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Vol. LII No. 2 (June'17 - July'17)

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Printed and published by Dr. Ashok Kumar Saxena on behalf of Indian Science Congress Association and printed at T. C. Dutta Merchants Pvt. Ltd., P-23/24, Radha Bazar Street, Kolkata - 700 001 and published at Indian Science Congress Association, 14, Dr. Biresw Guha Street, Kolkata - 700 017, with Dr. Ashok Kumar Saxena as Editor.

Annual Subscription : (6 issues)

Institutional ₹ 500/- ; Individual ₹ 300/-

Price: ₹ 20/- per issue

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As per decision of Council meeting held on May 03, 2014, Presidential Address will not be printed henceforth in Everyman's Science as they are already printed in the above mentioned book.

EDITORIAL**Climate Change Influences Floods in Urban India**

Climate change is a change in earth's overall climate. This may be a change in average temperature, and/or a change in precipitation patterns. Climate change is a change in the typical or average weather of a region in a region's average annual rainfall or average temperature. There are several effects of climate change includes sea level rise, receding of glaciers, cyclonic activity and changes in the precipitation patterns have also affected the Indian subcontinent. As per the IPCC Report (2014), the projection for mean annual increase in South East Asia is 3.3°C with minimum maximum range as 2.7°C - 4.7°C . The corresponding sea level rise would be 1 mts by the end of 21 Century. The ongoing rise has already submerged several low-lying islands in Sundarbans displacing thousands of people. I discuss here with the change precipitation patterns and their possible link with the climate change issues.

The change in the produces flood in Northwest and Northeastern region of India, while South India suffers from the rainfall deficit. The extremities in rainfall patterns have been increased frequently from Gujarat to Odisha. The recent floods are quite consistent with the similar patterns from Arabian Sea and not from Bay of Bengal as it usually exists. The extreme rainfall events cause floods in the last few years are once found in 300-500 years historical events. The role of climate change in drowned Mumbai in 26 July 2005 after the 940-mm rainfall in 24 hours, which claimed loss of human life and properties, badly affected due to submergence of roads and railway track as well as the aviation services for couple of days. In June 2013, a multi-day cloudburst centered on the North Indian state of Uttarakhand caused devastating floods and

landslides around Kedarnath became the country's worst natural disaster since 26 December 2004 Indian Ocean Mega Tsunami. The floods were caused due the very heavy rainfall received on a larger magnitude than the state usually received as normal rainfall. The metros like Delhi, Chennai and Bengaluru have now become all weather natural disasters over the last few years.

How to address these situations in a spatial distribution of urban areas needs to be analysed. Normally, the total annual precipitation during the monsoon months is being counted from June to September every year. An early rainfall tends to bring heavy precipitation where as the rest of the period is observed without rains. It indicates that the length of monsoon has been reduced. Approximately 10-15 % of the precipitation has been decreased since 1950 in Indian Subcontinent. During monsoon period, there are usually period with no rainfall. These non-rainfall periods are associated with monsoon system moves northward from equatorial region. It may be due to the climate change as the shortening of precipitation period and lengthening of dry spell. Therefore, the monsoon is changing in terms of its intensity, duration, frequency and spatial distribution. But, the shorter heavy precipitation spells may lead to increase monsoon extremes. The climate change is the leading factor in shift in the duration, intensity and frequency of rainfall. One of the major factor, which influences monsoon patterns and produces the 80% of the annual rainfall to Indian Subcontinent and South-east Asia is El Nino and its counterpart La Nina. We have experienced the effects of very scanty and heavy precipitation due to the El Nino and La Nina respectively in Indian Subcontinent. The observation on monsoon may be further

supplemented by more data analysis. Spatial distribution of the short period heavy precipitation and decreasing trend become 10% for long period average. It also affects the rainfed agriculture such as in Karnataka and Central Maharashtra where the rainfall deficit is close to 50%.

It is the high time that the nation needs an accurate prediction of monsoon by more extensive researches and modelling by meteorologists to

predict it appropriately, however, it is quite clear that the deficit is 10% since 1950. It will be easier to improve the monsoon forecasting in the future for the policy makers and concerned authorities to plan as well as act before commencing a flood disaster. There should be large scale plan to arrest the precipitation either by using rain harvesting structures or by modifying existing agricultural activities into an agroforestry in a spatially located geographical regions.

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Come forth into the light of things, let nature be your teacher.

- William Wordsworth

AGROMETEOROLOGY: A SUPPORTIVE TOOL FOR AGRICULTURAL RESEARCH AND DEVELOPMENT

Alok Kumar Patra

Agrometeorology is primarily concerned with the interactions among meteorological, hydrological and pedological factors that influence production systems in agriculture and allied sectors like horticulture, animal husbandry, fishery, forestry, *etc.* Since agrometeorology is multidisciplinary in nature, a good understanding of the interrelationships that exist among all the concerned disciplines is required. An agrometeorologist defines all these interactions and correlates physical environments to biological responses and applies the acquired and relevant meteorological skills to help farmers in exploiting weather conditions to improve agricultural production both in quality and quantity.

INTRODUCTION

Agrometeorology, abbreviated from agricultural meteorology is a branch of applied meteorology, which investigates the physical conditions of the environment for growth of plants, animals or other organisms. It is a well-defined science, interdisciplinary in nature, concerned with the application of meteorology to the measurement and analysis of the physical environment in agricultural systems. Agrometeorology puts the science of meteorology to the service of agriculture in its various forms and facets to help with the sensible use of land, to accelerate the production of food, and to avoid the irreversible abuse of land resources¹. Its objectives are to elucidate such effects, and subsequently assist farmers to apply this supportive knowledge and information in agrometeorological practices and services.

Its subject matter links together the physical environment and biological responses under natural conditions. An agrometeorologist applies every relevant meteorological skill to help farmers make the most efficient use of their physical environment in order to improve agricultural production both in quality and quantity and to maintain the sustainability of their land and resources².

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SCOPE AND IMPORTANCE OF AGROMETEOROLOGY

Weather and climate are natural resources that are considered as basic inputs in agricultural planning. Climate influences the distribution of crops in different regions of the world, whereas weather influences crop production and productivity. All the farm operations from land preparation to harvesting, threshing, storage and transport of farm produce are affected by weather. Agrometeorology has therefore, a wide scope on agriculture and other allied enterprises as summarised below^{3,4}.

Characterization of agroclimate: The growth, development and yield of a crop depend on the climatic parameters such as solar radiation, air temperature, precipitation, wind, humidity, *etc.* Agrometeorology considers and assesses the suitability of these parameters in a given region for maximum crop production and economical benefits. The meteorological data supplemented with soil and topographic information help to develop suitable land use plans.

Crop planning for stability in production: To get stabilized yields, even under weather adversity, suitable cropping patterns/contingent cropping planning can be adopted by considering water requirements of crops, effective rainfall and available soil moisture. This may reduce the risk of crop failure due to abiotic stresses.

Crop management: Farm operations such as sowing, fertilizer application, plant protection, irrigation scheduling, harvesting, drying and processing, *etc.* are carried out more effectively and scientifically if the information on prevailing or forecasted weather conditions is available to the farmers. Weeding, harrowing, mulching, *etc.* are undertaken during dry spells forecasted. Similarly, fertiliser application is advisable when rainfall is not heavy and soil moisture is between 30 and 80%. Spraying/dusting is undertaken when there is no rainfall, soil moisture is 90% and wind speed is < 25 km/hour.

Crop monitoring: Meteorological tools such as crop growth models, water balance or remote sensing techniques are used to evaluate the crop growth performance and recommend suitable remedial measures.

Crop modelling and yield-climate relationship: Suitable crop models can be developed by using the current and past weather data which can predict the growth and yield of a crop before its harvest.

Research on crop-climate relationship: Agrometeorology can help to understand crop-climate relationship so as to resolve complexities of a plant process in relation to its microclimate. Thus, the microclimatic conditions can be modified by appropriate agronomic practices for increasing agricultural productivity.

Climate extremities: Climatic hazards like frost, floods, droughts, hail storms, high wind velocity, *etc.* can be forecasted and the crops at various stages in the field may be saved by taking appropriate protective measures against these climatic extremities.

Climate as a tool to diagnose soil moisture stress: Soil moisture can be determined through water balance technique, which is used to diagnose the soil moisture stress and undertaken necessary protective measures such as irrigation, mulching, application of antitranspirant, defoliation, thinning, *etc.* to supply water to the system or reduce the moisture loss from it through evapotranspiration.

Livestock production: Meteorological parameters can be related to the growth, development and production of livestock. Favourable and unfavourable weather conditions for livestock are studied in the agrometeorology and the climatic normal is worked out for optimization of milk, meat and egg production. Animal growth simulation models can be developed for forecasting productivity and also obtaining potential yield in different agroecological zones.

Fisheries: Fishermen need meteorological information pertaining to atmospheric and oceanic changes before they proceed on sea for fishing.

Weather-crop pest and disease relationships: The weather-crop pest and disease relationships are studied in agrometeorology. It helps in taking preventive and curative measures to avoid or check the outbreak and spread of biotic stress in crops and livestock.

Delineation of agroecological zones: Study of agrometeorology of a region helps to delineate agroecological zones for efficient use of resources and faster transfer of technology.

Crop weather calendars: Study of agrometeorology helps in preparing crop weather diagrams and crop weather calendars for timely agricultural operations by farmers.

Agroadvisory: Value added weather based agroadvisory can be developed for different agroclimatic zones and by its real time dissemination to farmers, the input cost can be reduced and productivity can be increased.

Soil formation: Soil formation and development processes depend on climatic factors like temperature, precipitation, humidity, wind, *etc.*

Climate change: Study of agrometeorology helps to understand the impact of climatic variability or climate change on agricultural production systems. It also helps in devising suitable approaches to climate change adaptation and mitigation in agriculture.

Environmental pollutions: Modern intensive agriculture affects the environment through the generation of air pollutants, greenhouse gases,

ammonia and tropospheric ozone. Other modes of production cause soil erosion by wind and water. Agrometeorology has a major role to play in the understanding of emissions and pollutions from various unsustainable production systems.

AGROMETEOROLOGY AND FUTURE NEEDS AND CHALLENGES

The need for agrometeorological services has increased in recent years because of the increasing climate variability and associated extreme events. The fields of interest of agrometeorology include agricultural and horticultural production, forestry, animal husbandry, fisheries, agricultural planning, processing, transport and storage of food, poverty reduction and sustainable development aspects of the livelihood of farmers. Other important subjects are agroclimatic characterisation of pests and diseases and their safe control, quality of agricultural products, animal comfort aspects, plant production for other than food purposes including biomass as a renewable energy resource and ecological considerations.

The welfare, safety and quality of human society are subject to profound effects of the vagaries of weather and climate. Meteorological hazards such as drought, flood, tropical storms, heat and cold waves may endanger lives and property and disrupt even the most sophisticated systems. Climatic conditions have a complex bearing on soil, crops, plant disease and the factors, both biotic and abiotic that is related to agricultural and animal production systems. The greenhouse effect and global warming, destruction of ozone layer, protection of land and water resources and renewable energy are few areas where climate will be increasingly important.

Agroclimatological Database and Research

The availability of a proper meteorological and agrometeorological database is a major prerequisite for studying and managing the processes of agricultural production. A major and inevitable priority is to build a database of meteorological, phenological, soil and agronomic information⁵. The acquisition of pertinent climate and

agrometeorological data, their processing, quality control, and archiving, and timely access and database management are important components that will make the information valuable to agrometeorological research and operational programs⁶. Agrometeorological models have many potential uses for answering questions in research, crop management, and policy. As society becomes more computerized and technology oriented, there will be a greater scope for the application of crop simulation models and decision support systems to help provide guidance in solving real-world problems related to agricultural sustainability, food security, the use of natural resources, and protection of the environment⁵.

Crop-weather models for a large number of crops have been generated. But many of these models need to be further refined and validated before their practical applications. Current research is being focused on detailed soil-water-crop relationships, determining the adjusted crop genetic coefficients, bridging simulation model outputs with user needs for applications, and developing practical decision support systems. The results of these findings may be of immense utility and form an important component of the decision support system which when coupled with the crop status on a regional scale would go a long way to alleviate the farmers' problems to a great extent.

Early Warning System and Weather Based Agroadvisories

Agriculture plays a significant role in the overall socio-economic fabric of India. Weather becomes more significant in crop management. The farmers are adversely affected by climate risks in their farming, which include increase in temperature, decrease in rainy days, increase in precipitation intensity and amount, shorter winter periods, decreased ground water availability, increased occurrence of drought and floods, increased duration of water logging, *etc.* which in turn result in yield losses. Agrometeorology has advanced over decades from a descriptive to a quantitative science using physical and biological principles. The developed

countries are now applying climate knowledge and early warning systems for adaption to mitigate the impacts of extreme events. Thus, the farming in these countries is now less affected by climatic hazards. Though India has acquired the relevant sophisticated technologies but these are yet to be fully translated to the benefits of the farming community.

The availability of adequate and quantitative agrometeorological data is an absolute prerequisite for analysing and managing production processes in agriculture, including livestock and forestry. Decision making in agricultural operations for well grown crops or crops endangered by pests, diseases and/or other environmental disasters needs weather forecasting and climate prediction to the required accuracies. A number of crop monitoring systems and yield forecasts are now being implemented worldwide and upscaling to regional scales are being attempted. In these, commercial crops like soybean, maize, wheat, sorghum, etc. are continuously monitored and forecasted.

Use of Satellite Remote Sensing Technology

Despite the technological advances, Indian farmers are mostly dependent on seasonal rains which are highly variable in time and space. Thus, weather forecasts are of great importance to agricultural activities. Much research has gone into characterization of various crop environments, quantification of crop-weather interactions in relation to crop yield, crop weather modelling and crop-pest-weather dynamics. Now it is time to consolidate these findings in different locations, make use of this information and reach the farmers through agro-advisories on a larger scale in a more realistic way. These advisories are to be more farmer-friendly. A more accurate forecast along with actionable agro-advisories is required at block level. Remote sensing aided weather based agro-advisories may be a promising way to enable the farmers take the most appropriate actions on real time basis. Satellite remote sensing technology is increasingly gaining recognition as an important source of many agricultural applications as it is superior to the traditional methods in terms of accuracy and saving

of time. Geographic Information Systems technology is becoming an essential tool for combining various maps and satellite information sources in models that simulate the interactions of complex natural systems.

