awards were announced for each category like UG/PG, M.Phil/Ph.D and Faculty in valedictory function. The winners received cash prizes and certificates. All registered participants also received certificate of participation. The seminar was supported by Gujarat University and Mr. Kamlesh Patel and Mr. Nirav Patel from Bioinnovations, Mumbai.

Dr. Hitesh Solanki welcoming the Chief Guest, Shri S. N.Tyagi IFS

Dr.Nainesh Modi welcoming the Vice-chancellor, Dr.M.N.Patel

Shri S N Tyagi IFS addressing the gathering

Dr. M. N. Patel addressing the gathering.

Dr. Himanshu Pandya and Dr. Hitesh Solanki with the dignitaries

Department of Botany, Bioinformatics and Climate Change Impacts Management

The Department of Botany, Bioinformatics and Climate Change Impacts Management organized a state level seminar on **Integrating Climate, Energy Transformations and Youth (ICETRAY 2016) on Saturday, 1st of October, 2016.** The day started with registrations and breakfast for the UG/PG/Research scholars and Faculty registered as participants. There were more than 200 registered participants from Universities of Gujarat like M S University-Baroda, S P University-Anand, Bhavnagar University, HNGU-Patan, and outside Gujarat like Fergusson college-Pune, IIT-Mumbai, Colleges of Gujarat University like K KShastri Science college, R G Shah Science college, M G Science Institute, C U Shah Science College, St Xavier's college, President College, PG departments of Gujarat University like Department of Botany, Bioinformatics and Climate Change Impacts Management, Department of Microbiology, Biotechnology, and Department of Environment Science, NGOs like Shashwat, C4DI and Aatap Energy, resource persons from GEDA and Climate Change Department, Government of Gujarat, Gandhinagar, IIM and Adani Power Training and Research Institute, Ahmedabad.

The programme began with the Inaugural function. The President of the function, Honorable Vice Chancellor, Dr. M. N. Patel, Chief Guest, Shri Mukesh Shah, Joint Secretary, Climate Change Department, Government of Gujarat, and Guest of Honour, Dr. Himanshu Pandya, Registrar, Gujarat University along with Dr. Archana Mankad, Professor and Head of Department were on the dais. The programme started with the University song as a mark of respect and gratitude to the University. This was followed by lighting of the lamp and seeking the blessings of the almighty God for successful completion of the tasks for the day ahead. There was a floral welcome of the dignitaries on the dais followed by a formal welcome. Dr. Archana Mankad delivered the formal welcome speech and justified the need of such a seminar for the students and researchers in the field of climate change. The participants were motivated to present posters and the academic inputs by the professors were duly acknowledged. The seminar was one of the many such academic events organized by the Department as Gujarat University Botanical Society (GUBS). GUBS is a society of budding and blossomed learners and researchers from the Department of Botany, Bioinformatics and Climate Change Impacts Management that provides a platform for curricular, co-curricular and extra-curricular interactions and learning. The Department of Botany, Bioinformatics and Climate Change Impacts Management has been constantly striving and aiming at all round development of the students. The Seminar theme, energy transformation is the thrust area of innumerable initiatives. Everyday new aspects are being explored that have redefined our way of utilizing energy in an environment friendly manner. The seminar is one such initiative to bring the learners and the learned under one roof for Brainstorming on various challenges faced in the sustainable utilization of energy for a better tomorrow.

Shri Mukesh Shah in his opening remarks gave a brief overview of Government's perspective and what the Climate Change Department can offer to young researchers. Shri Mukeshbhai presented his views further, only Gujarat University in whole Gujarat offers this unique course on climate change department and this has been duly recognised even by our then Chief Minister and Now Prime Minister of India , Shri Narendra Modi in his book ,The

Unconventional truth. He also talked about the solar power, energy system and government policies for the same. Climate change is multidisciplinary subject and is one of the most important topic today. He also shared the talks about COP 21 Paris, Seminar on Conclave of Renewable Energies at Mahatma mandir in the coming months. He winded up with the resolution of 1100MW energy production in 2020. Dr. M.N.Patel, Honourable Vice Chancellor emphasised on the need of such endeavours and congratulated the department for organising the event. Shri M.N Patel shared his views on changing climate, and added that utilization of solar energy or for that matter any source of energy is a thrust area and challenges thereof should be understood. He added that RUSA and University will together create a Climate Centre in the University. Dr. Dhara Bhavsar gave a vote of thanks. Dr. Megha Bhatt anchored the programme very gracefully.