Assessment of Climate Change

Agrometeorology can play a leading role in the assessment of climate change, its impact on agriculture, and adaptation strategies to increasing climate variability. Increasing environmental, population, and economic pressures are creating difficulties in solving agricultural pest and disease management problems⁵. Future climate change and increased variability will further complicate pest and disease management problems. This will require improved analyses of the weather to develop new pest management techniques and strategies⁷. In addition to weather predictions, the agrometeorologists should be able to estimate the likelihood of unusual weather events and their potential impact on crops and animals through quantitative analysis, which will be a major challenge.

CONCLUSION

Despite impressive advances in agricultural technology, agricultural production is still dependent on weather and climate. Decision making in agricultural operations needs weather forecasting and climate prediction to the required accuracies. The fields of interest of agrometeorology include agricultural and horticultural production, forestry, animal husbandry, fisheries, agricultural planning, processing, transport and storage of food, poverty reduction and sustainable development aspects of the livelihood of farmers. Other important subjects are agroclimatic characterisation of pests and diseases and their safe control, quality of agricultural products, animal comfort aspects, plant production for other than food purposes, including biomass as a renewable energy resource and ecological considerations. Use of agrometeorological services is thus not only useful but essential for undertaking the following activities.

- | Climate monitoring and analysis leading to planning and early warnings of climate anomalies
- | Real time monitoring leading to the provision of operational advices, for example, in determining irrigation efficiency
- | Microclimate manipulation and prediction, within crops, soils and environments
- | Preparing for agricultural hazards including pests and diseases

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MANGO PICKLE

Pushpa Chethan Kumar* and H. Mamatha**

Mango is one of the important fruit crops of India. The fruit is utilized for consumption in various forms at all stages of its development. The most important processed product of mango is pickle which has its own traditional value as condiment with respect to its taste, flavour and texture. Though pickle is considered as an essential food adjunct in many parts of India but the prevalence of high blood pressure makes people not to add pickle to their regular food habit. So there is a need to develop recipes of pickles with less salt and oil for modified or therapeutic diets.

INTRODUCTION

Mango (*Mangifera indica*) is one of the most important fruit crops of India, growing mainly in tropical and subtropical regions, covering 34.9 per cent of total fruit growing area accounting for 20.7 per cent of total fruit production and producing 45.1 per cent of world's mangoes¹. Mango fruits are usually eaten fresh because of their succulence, exotic flavour and delicious taste. Nutritionally, mango is a good source of bioactive compounds such as provitamin A, vitamin C, dietary fibre and micro minerals².

The fruit is utilized at all stages of its development for various usages such as juice, squash, nectar, wine, jam, toffee, yoghurt, ice cream, lassi, cereal flakes (ripe fruits) and leather while unripe fruits or raw mangoes are used to prepare slices in brine, pickle, chutney, powder and beverage³.

Over the last couple of years there has been a positive growth in Indian pickle industry. By size, pickle industry forms the strongest category under unorganized sectors of fruits and vegetable processing. India has a great potential for export of pickle and many Indian brands such as Mothers Recipe, Truly Indian, MTR etc., are finding place in international markets⁴. Similarly, mango chutney

and slices in brine are also exported. The utilization of raw mango slices is mainly for manufacture of pickles⁵.

HISTORY AND DEFINITION OF PICKLING

Pickling is one of the oldest and most successful methods of food preservation known to human. Pickle and pickling industry have a long history as the cucumber was taken to Middle East from India about 4000 years ago. In India, usage of pickle in meals has a long history where Ibn Battuta (A.D.1336-1357) described pickles of 'Pepper, green ginger, or lemon and mangoes'⁶. Pickling was defined in a broad sense as 'the use of brine, vinegar or a spicy solution to preserve and give a unique flavour to a food'⁷.

The commercial preservation of pickling is accomplished by two general processes viz. brining and direct acidification with or without mild heat process (pasteurization)⁷.

Brining is achieved by mixing cut or whole fruit/vegetable with dry salt or by placing them in a salt solution, whereas direct acidification is done by the addition of acetic acid in the form of vinegar and preservation by pasteurization or addition of preservatives⁷.

Pickle is the most important processed product of raw mango which has its own traditional value as condiment with respect to its taste, flavour and texture. Preparation of pickle from mango stands at top among other fruits and vegetables used for pickle

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preparation. In India, pickles are prepared traditionally according to the regional availability of variety and taste. There are several types of mango pickle, viz. pickle in oil, oil less pickle, whole tender mango pickle, pickle in vinegar, fermented pickle and mixed vegetable pickle, which have distinct flavor, aroma, texture and diversified taste^{8,9}. However, the availability of documented pickling technology and pickling mango varieties is limited.

TYPES OF PICKLE

Generally pickles can be classified into several types such as:

1. *Mango pickle with oil*

Pickle in oil is the one which is prepared by the addition of 5-10 % of oil along with salt and spices. About 1-2 cm layer of oil is incorporated to prevent oxidative deterioration¹⁰.

Different types of pickle can be prepared with the addition of oil such as,

1.1 *Whole tender mango pickle*- it is prepared from freshly harvested whole tender mangoes of about 3-4 cm in length and salt, spices are added along with oil.

1.2 *Shredded mango pickle*- it can also be used as chutney. It is prepared by grated raw mango to which spices and oil is incorporated.

1.3 *Mixed vegetable pickle*- mixed vegetable pickle is the one where, in addition to mango other fruits and vegetables are also incorporated such as lemon, carrot, ginger, chilli, bitter gourd, garlic etc., along with salt, spices and oil.

2. *Oil less mango pickle*

Oil less pickles are gaining importance since oil is not used here as one of the ingredients in the preparation. So that it can be used by people who are in less fat diet such as people suffering from cardiovascular diseases, obesity, renal problem etc. Oil less pickle contains about 10-11 % salt, spices and about 250 ppm of sodium benzoate which is used to prevent microbial spoilage¹¹.

With the varying ingredients, different types of oil less mango pickle can be prepared such as

2.1 Oil less mango pickle with asafoetida

2.2 Oil less mango pickle with asafoetida and sugar

2.3 Oil less mango pickle with cumin seeds.

3. *Instant oil less mango pickle*

It is prepared by dehydrating salt cured mango pieces and then mixed with spices. Whenever needed, a good quality pickle can be prepared by adding hot water and leaving for about 12 hrs. The mango pieces in dried form could be stored for a year without any spoilage.

4. *Mango pickle in vinegar*

It is popular in Middle Eastern countries for its oil-free composition. It is prepared by mixing green mango slices with brewed vinegar, salt, mustard, turmeric and green chilies.

5. *Fermented mango pickle*

The manufacturing process involved in fermented pickle is similar to the process of making sauerkraut (lactic acid fermentation of shredded cabbage by lactic acid bacteria which produces acids up to 2-2.5%)¹². In fermented pickle industries brine is used instead of dry salt and there will be controlled fermentation process using starter cultures¹³.

Concentration of additives for the development and processing of oil less mango pickle was standardized¹⁴. Among nine combinations, the combination which contained 20 per cent salt based on mango pieces, 7.5 per cent red chilly powder and 1 per cent asafoetida was found best after nine months of storage both in quality and in organoleptic acceptability¹⁴.

In southern parts of India, mango pickle is prepared by using fully mature raw mango and the one which is prepared by using small whole tender mango is called *midi uppinakayi* in local language. In Central Western Ghats, since the availability of wild aromatic mango is high, people use these mangoes to prepare pickle locally called *appe midi*¹⁵. And then

thin slices of mango without endocarp were allowed to ferment and preserved by dehydrating under sun with salt. These are very salty and sour which contains very less amount of oil with other spicy ingredients. We can find usage of sunflower or groundnut oil in southern parts of India for pickling, whereas in northern parts mustard oil is preferred.

The quality of mango pickle mainly depends on the quality of raw material used. Though more than 1000 varieties of mango are available in the country but all the varieties are not suitable for pickle preparation¹⁶. A pickling variety should have high acid and fibre contents with firm texture. It has been suggested that the best stage to harvest mango for pickling is after endocarp hardening when there is not much reduction in the content of soluble solids¹⁷.

Among several mango varieties studied for pickle preparation, 'Rumani', is one of the varieties grown in Madhya Pradesh, India found best for pickle purpose¹⁸.

Similarly, some varieties/hybrids have been evaluated for pickle purpose at ICAR-Central Institute for Subtropical Horticulture, Lucknow. Among those S-388, Bathui and Sukul were found best for pickle preparation. In terms of their storage quality all these pickling varieties showed declining trend in moisture, acidity and ascorbic acid contents while reducing sugars increased¹⁹. It has been reported that among various mango accessions tested for fermented and cured whole tender mango pickle, acid taste and specific raw mango flavor play an important role in their acceptance. The accessions *Kashimidi*, *isagoor Appe*, *Malange*, *Appemidi*, *Dantimamidi* and *Jeerige* were considered most suitable for the preparation of whole tender mango pickles²⁰.

Fruit trait diversity of aromatic pickle mango in the humid tropics of Central Western Ghats was documented. About 300 types of aromatic pickle mangos were recognized by the people of Central Western Ghats with respect to their aroma and taste apart from their color, shape and size²¹.

Physico-chemical and microbiological examination of about twelve important indigenous

pickling mango varieties from Andhra Pradesh, Mysore, Tamil Nadu, Maharashtra, Gujarat, Madhya Pradesh, Punjab, Uttar Pradesh and Bihar were studied. During this study it has been found that *Avakai* from Andhra Pradesh stood better storage compared to all other varieties. And a formula of having four parts of mango pieces (with not less than 2% acidity and less than 4.5 pH), one part of salt with other ingredients of 50-55 per cent having an oil layer of about one inch above the surface of the pickle in the container improved the storage quality of pickle without changing their typical taste and flavor²².

Pickles are invariably made from salt stocks of raw fruits or vegetables prepared during the season and its consumption may vary from 5 to 25 g depending on individual preference. Though pickle is considered as an essential food adjunct in many parts of India but the prevalence of high blood pressure makes people not to add pickle to their regular food habit because of high salt content in pickle²³. So there is a need to develop recipes for pickle preparation with less salt and oil for modified or therapeutic diets (low sodium).

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ARTIFICIAL SYNTHESIS OF PLATELETS: RECENT PERSPECTIVES

Shival Srivastav¹, Simran Kaur¹ and Renuka Sharma²

Platelets serve important roles of hemostasis in the human body. They are routinely transfused to patients for indications as diverse as dengue to post cancer chemotherapy bleeding diathesis. The gap in demand versus supply has intrigued the scientific community to attempt in vitro synthesis. We discuss the miscellaneous roles of platelets in our physiology and the use of "bioreactors" to synthesize platelets in the laboratory.

INTRODUCTION

Platelets are tiny, motile granulated cells found circulating in the blood. They are formed from megakaryocytes, which in turn are derived from haemopoietic stem cells of the bone marrow. They are called platelets as they resemble a plate in structure. Though they make up only a small fraction of total blood volume, they play a vital role in prevention of bleeding by aiding in clot formation.

PLATELET PHYSIOLOGY

Platelets are formed from precursor cells known as Megakaryocytes (MKs), named so because of their large size (up to 100 micrometers). A single megakaryocyte can give rise to up to 1000 platelets. MKs are quite rare in the bone marrow and form just 0.01% of the entire population¹. They are acted upon by a hormone, thrombopoietin and soluble chemical factors, such as Interleukins and growth factors, to form platelets.

The bone marrow microenvironment is very critical for development of platelets from megakaryocytes. The entire process of platelet formation is very tightly controlled and finely regulated. In the presence of specific chemical factors, the MKs migrate to the vicinity of blood vessels inside the bone and send out projections inside the blood vessel lumen. These projections, known as proplatelets, are the precursors of mature

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platelets. Due to continued action of shear stress due to blood flow, platelets are eventually released from proplatelets² (Figure 1).

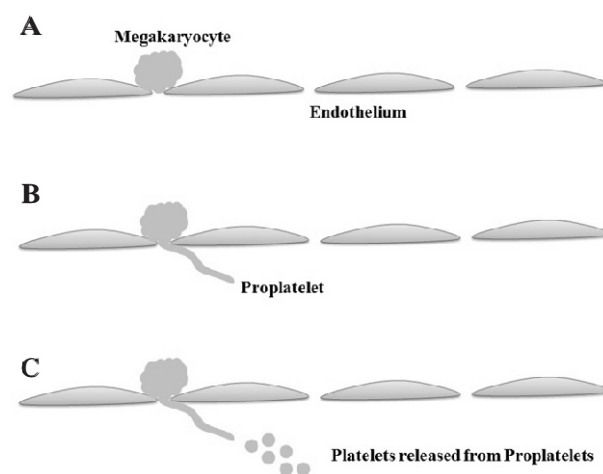


Figure 1: Platelet formation from Megakaryocyte (A) Megakaryocytes migrate to vicinity of vascular niche and interact with endothelial cells of Bone marrow sinusoids and blood vessels . (B) Due to continued action of shear stress and interaction with bone marrow and vascular environment, megakaryocytes give out processes known as proplatelets .(C)Platelets are eventually formed from proplatelets by detachment .

PLATELET FUNCTIONS

Platelets in the circulation are observed to be in a passive state. Whenever there is blood vessel injury, the exposure of collagen to the circulating platelets

causes their activation and causes them to form clumps in a process known as platelet aggregation. This clump forms a temporary hemostatic plug to seal the site of injury. In minor injuries, this may be sufficient to stop bleeding. In addition to clump formation, there is concomitant activation of specific proteins in the blood, known as clotting factors, which form a definite hemostatic plug and cause arrest of bleeding.

In addition to their well known role in coagulation, recent literature also points to their possible role in immunity and cancer metastasis. The contents of platelet granules work as chemokines, which are chemical factors that recruit immune cells and help in modifying their function. Also, it is proposed platelets may have a role in spread of cancer cells to different parts of the body. The platelets form a covering around the tumour cells. As the cells travel to distant sites in the body, the cover of platelets prevents their disintegration. This process may play a role in facilitating transport of tumour cells to distant sites in the body, a process known as metastasis.

Hence, we can infer that platelets play a vital role in various vital events in our body, ranging from coagulation of blood to spread of tumors.

USE OF PLATELETS IN CLINICAL PRACTICE

Since platelets play a vital role in hemostasis, they are transfused in patients who are at risk of bleeding. Dengue haemorrhagic fever (DHF) is a common disease seen in our country during the monsoons. DHF is characterized by high bouts of fever, joint pains and reduced platelet count (thrombocytopenia). The reduction in platelet number predisposes the patient to the risk of spontaneous bleeding, which may be life threatening in some cases. Platelet transfusion is critical in averting this catastrophic complication.

Another pool of patients that require platelet transfusion is blood cancer patients. Bone marrow suppression is a common side effect of chemotherapy and radiotherapy in these patients,

which manifests as reduction in levels of all circulating blood cells, including platelets. This therapy induced thrombocytopenia predisposes the patients to risk of hemorrhage, which may be averted by platelet transfusion.

According to Indian Red Cross society the annual demand of platelets in our country is 12 million units of which, only 75% is met. Similar scenario of deficiency exists in the western world and high costs are incurred in a bid to meet the demand of platelets for transfusion needs. Despite the high requirements, the actual supply of platelets falls short both in India and elsewhere.

The common reasons for the demand-supply gap are numerous. Firstly, the platelets, once separated from whole blood, have a very short shelf life. Their storage in the blood bank is limited to 5 - 7 days, during which they require intermittent agitation. Beyond this time interval, the platelets clump spontaneously and are unsuitable for transfusion. In addition to wastage of blood collected from healthy donors, there is also generation of biological waste, the safe disposal of which is a complex issue.

Also, shortcomings in blood collection and storage techniques entail the risk of contamination. Transfusion of such blood products can lead to risk of infections in the recipients which may again be hazardous. Another major problem is the lack of voluntary blood donation in our country. Despite continuing efforts by the government to encourage blood donation, the number of active donors is quite less than that required. Thus, the availability of platelets is severely inadequate in meeting the clinical needs.

The approaches to tackle platelet shortage are multiple. Stem cells are induced to form megakaryocytes by application of appropriate stimuli which may serve as source of platelets. The second and more recent approach involves generation of platelets in vitro from megakaryocytes. This process occurs in specialized devices known as bioreactors.

We subsequently discuss culture of platelets from different sources and the different generations of bioreactors.

IN VITRO PLATELET SYNTHESIS

The solution to the short supply of platelets is seemingly simple - artificial or in-vitro synthesis in a *bioreactor*. In common parlance, a bioreactor is a device in which a biological reaction can take place. In principle, a bioreactor is up scalable to produce large output to meet industrial demands. Such an approach would obviate the need of blood donors and a single stem cell can serve as a potential source of endless supply of platelets.

Bio-reactors have been clubbed into three generations based on the principles on which they operate.

The first generation of bioreactors employed stem cell culture in appropriate culture media. The stem cells chosen were megakaryocytes or were sourced from the skin. The addition of growth factors was done to facilitate and hasten the maturation of stem cells into platelets. These bioreactors are named as static cultures as they simply employ cell culture on a culture plate. The drawback of the first generation bioreactors was the unpredictable yield. In some instances, the stem cells failed to form any platelets at all or each megakaryocyte formed only one platelet, which was grossly inadequate to meet the stated goals.

After more experiments, the scientific community realized that merely the addition of growth factors to the culture media was insufficient. The recreation of the bone marrow environment was a critical step in induction of stem cells to divide and form mature platelets. The bone marrow environment with all the physicochemical factors needed to be recreated onto the culture plate for getting a practically useful yield of platelets. This came to be known as second generation of bioreactors.

The third generation of bioreactors brings together three critical factors for the platelet micro environment onto the culture plate, as detailed by Thon and other researchers⁶⁻¹² :

- Interactions with the endothelial cells
- Imitation of the bone marrow matrix stiffness
- Replication of the shear stress seen in blood vessels of bone marrow.

These factors have been collated in a bioreactor to generate platelets from megakaryocytes.

WHAT IS A MICROFLUIDIC DEVICE?

The key design of the microfluidic device employed by various authors has two chambers separated by minute slits. The base of the upper chamber is seeded with artificially cultured endothelial cells resembling the bone marrow. The roof of the lower chamber is lined with cultured cells resembling the vessels. The upper chamber is infused with megakaryocytes suspended in a liquid media. The MKs get trapped in the slits in between the two chambers and are exposed to shear stress due to constant flow of liquid media in the upper chamber. They give out projections known as proplatelets in the lower chamber which eventually form platelets. Finally, the platelets are collected from the perfusate collected from the lower chamber. The schematic diagram and operation of such a device is shown in Figure 2.

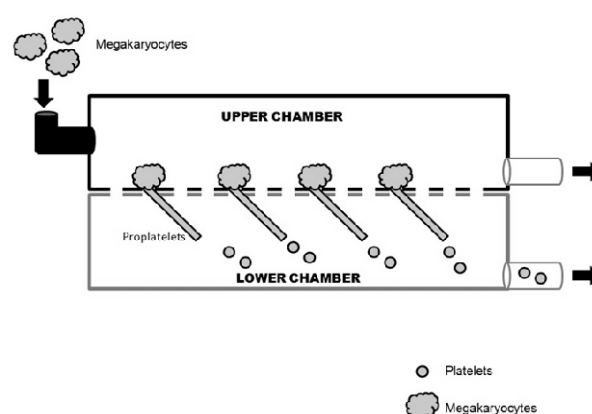


Figure 2: Schematic diagram of a Microfluidic bioreactor^{6,12,13}.

WHERE DO WE STAND NOW?

Despite all the advances in platelet synthesis, the actual yield of platelets remains far from satisfactory. It has been proposed that the entire cohort of megakaryocytes need to replicate to their full potential to provide necessary throughput to be practically useful. Therefore, there is still a long way to go before these bioreactors may be able to generate sufficient number of platelets. Further, once these cells are generated in sufficient numbers, they

have to go through safety checks by animal and human experimentation before being approved by competent authorities for clinical use. Still the progress made in synthetic platelet generation in the past few decades is remarkable.

To summarize, the role of platelets in hemostasis is well established. Recently their roles have been identified in regulation of immune mechanisms and tumour metastasis. Platelet transfusion is required in various patient groups at risk of hemorrhage. Though blood donation is the key source for platelets, it is not sufficient to meet clinical needs. Therefore serious efforts are underway to synthesize platelets artificially in laboratories to bridge the demand supply gap. Recent advances in bioreactor technology offer an exciting prospect in understanding of platelet physiology and may unlock new frontiers for generation of donor independent platelets.

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NANO-FERTILIZERS TO INCREASE NUTRIENT USE EFFICIENCY

C. Sharmila Rahale

Fertilizers play a pivotal role in agriculture production (35 to 40%). To enhance nutrient use efficiency and overcome the chronic problem of eutrophication, nano-fertilizer might be the best alternative. Nano-fertilizers are synthesized in order to regulate the release of nutrients depending on the requirements of the crops, and it is also reported that nano-fertilizers are more efficient than ordinary fertilizers. Nano-fertilizers could be used to reduce nitrogen loss due to leaching, emissions, and long-term incorporation by soil micro-organisms. They could allow selective release linked to time or environmental condition. Slow controlled release fertilizers may also improve soil quality by decreasing toxic effects associated with fertilizer over-application.

INTRODUCTION

Nanotechnology has the potential to revolutionize the agricultural and food industry with novel tools for rapid disease detection, the molecular management of diseases, enhancing the ability of plants to absorb nutrients, among others. On the other hand, nano-biotechnology can improve our understanding of the biology of various crops and thus can potentially enhance yields or nutritional values, as well as develop improved systems for monitoring environmental conditions and enhancing the ability of plants to absorb nutrients or pesticides. Nanoparticles are atomic or molecular aggregates with at least one dimension between 1 and 100 nm, which can drastically modify their physicochemical properties compared to the bulk material. Owing to its high surface area to volume size ratio, these particles exhibit significantly novel and improved physical, chemical, and biological properties, phenomena, and functions¹.

A nano-fertilizer refers to a product that delivers nutrients to crops in one of the under mentioned three ways. The nutrient can be encapsulated inside nano-materials such as nanotubes or nanoporous materials, coated with a thin protective polymer film, or delivered as particles or emulsions of nanoscale dimensions. Ideally, nanotechnology could provide

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devices and mechanisms to synchronize the release of nitrogen (from fertilizers) with its uptake by crops; the nano-fertilizers should release the nutrients on-demand while preventing them from prematurely converting into chemical/gaseous forms that cannot be absorbed by plants. This can be achieved by preventing nutrients from interacting with soil, water and microorganisms, and releasing nutrients only when they can be directly internalized by the plant². The coating and cementing of nano and sub-nanocomposites are enable regulate the release of nutrients from the fertilizer capsule. Generally the activities of nanoparticles can be closely monitored using Transmission Electron Microscope (TEM) and Scanning Electron Microscope (SEM)³.

IMPORTANCE OF NANO-FERTILIZERS

Nowadays, nanotechnology is progressively moved away from the experimental into the practical areas. For example, the development of slow/controlled release fertilizers, and conditional release of pesticides and herbicides on the basis of nanotechnology have become critically important for promoting the development of environment friendly and sustainable agriculture. Indeed, nanotechnology has provided the feasibility of exploiting nanoscale or nanostructured materials as fertilizer carriers or controlled-release vectors for

building of so-called "smart fertilizer" as new facilities to enhance nutrient use efficiency and reduce costs of environmental protection^{4,5}. Encapsulation of fertilizers within a nanoparticle is one of these new facilities which is done in three ways namely a) the nutrient can be encapsulated inside nanoporous materials, b) coated with thin polymer film, or c) delivered as particle or emulsions of nanoscales dimensions. In addition, nano-fertilizers will combine nano devices in order to synchronize the release of fertilizer-N and -P with their uptake by crops, so preventing undesirable nutrient losses to soil, water and air via direct internalization by crops, and avoiding the interaction of nutrients with soil, microorganisms, water, and air.

NANO ZEOLITE

Zeolite is a natural super porous mineral (part of group of hydrated aluminosilicates) carries a negative charge balanced by freely moving cations with positive charges; this provides an ideal trap for positive cations like nitrogen rich ammonium and potassium which are then released that commensurate with crop nutrient requirement. With the current high price of nitrogenous fertilizers, zeolites can be used to enhance their efficiency and performance. Blending fertilizers with zeolites can produce the same yield from less fertilizer applied because of the reduction of volatilization and leaching losses. An added benefit of zeolite application as compared to having other soil amendments is that it does not break down over time but remains in the soil to improve nutrient and water retention permanently. With subsequent applications, the zeolite will improve soil ability to retain nutrients and produce improved yields. The nutrient release from the zeolite is plant driven setting up a natural cycle of N, P and K release. The zeolite will recharge when an ammonium or potassium source becomes available either naturally or through application. The zeolite prevents free nutrients from leaching (Zeolite Australia PTY LTD, 2008) and has a strong affinity for ammonia (NH_4^+) and store it up instead of allowing it to volatilize. The ammonium ion (NH_4^+) is attracted to the negative

charge of the crystal. The large honeycomb crystal structure provides a huge storage space. Plant nutrient cations eg. potassium (K^+) and zinc (Zn^{2+}) are also stored in the zeolite crystal as well as water molecules. All these nutrients are readily available to the plant. It is thought that the readily available potassium increases the plants' resistance to disease, eg. Crown rot, and improves the quality of the grain eg. Prime Hard Wheat. The ammonium ion is thought to slowly release and produce the high yield and protein at flowering time. This nano-zeolite is now a day used to develop nano-fertilizers.

Zeolite based nano-fertilizers are capable to release nutrient slowly to the crop plant which increase availability of nutrient to the crop throughout the growth period which prevent loss of nutrient from denitrification, volatilization, leaching and fixation in the soil especially $\text{NO}_3\text{-N}$ and $\text{NH}_4\text{-N}$. Particles of size below 100 nm nano-particles can be used as fertilizer for efficient nutrient management which are more eco-friendly and reduce environment pollution. Main reason for high interest in fertilizers is mainly their penetration capacity, size and very higher surface area which usually differs from the same material found in bulk form. This is partially due to the fact that nano particles show a very high surface: volume ratio⁶. Thus, the reactive surface area is proportionally over-represented in nano particles compared to larger particles. Particle surface area increases with decreasing particle size and the surface free energy of the particle is a function of its size.

Researchers at the Sri Lankan Institute of Nanotechnology (SLINTEC), Nanotechnology and Science Park, Homagama, Sri Lanka have developed a nano-fertilizer using urea coated hydroxyapatite nanoparticles for targeted delivery via slow release using nanohybrids that have so far been primarily used in medicine to realize the nano-fertilizer. Their method significantly reduces the amount of urea required for fertilization since it can be applied locally. Perhaps more impressively, the authors demonstrate that, with their approach, the rice crop yields are significantly enhanced even when 50% less urea is used.