The technical session started with the first lead lecture by Shri Anil Purohit from GEDA. Shri Purohit in his address highlighted the activities of Gujarat Energy Development Agency (GEDA) He is serving in GEDA since 1985. GEDA has got 33 agencies in the country. Focus of GEDA : sustainable and climate resilient future. He added in his talk about Gujarat a pioneer of renewable energy in India. He showed the ratio of usage of renewable energy and its production. Gujarat is progressing through various projects like, Gujarat small tidal policy, Gujarat bio energy tariff 2010, Gujarat charanka solar project.There are many more such projects, with Asia's biggest charankaproject,Gujarat is generating 1138 MW of energy. He also explained the significance and use of bidirectional meters, solar meters and Smart meters . He also described the novel projects like the very important project of Solar panels for canal top to minimise water evaporation and utilize the open canal top, 5MW solar roof tops at Gandhinagar and others. In all the participants gained a lot by interaction with Shri Purohit. The department felicitated Shri Purohit with a memento and certificate. GEDA had sent its Energy Van and Shri Anil Dange was here at the department with the Urjamitra in time to demonstrate the various energy conservation ways for the enthusiastic participants.

The second technical session was taken by Shri Sandeep Dixit, Head, Adani Power Training and Research Institute (APTRI) in the form of his lecture titled, the next Convergence. His focus was on Resource, logistics and energy and how by combining all three groups ADANI is operating. They have biggest power plants and transmission lines across the India. He impressed upon the fact that not only environmental but technical, economical and social aspects also need to be studied for sustainability. He also described about the case study conducted in Canada. In Canada one person had developed a tree net and experimented well on that by fungus. He also gave a description of SCADA-supervisory control and data applicable system. The Adani group integrates data with SCADA. He extended support to all participants and assured them for internship projects at ADANI.

This session was followed by Demonstration of Energy Van and Lunch. The very energetic gujarati menu attracted all the participants as they enjoyed Kesarshrikhand –puri-bateta nu shaak, bhindi masala alongwithdhokla, dal, bhaat and papad. After lunch the evaluation of posters was done by a panel of distinguished judges and best poster at all levels was selected.

The third technical session was taken by Mr. Asif Raza from IIM Ahmedabad. His topic was "Climate Change and Buildings" He talked about buildings and sustainability. World's buildings accounted for 32% of global final energy use. In India, residential energy use projection, life cycle of a building, story building design, mitigation options, technology and design measure are focussed for sustainable and energy efficient buildings. He also gave an overview of the opportunities and major barriers of the projects on energy efficiency in construction business.

This session was followed by the Panel Discussion wherein a team of experts formed the Panel and participants could freely ask questions and interact on an one to one basis. Mr. Asif Raza, IIM Ahmedabad, Dr.Shital Shukla, Department of Geography, M S University and Shri Shwetal Shah, Technical advisor, Climate Change Department, Government of Gujarat, were invited as a distinguished panel for answering the questions. Many question like feasibility of smart meters, best renewable energy amongst all and past and present scenarios were discussed in the discussion.

The much awaited moment of the day for the participants was the announcement of best poster awards. This was done by Dr. Archana Mankad and the prizes were distributed to the winners by the experts. Best poster award included a certificate and cash prize to winner-one in each category.

This event concluded with thanksgiving to all participants for their interest and active participation in the seminar. The registration kits were sponsored by GEDA and was duly acknowledged and appreciated by all. All registered participants received a certificate of participation and the long day ended with a hot cup of tea to refresh one and all.

TEAM ICETRAY 2016

Memorable moments : ICETRAY 2016

Registration

Dr.Megha Bhatt- Anchor

Shri Mukesh Shah,

Dr.M. N.Patel

Dignitaries off the dais

Lighting of the lamp

Welcoming Shri Mukesh Shah

Welcoming Dr.M.N.Patel

Formal Welcome

Blessings Chief Guest

Dr.M.N.Patel: Presidential Speech

Participants

Participants

Descision makers

Shri Anil Purohit, GEDA

Shri Sandeep Dixit, APTRI

Demo of URJA MITRA

Lunch

Poster session

Poster session

Shri Asif Raza, IIM-A

Panel Discussion

Prize Distribution

Prize Distribution

Prize Distribution

The members of GUBS participated in the annual garbamahotsav "**ZANKAR 2016**"during Navratri and won many prizes. The members also won prizes at the Gujarat University Alumni association garba.

Aarti

Garba

Garba

Garba

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