ADVANTAGES

Smart fertilizers might become reality through transformed formulation of conventional products using nanotechnology. The nanostructured formulation might enable fertilizer intelligently control the release speed of nutrients to match the uptake pattern of crop. Solubility and dispersion for mineral micronutrients cause controlled release formulation. Nanosized formulation of mineral micronutrients may improve solubility and dispersion of insoluble nutrients in soil, reduce soil absorption and fixation and increase the bioavailability which lead to increased nutrient uptake efficiency. A point may be considered here that, what was mentioned is only part of opportunities for using nanotechnology to improve fertilizer formulations and construction of more environmentally friendly fertilizers. In these cases, the emphasis is primarily on improving nutrient use efficiency. Whereas, nanotechnology can also improve the performance of fertilizers in other ways. For instance, due to its photocatalytic characteristic, nanosize titanium dioxide has been incorporated into fertilizers as a bactericidal supplement. Nano-fertilizers could be used to reduce nitrogen loss due to leaching, emissions, and long-term incorporation by soil micro-organisms. They could allow selective release linked to time or environmental condition. Slow controlled release fertilizers may also improve soil by decreasing toxic effects associated with fertilizer over-application.

NANO-FERTILIZERS IN ORGANIC FARMING

Organic farming has been a long-desired goal to increase productivity (that is, crop yields) with low input (that is, fertilizers, pesticides, herbicides among others) through monitoring environmental variables and applying targeted action. Organic farming makes use of computers, GPS systems, and remote sensing devices to measure highly localized environmental conditions, thus determining whether crops are growing at maximum efficiency or precisely identifying the nature and location of problems. By using centralised data to determine soil

conditions and plant development, seeding, fertilizer, chemical and water use can be fine-tuned to lower production costs and potentially increase production all benefiting the farmer. Precision farming can also help to reduce agricultural waste and thus keep environmental pollution to a minimum.

NEED TO STUDY

Research is underway to develop nano-composite to supply all the required essential nutrients in suitable proportion through smart delivery system which may help in balance supply of nutrient to the crop, there is need to study about nano nutrient delivery in the plant systems, assess the impact of nano-fertilizers on soil and soil beneficial microorganism, fate of nano-fertilizers in soil and plant have to be studied, need to optimizes concentration and doses of nano-fertilizers for different crop and site specific management of nano-fertilizers in precision agriculture these are several issues need to standardize to achieve better result from nano-fertilizers in crop production.

CONCLUSION

Since fertilizers, particularly synthetic fertilizers, have a major potential to pollute soil, water and air; in recent years, many efforts were done to minimize these problems by agricultural practices and the design of the new improved fertilizers. The appearances of nanotechnology open up potential novel applications in different fields of agriculture and biotechnology. Nanostructured formulation through mechanisms such as targeted delivery or slow/controlled release mechanisms, conditional release, could release their active ingredients in responding to environmental triggers and biological demands more precisely. There is the possibility of using these mechanisms to design and construction of nano-fertilizers. The use of these nano-fertilizers causes an increase in their efficiency, reduces soil toxicity, minimizes the potential negative effects associated with over dosage and reduces the frequency of the application. Nano-fertilizers mainly delays the release of the nutrients and extends the fertilizer effect period. Obviously, there is an

opportunity for nanotechnology to have a significant influence on energy, the economy and the environment, by improving fertilizers. Hence, nanotechnology has a high potential for achieving sustainable agriculture, especially in developing countries.

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PREPARATION OF ENRICHED COMPOST FROM FARM WASTES/ BY-PRODUCTS THROUGH MICROBIAL DECOMPOSITION FOR AGRICULTURE SUSTAINABILITY

Amaresh Das

India has vast resources of farm wastes/by-products as organic inputs. These inputs can be transformed into nutrient-rich materials i.e. enriched compost through use of microorganisms or microbial consortium. The preparation of such enriched compost from various farm wastes/by-products is presented step by step by use of any effective microbial culture capable of decomposing various farm wastes/by-products or through use of effective microorganisms consortium-1 (E.M.-1). Enriched compost prepared by such method can fruitfully be used in agriculture for sustenance of crop productivity and environmental stability as well.

INTRODUCTION

Composting of organic wastes can be most effectively accomplished by biological process, employing the activities of microorganism such as bacteria, algae, fungi or by some microbial consortium meant for decomposition of organic substrates. India has vast resources of farm wastes/by-products as organic inputs. Though it would be difficult to access the exact estimate of farm wastes or other organic wastes being generated in India annually, it is estimated that about 700 million ton organic waste as is being generated in India annually which is utilized as land filling or burned¹. It is estimated that total availability of different trappable organic sources (cattle manure, crop residues, forest litter, rural compost, city refuse, sewage sludge and press mud) in the country is 875 million tonnes². The novel process of composting on one hand, transform of huge organic waste materials into nutrient-rich worth materials and on the other would save huge exchequer of farmers of our country³. Microorganisms are important biological organisms responsible for maintaining nutrient flows from system to system and in the process reduce the environmental degradation. Adoption of sustainable farming practices is one of the prime practices that

can arrest the diminishing trend of crop productivity and enhance environmental stability^{4,5,6}. As the availability of FYM is limited and prices of inorganic fertilizers are increasing day by day, there is an immense need to prepare enrich -organic manure or compost from farm wastes/by-products through scientific process or by using microorganisms or microbial consortium for the use of compost in agriculture for sustenance of crop productivity and environmental stability as well. In recent years much work has been done by scientists on the management of various wastes including farm wastes to transform these into mineral-rich-compost i.e. wastes to wealth.

Benefits of Compost:

1. Compost when added in heavy soils or in clay soils, water holding capacity of soil improves.
2. It loosens heavy soils by reducing their compactness and providing more passage for air, and thus prevents soil water-logging too.
3. Compost associated with microorganisms also acts as growth promoter of plants and at the same time plays a role as a source of plant nutrients.
4. Repeated addition of composts in soil improves its physical, chemical and biological properties which in turn enhances the growth and yield of plants.

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5. Compost being an organic source, gradually and slowly releases plant nutrients (nitrogen, phosphorus, sulphur etc.) within soil system which ultimately become available to the plant root system resulting in good growth and higher crop yield.
6. The growth and yield of crop are influenced by compost due to its many-fold benefits in soil.
7. Composting process of farm waste materials and its proper use in crop production minimize the chances of pollution hazards and sustain the environmental stability.

RAW MATERIALS FOR COMPOSTING OF FARM WASTE /BY-PRODUCTS

Farmers can make a small pit-cum-heap (3 m length × 2 m width × 2 m depth) on soil in a suitable place. 7 to 10 days old cattle dung, farm wastes of wheal, pigeon pea, indian bean, mustard etc. are used as main raw materials. However, leaves and twists of subabul /gliricidiya /sun hemp etc. Castor cake and animal urine may be added along with main raw material to enrich the compost in nitrogen. Further, rock phosphate may also be blended with the raw material to enhance the phosphorus content of compost. Small quantity of FYM and soil are also additionally mixed with raw materials for preparation of enriched organic compost to take advantage of microorganisms present in these substrates during composting process apart from decomposing micro-organisms culture or microbial consortium. Decomposing micro-organisms culture or microbial consortium available in the market for making eco friendly organic compost may be used as per the direction specified for spraying on the wastes/by- products for making compost/ enriched compost.

PREPARATION OF COMPOST

Step 1. Selection of site:

Heavy soils (pH between 6 and 8) should be selected preferably for making pit-cum-heap so as to minimize termite and rodent attacks in light soil.

Step 2. For preparation of enriched compost, main and other raw materials as described above are to be collected. Large sized raw materials first to be chopped to about 2-3 cm size.

Step 3. For making enriched compost leaves and twists of subabul /gliricidiya /sun hemp etc. (5 to 10 % of total weight of raw materials), castor cake (5 % of total weight of raw materials), rock phosphate (5% of total weight of raw materials), FYM (3 to 5 % of total weight of raw materials) and soil (2 to 3 % of total weight of raw materials) are to be mixed thoroughly with main raw materials (farm wastes of Wheat, Pigeon pea, Indian bean, Mustard etc. . up to about 25 to 30% to total weight of raw materials).

Step 4. For making the first layer (about 15 cm thick) at the bottom of the pit, first cattle dung having 50% weight of the layer is to be spread and then above a layer of mixed materials as under step 3 is to be spread so as to maintain the total height of first layer of about 15 cm.

Step 5. The complete layer is to be moistened throughout with water to allow the entire material to soak as much as water. Then animal urine (10% V/V of this layer) is to be sprayed over it.

Step 6. Spraying solutions of decomposing microbial culture or microbial consortium is to be spread thoroughly on whole material.

Step 7. The same procedure is to be followed for making the 2nd layer of raw materials having height of 15 cm. Then again it is to be soaked with as much as water followed by Spraying of decomposing Solution.

Step 8. The same procedure is to be followed for making 3rd, 4th, 5th layer..... The layers to be made till the upper height of the layer heap reach to 0.5 m above ground.

Step 9. The upper surface of heap (materials) is to be covered with a thin layer of cattle dung slurry (3 – 4 cm) and then is to be covered with gunny bags to avoid any direct sunlight on the heap and loses of nutrients.

Step 10. The whole materials are then to be allowed for composting for about 55 days maintaining moisture level to about 55 to 60 %. Throughout the period of composting the moisture level is to be maintained around 55 to 60 % by watering the materials at regular interval.

HARVESTING OF ENRICHED COMPOST

When the color of the material would becomes dark brown to black (at about 55 days), the compost would be ready for harvesting. Thus watering to the material should be stopped 6 to 7 days prior to harvesting of brownish black enriched compost material. Harvested compost material should be stored in plastic bags under shades.

Microbial consortium capable of decomposing organic wastes can be utilized for making compost. Das and Patel (2011) used Effective Microorganisms –1(EM1) consisting of lactic acid bacteria (*Lactobacillus spp.*), photosynthetic bacteria (*Rhodospseudomonas spp.*), yeast (*Saccharomyces spp.*) for preparation of eco friendly enriched organic compost, whereby in S.N.- 1 wheat straw waste and

S. N.	pH (1:10)	EC(dS/m)	O.C (%)	C:N ratio	Total%					Total(mg/Kg)				
					N	P	K	Ca	Mg	Na	Fe	Zn	Cu	Mn
1	7.59	2.11	41.9	22.5	1.86	1.33	0.66	2.11	3.02	0.95	3964	268	58	898
2	7.26	2.63	40.1	14.7	2.72	1.51	0.91	2.35	3.08	1.28	4690	189	71	1022

? Data are pooled of 2 years.

in S.N.-2 waste of pigeon pea + Indian bean were used as raw materials along with cattle dung and other substrates as above for N and P enrichment of compost.

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USE OF PAPER MULCHES IN VEGETABLE PRODUCTION

Hament Thakur

Mulching with organic materials has been a long and beneficial practice for plant growth but plastic mulches widely replaced them. However, they are not suitable when the consideration is given to environment pollution. Paper mulches are the solution for the environmental problems due to use of plastic mulches. Several kinds of paper material have been used for mulching in different vegetable crops. Kraft paper have been used most commonly for mulching. Paper mulches may lower soil temperature as compared to black plastic mulch or bare soil. Oil treatment in paper mulches may improve its capacity to conserve soil moisture. Black paper mulch and black polyethylene mulch can be equally effective in controlling weeds. Paper mulches are less durable as compared to plastic mulches because they get easily destroyed with wind or rain. In future, paper mulches with better strength and developing properties for mulching is needed.

INTRODUCTION

Mulching is a very old practice which has been used by farmers and agriculturists since a long time for improving soil conditions by covering the soil surface with different kinds of materials. Plant growth is encouraged in a better way with the improvement of physical environment of the soil. Using mulch on the soil surface adds organic matter to it, reduces weed growth and also checks soil erosion to some extent. Several kinds of mulches had been used to control weeds and to improve plant health. In the ancient times mulching with organic matter was done along with stones, pebbles, gravels, volcanic ash and cinder as well as other lithic materials. These methods not only reduces evaporation but also decreases runoff of upper soil layer by wind or heavy flow of water.

Mulching with organic materials has therefore, been very long and beneficial for plant growth but plastic mulches widely replaced them and are very common in vegetable production these days. An ideal mulch should be made up of a renewable material, biodegradable, durable, permeable to rain and huge winds. It should suppress weed growth, maintain soil temperature and moisture and checks evaporation. Also, it should be cost effective and

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easily manageable and should be easy to put in the field. Paper mulches are better option for mulching because they can be easily decomposed and incorporated into the soil whereas plastic mulches have problem of disposal. Although paper mulches are more expensive than plastic mulches their life span is shorter and can be destroyed easily with heavy rain and wind.

MATERIALS USED FOR PAPER MULCHES

Paper is a thin material produced by pressing together moist fibres of cellulose pulp derived from wood, rags or grasses, and drying them into flexible sheets. It is a versatile material with many uses, including writing, printing, packaging, cleaning, mulching and a number of industrial and construction processes. The function, durability and stability of a paper mulch depends on the selection of quality raw paper material. Quality can be enhanced by constituents like mineral fillers, dry and wet strengthening agents, colorants and water repellents. Several kinds of material have been used for mulching in different vegetable crops. Kraft paper has been used most commonly for mulching. Commercial mulch papers are also available as colored and uncolored. All the paper mulches which are used for mulching and are not covered with polyethylene can be used for mulching in organic

farming as these are biodegradable and can be ploughed into soil.

Durability of paper mulch has a direct effect as degradability. It was found that newspaper degraded most rapidly, followed by shredded newspaper and straw mulch was slowest in degradation¹. The paper started degrading from the sides of the paper and allowed weeds to grow on edges. The major disadvantage of the paper mulch is its degradation from edges. Oil coating can be a solution for the fast degradability of the paper. Also saturated paper mulch with vegetable oil significantly prolongs usage time of mulch. Durability of a paper mulch depends on the quality of paper, soil and weather conditions.

EFFECT OF PAPER MULCH ON SOIL TEMPERATURE

It is a well known fact that mulching can modify the soil temperature in different geographical regions. Paper mulches may lower soil temperature as compared to black plastic mulch or bare soil. This might be due to the less absorbed light by lighter color of the paper than the black plastic film which absorbs more light. In a study, the soil temperature was higher under waxed paper mulch than the kraft paper and it was higher in black polyethylene mulch than the paper mulch. Color of the paper mulch had an direct effect on the soil temperature². Treating the paper with oil may increase penetration of thermal radiation which leads to increase in soil temperature. Paper mulches can be used in higher hills for the production of cool season crops as the mulch can increase the soil temperature.

EFFECT OF PAPER MULCH ON SOIL WATER CONTENT

Soil water content depends on soil structure, temperature and evaporation. Mulching can conserve moisture by avoiding evaporation. However, the positive effects of mulching on soil water content depends upon the climate. In temperate regions, there is very little effect of mulching on the soil water content under different mulches or bare soil. It was revealed that both biodegradable paper mulch or brown Kraft paper was able to keep soil

moisture than the plastic mulch³. While effectiveness of polyethylene mulch was shown better than the paper mulch for conserving soil moisture⁴. Oil treatment in paper mulches may improve its capacity to conserve soil moisture. Straw mulch can be very effective in conserving soil moisture for a longer time because it allows penetration of water and avoids losses due to evaporation.

EFFECT OF PAPER MULCH ON WEEDS

Weeds cause huge losses to the main crop as they fight for nutrition, water, light, etc with the main crop. Mulching can reduce the losses due to weeds and can also save manpower and total cost of production by avoiding mechanical weeding practices. Paper mulches have been found equally or even more effective in controlling weeds than black plastic mulch. It was found that butcher paper and polyethylene coated kraft paper were equally effective in weed control as compared to plastic mulch². In a study on tomato paper, mulch was found better in controlling weeds than black polyethylene or biodegradable plastic mulch⁵. The color of the paper mulch can be very effective in controlling weeds. Black paper mulch and black polyethylene mulch can be equally effective in controlling weeds.

EFFECT OF PAPER MULCH ON YIELD

Mulching with paper may increase yield and can also improve fruit quality as the fruit does not get a direct contact with soil. Also as the weed competition is less and moisture conservation is there so the availability of nutrients is more to the crop and there is increase in yield. For example, the yield of head lettuce was significantly higher when paper mulch was used in a warm and dry season⁶. There was increase in yield of tomato when kraft paper, oiled kraft paper and commercially available black paper mulch was used with unmulched treatment⁷. The benefit from different types of mulches also depends upon weather conditions in which they are used. For example, paper mulch gave best result in the rainy season as compared to plastic and straw mulch for increasing yield of tomato⁸. Effect of paper mulches on different vegetable crops is given in Table 1.

Table 1: Effect of paper mulches as compared to bare ground on different vegetable crops

Crop	Type of paper mulch	Effect on yield	Reference
Pepper	Different quality paper	Increase	9
Tomato	Shredded newspaper	Increase	10
Bean	Kraft paper	Increase	8
Cucumber	Newspaper sheets	Not significant difference	1
Pumpkin	White butcher paper	Increase	2

CONCLUSION

These days plastic mulches are more economical than all other mulches. However, they are not suitable when the consideration is given to environment pollution. The availability of paper and high cost of paper mulch are the major problems for large scale field production of vegetable crops. More extensive use of paper mulches could bring the production price closer to plastics, but hardly to the level to compete with them if only the price of mulch is considered. Paper mulch can be left in the soil after the crop ends without any environmental concerns, so its value gets increased as compared to plastic mulch particularly in the presence of increased environmental awareness. The major problem with the paper mulches is their durability. Paper mulches are less durable as compared to plastic mulches because they get easily destroyed with wind or rain.

Paper mulches with better strength and developing properties for mulching is needed, because many paper products tested so far tend to degrade too fast. Due to the environmental problem caused by the use of plastic mulches, it is not too difficult to forecast that there will be great demand for cheaper better and cheaper paper mulches that are environmentally trouble free.

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LIFE SKETCHES OF OFFICE BEARERS, SECTIONAL PRESIDENTS AND RECORDERS OF THE INDIAN SCIENCE CONGRESS ASSOCIATION, 2017-2018



PROF. ACHYUTA SAMANTA
General President

Achyuta Samanta, after obtaining Master's Degree in Chemistry from Utkal University at 22 years of age, became a faculty in a Government Aided College in 1987. He joined KIIT University, Bhubaneswar as a senior lecturer in 1997 where he became Associate Professor on a later date. He at present continues as Professor in KIIT University. He has 30 years of teaching experience to his credit and he has done his Ph.D. in Social Science.

Prof. Samanta went on to serve KIIT University as its first Chancellor and has had the distinction of being the youngest Chancellor of any Indian University. He served University Grants Commission (UGC) as Member for two consecutive terms (2008-11 & 2011-2014) and was a Member of the Executive Committee of All Indian Council for Technical Education (AICTE). He was the first Indian to be Member of both UGC and AICTE simultaneously. He has also served as Member of several other Government of India bodies like, NCTE, ISTE, ISCA, COIR BOARD, CAPART, etc. He has been a Member on the Academic Council of Central University, Silchar, Assam and the Central University, Odisha. He has delivered nearly 100 motivational speeches in different institutions and

organizations across the country and the globe

Prof. Samanta has been conferred with 33 *Honoris Causa* Doctorate awards from different Universities across the globe. He has also been decorated with prestigious Civilian Awards from many countries including, Gusi Peace Prize International, the highest Civilian Award from Bahrain besides over 50 national and international and over 200 State honors and accolades.

He is the Founder of Kalinga Institute of Industrial Technology (KIIT University) and Kalinga Institute of Social Sciences (KISS), Bhubaneswar. Starting modestly with an initial seed capital of Rs 5000/-, KIIT has grown into one of the most promising Universities in the Country with global acclaim having 27,000 students. KISS has become the largest Residential Tribal Institute in the World and is home for 35,000 tribal children (25,000 pursuing education and 10,000 passed out). Both KIIT and KISS found place in the Limca Book of Records as well as Guinness World Records in many counts.

Prof. Achyuta Samanta, who had lost his father at the age of four, before he could know the significance of the world, was pushed into the mire of abject poverty. Today, he is a legend, an iconic educationist, an emblem of service to humanity, a beacon of light for social transformation, and a redeemer of the fallen, the oppressed and the marginalized. With huge contributions in the field of education, health, art, culture, literature, rural development, social service and spiritualism his journey in life is not only awe-inspiring but soul-awakening for millions of poverty-stricken youths all over the globe. He has converted the village 'Kalarabank', Cuttack into a Smart Village and has already started working to establish 12 branches of KISS in different districts very shortly.



PROF. GANGADHAR
General Secretary
(Membership Affairs)

Prof. Gangadhar, an alumni of University of Mysore started his career as Lecturer, Reader & Professor of Zoology at Visvevarapura College of Science, Bangalore. Later he was promoted as the Professor and Head, Dept. of Biotechnology, Dean of Science and Principal at BTL Group of Institutions affiliated to Bangalore University. He has been given the "Best Teacher Award" in the international conference held at Bangalore. He has 37 years of teaching, research and administrative experience. He has received "B. S. Chauhans Gold Medal" from Zoological Society of India.

He has served as Chairman, Board of Examiners in Zoology, Genetics & Biotechnology of Bangalore University. He has also served as the member of Board of Studies in Zoology and Genetics of Bangalore and various other universities in Karnataka. He has done research in the field of fish toxicology and published research papers and articles in the journals of national and international repute. He has received funds for research projects from UGC, Bangalore University and other funding agencies.

He is a fellow of Zoological Society of India, Society of Environmental Sciences and member of various other academies. He was elected to the academic council of Bangalore University twice from the teacher's constituency. He has organized number of national, international & regional conferences/seminars, workshops & refresher

courses under the aegis of Bangalore University Zoology Teacher's Forum.

He has visited number of countries including USA, UK, France, Italy, Ethiopia, Sri Lanka and Singapore for academic and scientific assignment and collaborations. As a member of European Comparative Endocrinologist Association, he has attended conferences held at Bonn University, Germany, Manchester University, UK and Genoa University, Italy.

His Excellency, the Governor of Karnataka was kind enough to nominate him as the syndicate member for Bangalore University (one of the biggest universities in Asia). He had the opportunity to serve as the Chairman and Member of various academic administrative scientific and technical committees.

He is serving as the President of Bangalore University Teacher's Forum, Secretary Society for Advancement of Biological Sciences, Treasurer, Indian Biotech Association and member of various academic bodies. Prof. Gangadhar had the opportunity of serving Indian Science Congress Association as a life member, Executive Committee member for six years and council member for nine years.



PROF. PREMENDU P. MATHUR
General Secretary (Scientific Activities)

Prof. Premendu P. Mathur, Ph.D. is the Vice-Chancellor, KIIT University, Bhubaneswar, India. He is a Fellow of National Academy of Medical Sciences (India). He is Vice-President, Asian Association of Andrology (China) and on the

Membership Committee of the Society for the Study of Reproduction, U.S.A.

Prof. Mathur had served as Dean, School of Life Sciences and Professor of Biochemistry & Molecular Biology and Head, Center of Excellence in Bioinformatics, Pondicherry University, Pondicherry. He received M.Sc. and Ph.D. degrees from Banaras Hindu University, Varanasi. He has guided several Ph.D., M. Phil. and M.Sc. dissertations. He has over 40 years of teaching and research experience. He has published around 170 scientific papers/ reviews in various high impact journals and books and participated in more than 100 national and international scientific conferences. His publications has h index of 30 (Scopus) and 36 (Google Scholar). He is on the Editorial Boards of many national and international journals. He is Reviewer for more than 110 national and international journals. He is recipient of many prestigious awards such as Asutosh Mookerjee Memorial Award (ISCA), Young Scientists' Award (ISCA), Lifetime Achievement Award (ISSRF), Rockefeller Foundation Special Postdoctoral Fellowship Award, Rockefeller Foundation Biotechnology Career Award, INSA-German Academy (DFG) Exchange Programme, Dr. P.N. Shah Memorial US Vitamin (India) Oration Award, ICMR International Fellowship Award for Senior Indian Biomedical Scientist, Subhash Mukherjee Memorial Infar India Oration Award, Dr. K.K. Iya Memorial Oration (NDRI), Vidyasagar Award (Indian Institute of Oriental Heritage, Kolkata) and Foundation Day Lecture, ICAR-Central Rice Research Institute, Cuttack. He has travelled widely within India and abroad.

Prof. Mathur has been Visiting Professor/ Scientist at The Population Council, Rockefeller University, New York, Cleveland Clinic, USA, Westfalische-Wilhelms Universitat, Muenster, Germany and Hamad Medical Centre, Qatar. He has been Chairman/ Member for many national and International Committees. He has been member/ member coordinator of NAAC peer teams to more

than 55 institutions and has been Chairman/ Member of many academic/ scientific committees. He was member of Executive Committee of Indian Science Congress Association (ISCA), (2008-09 & 2009-10) and Founder Convener of Pondicherry Chapter of ISCA. He was President, Section of Animal, Veterinary and Fishery Sciences, Indian Science Congress 2013-14. He served on National Task Force on Bioinformatics and Infrastructure Facilities of the Department of Biotechnology (DBT) and Department of Information Technology, Government of India. He is on the National Task Force on Fertility Regulation & Expanding Contraceptive Choices of Indian Council of Medical Research. He was the Vice-Chairman of Scientific Committee of Third Asia-Pacific Forum on Andrology, China. He has made many innovations in teaching and research including launching of Study in India Programme at Pondicherry University. He received huge funding support from various national and international funding agencies. He developed a Bioinformatics Centre at Pondicherry University, which was recognized as a Centre for Excellence for teaching and research by the Dept. of Information Technology (Govt. of Indi). He was coordinator of National Biodiversity Strategy and Action Plan for Pondicherry.



PROF. RANJIT KUMAR VERMA
Treasurer

Professor Ranjit Kumar Verma has been working as Professor of Inorganic and Analytical Chemistry at the University Department of Chemistry, Magadh University, Bodh Gaya since 1993 except for the

3 year period (February 2014-January 2017) during which he was on lien after being appointed as the Pro Vice Chancellor of Patna University (7th oldest university of India) by the Chancellor through a Search Committee mechanism. His earlier workplaces include H.D. Jain College, Ara where he served as Lecturer (1977-1983) and after that, he joined the University Department of Chemistry (which later became *DST-FIST Sponsored and UGC-BSR Supported*), Magadh University, Bodh Gaya. He did also serve as the CCDC of Magadh University (2007-2010). He had become Reader in 1986 and Professor in 1993.

He is an internationally acclaimed Thermal Scientist and on account of his outstanding publication activity in thermal analysis, professional activity, awards, etc. his name figures in the prestigious list of 350 world's leading thermal scientists published in the 2nd edition of 'Who is Who in Thermal Analysis' by Springer Science from Europe (<http://www.springer.com/chemistry/analytical+chemistry/book/978-3-319-09485-4>). Presently, he is member of the Advisory Committee of the International Confederation for Thermal Analysis and Calorimetry (ICTAC) - the UN-affiliate (ICSU-IUPAC) professional body of scientists working in this area (www.ictac.org). He is also the Vice Chairman of its Scientific Commission and Chairman of its Education Committee. Earlier, he served as the Secretary of this organization (2012-16) and as a Member on the panel of Scientific Award Commission (2008) for ICTAC. Besides, he is also the present Vice President of the Indian affiliate of ICTAC, the Indian Thermal Analysis Society (www.itasindia.org). His areas of interest include solid state thermal decomposition, kinetics, calorimetry and nanotisation and his fields include inorganic, materials, nano, complex, food (edible oils) and the methods include TG, DSC, kinetics, specific heat & calorimetry. He has published dozens of trend-setting research articles and, has supervised a dozen Ph.D. students. He is an F.I.C. [Elected Fellow of Institution of Chemists (India)].

Besides publishing in the domain of 'Thermal

Analysis', 'Nanotisation' and 'Chemical Education', he has been serving as Editorial Board Member (since 2013), as Regional Editor, (2010) as well as the Guest Editor for SATAC-2010, SATAC-2011 and SATAC-2014 Special issues of the *Journal of Thermal Analysis and Calorimetry* (Springer Science) (www.springer.com/10973). He was the Honorary Editor (Inorganic and Analytical) of the *Journal of Indian Chemical Society* (www.indianchemicalsociety.in) during 2007-2010. He was the National Coordinator, Chemistry (M.Sc., Organometallic Chemistry) in the UGC's e-PG Pathshala Project. Chemistry videos were recognized as the best at the National Workshop on MOOCs (massive open online courses) for SWAYAM (Govt. of India) - by HRD Minister Sri Prakash Javadekar at Vigyan Bhawan, New Delhi on 2 March 2017. The project was supported fully by the Ministry of Human Resource Development of the Govt. of India under their National Mission on Education through ICT (NME-ICT) project (http://epgp.inflibnet.ac.in/view_f.php?category=666). He has deeply been involved in Govt. sponsored textual material development programmes at every level (secondary, tertiary and Post graduate levels- from Senior Secondary to M.Sc.). Earlier, he participated in the e-Text Book project on 'Inorganic Chemistry' which was published by the Council of Scientific and Industrial Research (CSIR, Delhi) under the nsdl-project (National Science Digital Library- www.nsdl.niscair.res.in) of Govt. of India. He has also actively been associated with the textual material development projects of NCERT (National Council of Educational Research and Training, Govt. of India, Delhi) for senior secondary students and, is one of the authors of the present Class XII text book.

Prof Verma has earlier been in the Executive Committee (2013-2014, 2014-15, and 2015-16) and Council of the Indian Science Congress Association. He was the Founder Convener of the Bodh Gaya Chapter of the Association. He is Vice President of Indian Council of Chemists (www.chemicc.com) and, has served on different panels of UGC, AICTE, and MHRD and has also been associated with

NAAC. He has delivered several dozens of invited lectures at conferences, seminars and symposia in India and abroad (besides lectures in Refresher Courses in Universities in Bihar, UP, MP, Rajasthan, Maharashtra etc.). He has widely travelled in India and abroad (including USA, Italy, France, Finland, Hungary, Japan, Brazil, Chile, Peru, Hong Kong etc.).

He is a motivational speaker and socially, he is associated with Rotary International (he is a Paul Harris Fellow and two times Club President, 1990-91, 2012-13) and Bharat Vikas Parishad (ex-Zonal Secretary).



DR. SURENDRA KUMAR SINGH
President
Section of Agriculture and Forestry
Sciences

Dr. Surendra Kumar Singh, Director, ICAR-National Bureau of Soil Survey and Land Use Planning, Amravati Road, Nagpur 440 033 (Maharashtra) was born on 12th June 1960 in a village named Pindra in Varanasi district, Uttar Pradesh. Graduated from Gorakhpur University Gorakhpur in 1983; post-graduated in Soil Science & Agricultural Chemistry from Banaras Hindu University, Varanasi in 1985 and completed Ph.D in Soil Science from Rajasthan Agriculture University, Bikaner in 1999. Dr. Singh started his career as Agriculture Officer in the Govt. of Tamil Nadu; later joined as Scientist in ICAR services at ICAR-National Bureau of Soil Survey & Land Use Planning, Regional Centre(NBSS&LUP), Udaipur in the year 1989; elevated as Senior Scientist in Central Arid Zone

Research Institute, Jodhpur; further moved to Central Soil Salinity Research Institute as Principal Scientist. Dr. Singh appointed as Head, Regional Centre, NBSS&LUP, Kolkata in 2009 and became Director, ICAR-NBSS&LUP, Nagpur in 2014.

On joining as Director, Dr. Singh has initiated very ambitious programme of Land Resource Inventory and Land Use Planning on 1:10000 scale for ICAR-NBSS&LUP and also the architect of dedicated Geoportal on Soil 'Bhoomi'. Dr. Singh has the patents of developing Android based smart mobile phone and Automated Land Potential Evaluation System (ALPES). He has provided Scientific Leadership to the Clay Minerals Society of India, New Delhi (2015 & 2016), Indian Society of Soil Science, Kolkata Chapter (2012-14), Indian Society of Soil Science, Nagpur Chapter (2014-onwards), Indian Society of Soil Science, Jodhpur Chapter (2006-2008) and Indian Society of Soil Survey and Land Use Planning, Kolkata Chapter (2010-2012) and reviewer of many International Journals and has experience of leading multi-Institutional Projects.

During his career, Dr. Singh has guided 2 Ph. D students and 4 M.Sc Students and member in 6 Advisory Committees and published more than 100 research papers in international and national journals, 4 books, 20 book chapters, 43 reports.



PROF. PODURI NAGARAJA RAO
President
Section of Animal, Veterinary and
Fishery Sciences

Prof. P. Nagaraja Rao born at Mahabubabad village of Warangal (Dist), Telangana on 6th January,

1957. Father late P. Ramachandra Rao (teacher) and mother late P. S. Kantham. Studied in Government High School and completed intermediate at A. V. College, Warangal. Completed B.Sc in New Science college, Hyderabad and M.Sc in O U campus.

34 years of teaching and research experience on Botanicals, Biological Control, Integrated Pest Management, Insect Molecular biology, Immunology, Bioinformatics, and Biodiversity. Published 105 Research articles in International and National peer reviewed journals, 10 Books and recently CRC Publications book on "Pests and Pathogens Management Strategies". Completed three Major research projects of DBT and UGC and 8 minor Projects from various funding agencies. At present working on Insect immunology, Biochemical and Molecular aspects of Insects with reference to host – parasite/pathogen interactions, related Proteomic and Lipidomic profiles. 21 Ph.D students were guided and 3 Ph.D are submitted and awaiting for the results. Some of the Ph.D. students (8) are working on isolation and characterization of Antimicrobial peptides and immune induced genes from different Indian insect species.

Prof. P. Nagaraja Rao was in Japan, USA, Hongkong and Bangkok on a scientific voyage. He is recipient of ZSI conference Medal (2012) at IICT, Hyderabad, ZSI Gold medal at Lucknow (2011), Fellow of SPPS at IARI, New Delhi (2008), FPPAI in 2007, and FAEB of CTRI, Lucknow, Recognised as Crop Protection Specialist by Pestology (2001) and received Young Scientist Travel Grant of ICIR, Japan (1989) and AOSCE (1987) on merit basis. External Board Member of Board of studies of Kakatiya, Sri Venkateshwera and Palamur Universities. Former Controller of examinations, PG College, Secunderabad, Head and Chairman, Board of Studies at PG college, OU, Secunderabad and University college for Women, OU, Hyderabad, Governing Body member of OUCW etc. President of Science College Osmania University Teacher's Association. Prof. P. Nagaraja Rao has received "Dr. B. Vasantha Raj David (2009)" a prestigious

award instituted in the name of a living legend of Entomology and Dr. Anand Prakash of CRRRI (2008). Prof. P. Nagaraja Rao organized an international conference on "Global Meet of Biologists" in 2012 at Hyderabad and many National conferences, symposia and workshops. Worth mentioning is "IInd Global meet on parasitic diseases" Organized to commemorate the centenary celebrations of Sir Ronald Ross in 1997 as Joint organizing secretary. He is EC member of ZSI, Vice president of AZRA. Editorial committee and life member of many national and international journals and societies.



DR. RAKESH KUMAR SRIVASTAVA
President
Section of Anthropological and Behavioural Sciences (including Archaeology, Psychology, Education and Military Sciences)

Dr. Rakesh K. Srivastava was born on Feb. 15, 1953 at Srinagar of Lakhimpur-Kheri district of Uttar Pradesh. He retired as Head, Department of Psychology, Post - Graduate College, Malikpura, Ghazipur (U.P.) of the V.B.S. Purvanchal University. He earned his M.A.(1973) and Ph.D. degree in Psychology (1979) from Kanpur University, Kanpur. Earlier he served in research projects at I.I.T. Kanpur and I.I.M. Ahmedabad and teaching and research assignments at P.P.N. College, Kanpur. Dr. Srivastava has contributed more than 60 scholarly articles in Indian and foreign journals including Journal of Social Psychology (U.S.A.) and British

Journal of Projective Psychology (U.K.). He has published ten book chapters, two books reviews, two test adaptations and also completed several research projects funded by the University Grants Commission. His book Tribal ego-identity in India (1996) has been published by the Classical Publishing Company, New Delhi. He is also supervising Ph.D. level research in Psychology. He has done extensive research on tribals particularly on Ethnic Psychology of Tharu tribals. He is currently working in the areas of Psychology of acculturation, Ethnic socialization, Empowerment of tribals, Cross-cultural issues in human development and indigenization of psychology in India.

He is a member of several Indian and foreign professional associations including the life member of Indian Science Congress Association (ISCA) for more than three decades. He is also a member of International Council of Psychologists, U.S.A. (1981- 82). He was an organizing Committee member of 1st convention of Uttar Pradesh Psychology Association (1977), founder member and Joint Secretary of Community Psychology Association of India (1988 - 2001), Executive member of Praachi Psycho - cultural Research Association (2001 - 05), and Executive member of Indian Psychological Association (1993 - 94). He has been an Executive member of Uttar Pradesh Psychology Association since 1995 and also a member of Research Board of Advisors (since 2000) of the American Biographical Institute (U.S.A.). Presently he is a Governing Council Member of the Praachi Psycho-cultural Research Association (2016-19). He is also nominated as one of the members of the 27 member international operational group of the World Association of Cultural Psychiatry (WACP).

He is awarded IPERA Prof. M.A Hakim Memorial award for the Best Applied Psychologist (2013) at 1st IPERA International Conference and also awarded Indian Psychological Association (IPA) President's Gold Medal and certificate of

excellence in Psychology (2014, 2017). He was an Associate Editor of Purvanchal Journal of Social Sciences (1993 - 94). He has attended more than 90 National and International conferences. His co-authored papers were also presented at the 4th International Congress of the International Association for Cross - Cultural Psychology (1978) and 19th International Congress of the International Association of Applied Psychology (1978). One of his papers had been selected for reading on 'Anxiety' by the University of Sheffield Biomedical Information Service, England (Dec 1980).

Dr. Srivastava is a regular participant of Indian Science Congress sessions and a well - known figure for his active participation in discussions. He has so far attended 36 Indian Science Congress sessions held at different parts of India. He was an elected Sectional Committee member of Section of Psychology and Educational Sciences (82nd Session, 1994 - 95) and Section of Anthropological and Behavioral Sciences (90th session, 2002 - 03 and 95th sessions 2007 -08). He was also elected as a Sectional Recorder (Anthropological and Behavioral Sciences) of ISCA for 102nd (2014-2015) and 103rd (2015- 16) sessions. He has also served as Chairperson /Rapporteur at different conferences. Presently he is the member of the editorial boards of several journals of psychology and social sciences including Indo - Indian Journal of Social Sciences and Behavioral Research Review. Recently Dr. Srivastava is honoured by Professor Shirish Kulkarni, Vice-Chancellor, Sardar Patel University, Vallabh Vidyanagar for his excellence in Psychology with a medal and certificate (2017). He has visited various Universities of Singapore, Malaysia (2008) and the United States of America (2013 & 2014). Recently he is invited to attend the 29th International Congress of the International Association of Applied Psychology and 24th International Congress of the International Association for the Cross- cultural Psychology to be held in Canada in 2018.



PROF. K. S. RANGAPPA
President
Section of Chemical Sciences

Prof. Rangappa has made novel and significant contributions to Chemical Biology-Drug discovery programme, Bio-organic and Medicinal Chemistry. His research is characterized by both novelty and innovation, and has led to a substantial body of published work which has received extensive citations, national and international recognition with several awards. His most important contributions have been towards the synthesis of new molecules for various therapeutic areas including antimicrobial, anti-inflammatory, anti-malarial, anticancer, antiangiogenic, anti-diabetic, Alzheimer's, etc. He has also worked extensively on p300 HAT activators, acetylcholine inhibitors and M1 receptor agonists. Over 4000 new bioactive molecules have been synthesized from his laboratory which were tested for their Antimicrobial, Anti-inflammatory (PLA2 Inhibitors), Anti-Malarial, Anticancer (Cervical, Breast, Liver and Mouth Cancer), Alzheimer's disease and Diabetes.

Prof. Rangappa received his Ph.D. from the University of Mysore (1982) and has worked as Post-doctoral / Research Associate / Visiting Professor at several Universities in Canada (1983 – 85), USA (1990 – 92), Germany (1995), Japan (1999 – 2000, May – July 2005), Korea (2002, 2014), Poland (April – May 2006), Russia (July 2013), Cambridge University, UK (Oct 2013) etc.

He has been awarded the D.Sc degree by the University of Mysore for his independent research

contribution (1998). He is the Fellow of The Royal Society of Chemistry (FRSC, UK) and Fellow of National Academy of Sciences (FNASc) India. Apart from the research activities of his own group, Prof. Rangappa has developed several national and international (Indo – Japan, Indo – French, Indo – Germany, Indo-NUS, Indo-UK, Indo-US, Indo-Korea, Indo-South Africa, Indo-Russia etc.) collaborative research programmes with more than 300 scientists working across the globe. Prof. Rangappa has established a school of researchers, to undertake further studies. Prof. K. S. Rangappa has published more than 450 research papers in national and international peer reviewed journals and presented more than 150 research papers in national and international conferences. He has 10 patents in the area of medicinal chemistry. He has over 4975 scientific citations for his research contributions as of now with h-index 35. Prof. Rangappa has successfully guided 54 candidates for PhD degrees and presently 10 students are working for the doctoral research.

Prof. Rangappa is a recipient of several prestigious national and international awards including Prof. Y. T. Thathachari prestigious research award for Science (2007), Sir C. V. Raman Young Scientist Award (2006) from Karnataka State Council for Science and Technology, Chemical Research Society of India (CRSI) Bronze Medal (2006) in Chemical Sciences by Chemical Research Society of India, Prestigious Dr. Raja Ramanna Award from Karnataka State Council for Science and Technology (2011), Global e-learning award (2012) and Kempegowda International award (2017) for the outstanding contribution in the field of education. He served as a Vice-Chancellor, Karnataka State Open University from 2009 to 2013 and Vice Chancellor, University of Mysore, Mysore and brought the global recognition to both the universities.

Currently, Prof. Rangappa is a UGC-BSR Faculty Fellow; Distinguished Professor of the University of Mysore; Chief Scientific Adviser, Sinotar Pharmaceutical Co., Ltd.

**DR. DEVESH WALIA****President****Section of Earth System Sciences**

Dr. Devesh Walia (DoB- August 17, 1965) Professor (Geology) and Head, Department of Environmental Studies, North-Eastern Hill University (NEHU), Shillong, India completed his University education B.Sc. and M.Tech. Applied Geology from Dr. Hari Singh Gour Vishwavidyalaya, Sagar and Ph. D. (Geological Sciences) from Gauhati University, Guwahati. Subsequently, he joined NEHU as a faculty in 1990 and is actively engaged in teaching, research and consultancy with more than 27 years of experience.

Dr Walia is a recipient of NCC Scholarship; University (UGC) Fellowship; Indian Science Congress Association- Earth System Sciences (ISCA- ESS)- Sectional Committee member and then Sectional Recorder (2013- 2014); Executive Council Member, Geological Society of India (2016-2019); Executive Council Member, Indian Geophysical Union.

Dr Walia has successfully completed and ongoing a number of research projects funded by various agencies such as North-Eastern Council, Department of Science and Technology, Ministry of Earth Sciences, Government of India, New Delhi, BARC-BRNS, DAE, Mumbai. He has guided research leading to the award of Ph. D. degree on topics: Geophysical Studies of the Deep Crustal Structure of North Eastern Indian region using Magnetotelluric Techniques; Hydrogeochemical Study of Hot Springs of the North East India; Study of Seismicity and Active Tectonics in the South

Eastern part of the Shillong Plateau; Flow characteristics and quality assessment of groundwater; Radon emanation and seismicity in NER.

He has many research papers in reputed National and International Journals to his credit. He has organised few National and International conferences/seminars/workshops. He has participated and presented his research findings in various National and International conferences/seminars/workshops held in India and abroad. He has been invited to deliver keynote address, state of art lecture and to chair the session in different National and International conferences/seminars/ workshops and has attended the Industry – Academia workshops on Upstream Petroleum Technology- Geology and Geophysics at Kaziranga, Gandhinagar and Duliajan. He has been collaborating with recognised scientists from national and international institutes of repute such as Earth Observatory of Singapore, NTU, Singapore; Indian Institute of Geomagnetism, Navi Mumbai; National Geophysical Research Institute, Hyderabad.

Although the basic area of expertise of Dr Walia is Structure and Tectonics of NE Indian region but the research areas where significant contributions have been made include magnetotellurics; radon emanation studies; micro-seismology; global positioning system, seismic disaster management and mitigation; Earthquake forecasting; Remote Sensing and GIS and groundwater flow and quality assessment. Dr Walia is faculty for the training imparted to the Legislators, Architects, Engineers, Contractors and different level of Officers of Meghalaya on the seismic disaster mitigation, DM Act 2005 and building codes for the disaster resilient structural and non-structural elements.

Dr Walia is life fellow of Geological Society of India, Indian Geophysical Union and Indian Society of Remote sensing and life member of a number of academic and professional bodies including Indian Geological Congress. The Geological, Mining and Metallurgical Society of India, Indian

Society of Earth Sciences, Indian Association of Earth Scientists, Indian Seismological Research Society, Indian Association of Hydrologists, Indian Society of Geomatics, Indian Institute of Geomorphologists and Member of the Sectional Committee (ESS) for 2009-2010 (97th Indian Science Congress) and for 2010-2011 (98th Indian Science Congress). He has been the Recorder, Earth System Sciences Section (2013-2014), ISCA. He has also worked as referee of scientific journals, expert in the area of disaster management and mitigation advisor/consultant and Member of the Shillong Disaster Management Plan Technical committee and acted as an Observer while the mock drill was conducted in Meghalaya with special reference to seismic disaster. He is the member of the District Level Environment Impact Assessment Authority (DEIAA). He has been member of the Term Review Committee of GSI- NER and attended CGPB Group VIII meetings.



DR. ARUNKANTI BISWAS
President
Section of Engineering Sciences

Born in January 1948, Dr. Arunkanti Biswas had his undergraduate and Post Graduate Degree in Civil Engineering from Jadavpur University with Specialization in Environmental Engineering. He obtained first class throughout his career. Dr. Biswas obtained Ph.D in Engineering from Jadavpur University in 2010 after Super annuation from CSIR-NEERI. He also possess Bachelor of Law from Calcutta University in the year 1985.

Dr. Biswas started his professional carrier as Research Fellow at Environmental Division of

Jadavpur University under the guidance Prof. Nilay Chaudhuri, a professor of eminence in the field of Environmental Engineering from 1976. Later on he joined for a couple of years in KMDA as Assistant Engineer in Water Supply & Environmental Hygiene Sector. During his tenure the major schemes on design of water treatment plant and reservoir at Kalyani were completed.

Dr. Biswas joined in CSIR- National Environmental Engineering Research Institute (NEERI) in July 1979 as Scientist. He had a long innings of 30 years till his retirement in 2008 as Scientist & Head and Deputy Director, CSIR-NEERI. During his tenure, he was involved at about 55-60 projects of National Importance, out of which served as the Project Leader of at least 18 major projects. He worked with famous Environmental engineers viz Late Dr. P Khanna, Dr. S N Kaul and Dr. R N Singh in NEERI and with their able inputs could upgrade the stature of NEERI as a very prominent CSIR Lab. During his tenure as Scientist & Head, Jaipur Zonal centre, NEERI was awarded National Awards for Excellence in Consultancy Services turnkey projects on CETP at Pali and Balotra. He also made significant contribution in research, monitoring and consultancy work on River Ganga viz. Rapid Estimation of Point Sources Discharging into River Hooghly within CMD Area. He was also involved as a project leader in Pollution abatement in Damodar River System (Sponsored by DVC).

In the field of Water management, he was involved in Evaluation of Rural Water Supply Schemes in India and Performance Evaluation of Water Treatment Plants in India (Both Sponsored by CPHEE&O). KMDA/KMWSA supported his work on Performance Evaluation of Water Treatment Plants at Baranagar – Kamarhati and Serampore.

In the field of solid waste management system, Dr. Biswas has significant role for the investigation and preparation of Development of Solid Waste Management System at Port Blair (Sponsored by Administration, Municipal Council of Port Blair), Urban Solid Waste Management: Critical Issues: Short and Long Term Road Map, (Sponsored by West

Bengal Pollution Control Board), Developing a policy Framework for Solid and Liquid Waste Management for Odisha, DFID Supported Wash Program.

For design of different types of treatment systems, contribution by Dr. Biswas were well acknowledge for Wastewater Management System for Talcher Thermal Power Station Township (sponsored by Orissa State Electricity Board), Waste Management at Paradeep Phosphates Ltd. (Sponsored by Paradeep Phosphates Ltd.), Planning of Chemical and Basic Engineering Packages for common Effluent Treatment Plant (CETP) for Amravati Industrial Area (Sponsored by Maharashtra Industrial Development Corporation (MIDC), Amravati), Design of Common Effluent Treatment Plants for Industrial Estates in NCT of DELHI (Sponsored by Delhi Pollution Control Committee). Dr. Biswas had a great expertise in the field of Air Pollution. He was the project leader of Ambient Air Quality Monitoring at Ten Locations within Kolkata City (Sponsored by WBPCB) and area leader for the Ambient Air Quality Status for Seven Cities in India (Sponsored by CPCB). Because of his initiative a Study on Preservation of Victoria Memorial Hall from Calcutta Environment Deterioration was conducted. As an Area Leader he conducted a study on VOC Emission at Metro Cities (Sponsored by CPCB).

Dr. Biswas is considered as an Expert of Environmental Impact Assessment (EIA). He made significant contribution in following EIA Studies: Ganga Action Plan on Public Health (Sponsored by GPD & ICMR), Dankuni Coal Complex (Sponsored by Coal India), Numaligarh Refinery (Sponsored by NRL), The Calcutta Port (Sponsored by CPT), LPG Recovery Plant at Lakwa, Assam (Sponsored by GAIL), Marketing Terminal at Siliguri (Sponsored by NRL). Apart from all these projects Dr. Biswas also mentored the Process package for Resource Recovery at Science City Kolkata; Wastewater Management in Cluster of Tanneries Tamilnadu; Management of Waste Generated during Processing of Jute in the Jute Mill and Impact of Pesticides used

under Public Health Programme on Environment & Health (sponsored by Directorate of National Vector Borne Diseases Control Programme).

Because of his expertise, Hon'ble Supreme Court and Hon'ble High Court of Gujarat retained him as an Expert for inspection of ETPs at Haryana and GIDC, Baroda respectively. Dr. Biswas was former Member for Accreditation of Quality Council of India under National Accreditation Board for Education and Training (NABET) as EIA Coordinator for Thermal Power Plants and Building Sector and Empanelled Experts for Air, water and solid waste (31.05.2010 to 30.08.2013). He was former Member of the State Level Expert Appraisal Committee (SEAC), West Bengal (Dec, 2013 – Dec,2016), Vivekananda Institute of Environment Management (VIEM as Secretary), Concern for Better Living (CFBL as Treasurer), Workshop for the Blind (Joint Secretary) and Sramajibi Hospital (Board Member).

He is also visiting Faculty Member of School of Water Resources Engineering (SWRE), Jadavpur University. Dr. Biswas also associated with SWRE for different projects- Development of Cost Effective Technology for Recharging in Over-exploited Groundwater Resources in Rural Areas in WB (sponsored by DST, Govt. of India), Hydro-geological Study of Sub-surface Water Flow/Storage Characteristics for Creation of Sustainable Source on Rainfed River for Semi Arid and Fluoride affected Blocks in connection with comprehensive Water Security Plan for Damodar & Kangsaati under Purulia District (sponsored by PHED, WB), Indo-European Union Research Project Energy Efficient, community-based water and wastewater treatment systems for deployment in India (sponsored by DST, IMRCD, Eco-India, Feasibility Study for of infiltration Gallery to draw 12MLD water in Darkeswar at Prakash Ghat in Bishnupur Block Bankura District (sponsored by PHED, WB), Evaluation of Desilting of River Ichamati along International Border with Bangladesh implemented during Xth Plan from Barnaberia (120 km) to B.S.F Bridge at Kalachi (140.5 km) in P.S. Gaighata, Dist

North 24-Parganas (sponsored by Irrigation & Waterways Directorate, WB).

He is an Expert Member of DST, Govt. of WB. He was instrumental in conducting the projects which are talking points at present (2014-2017) viz. Development of Sewerage in Tarapith Area (by the Directive of Hon'ble High Court), Technical Evaluative Study for the Work completed for Abatement of Pollution to Tollys Nullah (Sponsored by Urban Development, Govt. WB), Evaluative Study of Electric Crematoria constructed under Ganga Action Plan (Sponsored by KMDA). An overview of the works completed under Ganga Action Plan (Phase I & Phase II) sponsored by KMDA.

Dr. Biswas had 9 international publications (the average Impact Factor (Thompson Reuter) being 2.73), 19 conference and Journal Publications, 4 Book Chapters/Editor. He has organized 7 Workshop/Conferences.

Apart from his involvement in Indian Science Congress, he is member/ executive of Professional Bodies viz. Institution of Public Health Engineers, Indian Association of Environmental Management, Institution of Engineers (India) and Society of Civil Engineers, Jadavpur University.



DR. SUBRAT SHARMA
President
Section of Environmental Sciences

Dr Subrat Sharma is Head of the Climate Change Theme at G. B. Pant National Institute of Himalayan Environment & Sustainable Development which is an autonomous Institute of Ministry of Environment,

Forest & Climate change, Govt. of India, and Incharge of ENVIS Centre on Himalayan Ecology. An alumnus of many prestigious institutions, viz., Centre for Space Science and Technology Education in Asia and the Pacific (*affiliated to United Nations*), Yale School of Forestry & Environmental Studies, is well known ecologist who has worked intensively on various aspects of Himalayan Environment for last 26 years. He obtained his PhD degree in Botany (Ecology) from Kumaun University, Nainital, and further blended his skills through MTech in Remote Sensing & GIS while pursuing his scientific carrier. Scientific contributions of Dr Subrat Sharma include first exhaustive report on *Cordyceps sinensis* (a parasitic fungus of high value in the alpine region) from the Indian Himalayan region, reconstruction of *Taxus baccata* canopy volume of harvested trees (which provided base to implement ban, by the government, on reckless harvesting of species from the wild), long term monitoring of high altitude vegetation (part of global monitoring network), development of satellite based indicators of climate change responses in vegetation (new method developed), and contribution to vegetation types map of India (new map prepared for the entire country).

Dr Subrat Sharma, a member of various International and National Academic Bodies, has published more than sixty research papers in the journal of excellence, six books, and many popular articles for general readership. He is also Managing Editor of regular publications of ENVIS Centre on Himalayan Ecology. His academic services include peer reviewing of prestigious journals across the globe, academic counseling to students of Open Universities, development of course curriculum for universities, and advisory to other organizations. Dr Sharma is widely travelled for academic pursuit and received several research grants from International and National agencies. Phd students of Dr Sharma are placed in different organizations, and present ones are pursuing research in the front areas of the ecology. His current interests include characterization of high altitude timberline, use of space technology in long term monitoring of

ecosystem responses, and developing simple tools to involve citizens in monitoring and mitigation.

Beside several academic excellences and awards, Dr Subrat Sharma is recipient of prestigious award for “*Forest Conservation*” (1996-1997) by Indian Council of Forest Education & Research (Govt. of India). He is member of Interdisciplinary Committee for “*Albert Einstein World Award of Science*” by World Cultural Council, Mexico. At national level Dr Subrat Sharma is an expert member of the Task Force to develop National Risk management Strategy for Landslides (National Disaster Management Authority, Govt. of India).



DR. M. SUNDARESAN
President
Section of Information and
Communication Science & Technology
(including Computer Sciences)

Prof. Dr. M. Sundaresan, born on 28 July 1960, has more than three decades of teaching experience and two decades of research experience in Computer Science and Information Technology and its related areas. He did his M.C.A from Bharathidasan University, M.Phil. and Ph.D. in Computer Science from Bharathiar university. He started his career as System Analyst and has worked as Lecturer, Assistant Professor and Associate Professor at Bharathiar University. Currently, he is working as Professor and Head, Department of Information Technology, School of Computer Science and Engineering, Bharathiar University, Coimbatore, Tamilnadu.

He is a good academician, researcher and administrator too. He has contributed to Bharathiar

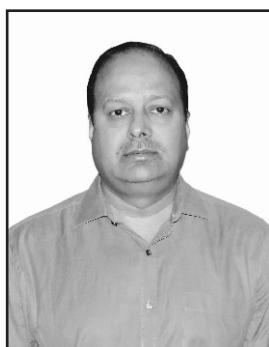
University as a Member of Syndicate, Senate and Standing Committee on Academic Affairs. He is Chairman of Board of Studies in Information Technology of Bharathiar University since 2008. He is a member of Board of Studies in Computer Science and Information Technology for many Colleges and Universities in South India. He is also Member in Governing Councils of various Colleges. He also has conducted Academic Audit for many Colleges and Universities. He has operated projects from UGC to the tune of Rs.47.25 Lakhs under Special Assistance Programme. He has handled an AICTE project for Rs.5 Lakhs. He also has received grant from Tamilnadu State Council for Science and Technology.

Over these years, he has been teaching, researching and supervising in areas of Digital Image Processing, Data Compression, E-Commerce and Cloud Computing. He has guided more than 30 M.Phil Scholars and 6 Ph.D Scholars for their research degrees. He is a member of various professional societies and associations like Computer Society of India, International Association for Computer Science and Information Technology and Indian Society for Technical Education. He has authored three books, two chapters in edited volumes and more than seventy research papers in National and International Conferences and Journals. He is also a reviewer for many International Journals.

He is an active participant and contributor for the Indian Science Congress Association. He has been attending all the Congresses right from 2008. He was a Sectional Member of the ICT Section during 2014–2015. He was an Invited Speaker for the Congress held in Jammu during 2014.

He is also an active member of Computer Society of India contributing at all the levels. He was Chairman, CSI Coimbatore Chapter during 2014–2015. At present, he is the Regional Vice President for Region VII (which comprises of Tamilnadu, Kerala, Pondicherry, Andaman and Nicobar Islands) of Computer Society of India. He was a Member of Organizing Team for CSI Annual Convention held in

2016 and has served in different capacities in all CSI Annual Conventions since 1990. He has been actively engaged in many regional programmes in this part of the country and chaired technical sessions in CSI Annual Conventions held in Visakhapatnam in 2013, Hyderabad in 2014, Delhi in 2015 and Coimbatore in 2016. He has also visited Malaysia and Singapore as academic expert.



PROF. DINESH KUMAR
President
Section of Materials Science

Prof. Dinesh Kumar joined YMCA University of Science & Technology, Faridabad (A State Govt University) as the Vice-Chancellor on 4.11.2015. Recently, Prof. Kumar has been awarded prestigious Indian Science Congress Association Homi J Bhabha Gold Medal by Hon'ble Prime Minister of India. Under his leadership & guidance, YMCA University has been accredited and awarded 'A grade' by NAAC in its first attempt. During his tenure, it has also been ranked No 1 among State Govt Engg Institutions in the State.

Prior to joining YMCA University, Prof. Kumar has undertaken various administrative responsibilities such as Chairman-Electronic Science, Director-Alumni Association, Director-UIET, besides teaching at Kurukshetra University. He has been instrumental in getting World Bank Project TEQIP grant for UIET and generating funds to the tune of Rs 6 crores for Alumni Association. He has also served as Coordinator of the National Programme for developing MEMS and Microsystems and was awarded the Nanomission

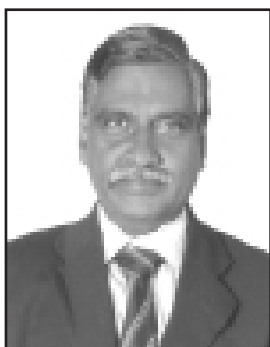
project by DST worth Rs.2.96 Crore to support Nano-science & Technology programme at Kurukshetra University.

He obtained his M.Phil in Microelectronic Engineering & Semiconductor Physics in 1991 and Ph.D in 1994 from Cambridge University, U.K. under the supervision of Prof. A. M. Campbell at Department of Engineering. He travelled to INFMTASC, Trieste, Italy in 1998 and worked there as a Post-Doctoral Research Associate with Prof. Alfonso Franciosi. In 2003, he was awarded the Commonwealth Fellowship by the Association of Commonwealth Universities, London to work again at Cambridge University in Prof. Mark Blamire's group, where he has also served as a bye-fellow of Selwyn College, Cambridge.

He has already published more than 100 research papers in journals of International repute. So far, he has supervised 17 Ph.D and around 40 M.Tech thesis in the areas of Metal/Semiconductor contacts, new functional Materials, MEMS design and fabrication and around 8 Ph.D thesis are under supervision.

Prof. Kumar is a widely travelled person and has been to France, Italy, Germany, Austria, England, USA, Russia, Australia, Taiwan and many more in connection with his research activities. Some of the research topics on which his group is working are:

Study of MBE grown semiconductor materials like GaAs, InGaAs, InAs, GaN and ZnSe Metal-Semiconductor contacts for optoelectronic applications. Development of copper based metal interconnections for high speed & low power ICs. Developing high-k dielectric materials for high reliability submicron MOS devices, ZnO based transparent Electronics and Quantum lasers, Nanomaterials based gas/humidity sensors, Synthesis of Silicon Nanoparticles for Nanoelectronic Devices, Graphene -Next generation material for Super-capacitors, water treatment and gas/ humidity sensing , Design, Fabrication and Characterization and reliability studies of Capacitive Type RF MEMS switches in collaboration with CEERI Pilani.



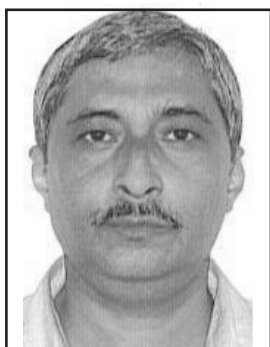
DR. M. XAVIER JAMES RAJ
President
Section of Mathematical Sciences
(including Statistics)

Dr.M.Xavier James Raj is presently serving as Head, Orbital Analytics Section, Applied Mathematics Division, Vikram Sarabhai Space Centre, Indian Space Research Organization, Thiruvananthapuram. He joined in Indian Space Research Organization in March 1984. Prior to this, he served as Post Graduate Teacher in Mathematics in St.Joseph's Higher Secondary School at Kanya Kumari District, Tamil Nadu. Dr.M.Xavier James Raj is the recipient of four Gold Medal in M.Sc (Mathematics) from the University of Jabalpur (Presently Rani Durga University, Jabalpur), Madhya Pradesh in 1981 and did B.Ed from Annamalai University, Chidambaram, Tamil Nadu in 1982. He is awarded Ph.D. in orbital mechanics on "Analytical and Numerical Predictions for Near-Earth's Satellite Orbits with KS Uniform Regular Canonical Equations" from Mahatma Gandhi University, Kottayam, Kerala in 2008.

He has life membership in many professional bodies including Aeronautical Society of India. He is also serving as an honorary President of Space Centre Employees Cooperative Society, ISRO,

Thiruvananthapuram. His research interest includes orbit prediction for satellites, Re-entry prediction of space objects, orbital life time estimates, Collision avoidness analysis (COLA) for Indian launch vehicles, Space object proximity analysis (SOPA) for Indian low earth satellites and interplanetary mission studies. His major contributions include development of analytical theories for orbit predictions with the Kustaanheimo - Stiefel (KS) element equations of motion with respect to the perturbations due to the Earth's oblateness and atmospheric drag. The solutions of the theories are well compared with the numerical solutions as well as found to be better than the solutions of the existing analytical theories in literature. Hence, it becomes one of the best analytical theories available at present. The theories are useful for orbit prediction of satellites, life time estimates and re-entry predictions of the space objects.

He presented more than 50 research papers in the International/National Conferences and published 21 research papers in internationally well reputed journals. He also published around 200 internal reports in Vikram Sarabhai Space Centre. He is a reviewer of many international journals. He represented Indian Space Research Organization in the Inter Agency space Debris Coordination (IADC) committee meeting held at Berlin in Germany in April 2011 and made 6 Technical presentations in Working Groups 2 and 4. He participated as a nominee of Indian Space Research Organization in the International Astronautical Federation (IAF) held at Jerusalem in Israel in October 2015 and presented a research paper. He also participated and presented a research paper in "Committee on Space Research" (COSPAR) in 2012. He visited many foreign countries including England, Scotland, Netherlands, Portugal, Germany and Israel.



**PROF. ANUP KUMAR
BHATTACHARYA**
President
Section of Medical Sciences
(including Physiology)

Dr. Anup Kumar Bhattacharya 61 yrs. of age (DOB 03.12.1955) passed Higher secondary Exam. In the year 1971 and obtained National Scholarship from G.O.I. Then he was admitted to R.G.Kar Medical College Calcutta and obtained M.B.B.S in the yr. 1979. During his career as undergraduate student he received College Gold Medal in Medicine, 1st certificate of Honors in Medicine and Govt. of West Bengal Merit Scholarship. After completion of House staff of 1 year he was admitted to M.D. (Medicine) course of Calcutta university at I.P.G.M.E&R and obtained post-graduate degree of M.D. in the yr.1984. He then joined Indian Railway Medical service as Assistant Divisional Medical officer through UPSC. Selected for Post Doctoral Course D.M.(Neurology) in the yr.1989 and admitted to Bangur Institute of Neurology- Kolkata .Completed post-doctoral course in 1990. Then joined West Bengal Medical Education Service as Medical College. Resigned from West Bengal Medical Education Service in 1996 as Assistant Professor.

Joined M.G.M. Medical College, Bihar as assistant professor in Medicine in 1996. Subsequently promoted to the rank of Professor of Medicine and in-charge of Neurology in 2005.He is now a regular examiner of both undergraduate and post-graduate examination of different universities

of India. Regular Guide of M.D. (Medicine) thesis for the last six years. Also a thesis adjudicator of different universities for last five yrs.

Selected for clinical attachment in Queens Square Institute of Neurology, London by Indian Academy of Neurology and successfully completed Post-Doctoral certificate course from University of London.

Delivered G.S.Sainani Memorial Oration during Annual conference of Indian Academy of Clinical Medicine 2014 at Agra Medical College. Served as Hony, Associate Editor of Journal of Indian Medical Association 2013-14. Elected as Hony, Editor of Journal of Indian Medical Association 2015-16. Served as Executive committee member (Vice-chairman) of West Bengal Branch of API 2012-15, and now working as Hony, Editor of Bengal Physicians Journal since 2014-till date. More than 30 publications in national and international Journals of repute. Edited two monographs of Indian College of Physicians (Academic Wing of Association of Physicians of India) –1. Chronic Diarrhea 2.Headaches.Awarded Fellowship of Indian College of Physician (F.I.C.P.) in 2015. Awarded Fellowship of American College of Physician (F.A.C.P.) in 2016.



PROF. V. RAVISHANKAR RAI
President
Section of New Biology (including
Biochemistry, Biophysics & Molecular
Biology and Biotechnology)

V. Ravishankar Rai earned his M. Sc and PhD from the University of Mysore, India. Currently, Dr. Rai is working as a Professor in the Department of Studies in Microbiology, University of Mysore,

India. He was awarded a fellowship from the UNESCO Biotechnology Action Council, Paris (1996), the Indo-Israel Cultural Exchange Fellowship (1998), the Biotechnology Overseas Fellowship, Government of India (2008), and the Indo-Hungarian Exchange Fellowship (2011) and Indian National Academy Fellowship (2015). He has been invited by Academia Sinica, Taiwan as Visiting Fellow (2010).

He has been actively involved in research work and brought around Rs.200 lakhs through various sponsored research projects from DBT, DST, UGC, ICMR, National Medicinal Plant Board (NMPB) and DRDO (DIBER). Recently Dr. Rai has edited a book on Advances in Food Biotechnology (2016) by Wiley Publication and edited two books on Microbial Food Safety and Preservation Techniques and Beneficial Microbes in Fermented and Functional Foods for CRC Press, USA. Currently he is involved in editing books on 'Nanotechnology Applications in Food Industry' and 'Food Safety and Protection' (Two Volumes) for CRC Press. He has successfully guided 19 Ph.D students so far. Presently eight candidates have registered for PhD and 18 students obtained their M.Phil degree in Seed Pathology. Presently, he is the coordinator for the Department of Science and Technology, Promotion of University Research and Scientific Excellence and University Grants Commission innovative programs. He is also a Coordinator of Regional Science Centre, Mysore (Karnataka State Govt), and coordinator for Mysore University Campus Green Initiative. Prof. Rai main focus of research, over the past three decades has been on food biotechnology, bacterial quorum sensing, Microbiological corrosion, Bioprospecting of Medicinal plants, Nanotechnology and food.



PROF. MANISHA GUPTA
President
Section of Physical Sciences

Prof. Manisha Gupta, born on January 6th, 1966, received her college to university education in Lucknow. She obtained her graduate, master's and doctorate degree in 1983, 1985 and 1990 respectively from the University of Lucknow, Lucknow. Prof. Gupta joined the department of Physics as a Lecturer in 1990 and rose to the position of Professor in 2007.

Prof. Gupta started her research career as a JRF (UGC) in 1985 in the department of Physics, University of Lucknow, Lucknow. She has an experience in research and teaching of over 27 years. Her field of research specialization is electrical, acoustical and spectroscopic studies of materials especially industrially important polymers. Prof. Gupta has vast experience of teaching and research, having guided 14 scholars for Ph.D.. She has also supervised several Masters' students for their project work. She has national collaboration as well as inter departmental collaboration within the university.

Prof. Gupta has more than 100 research papers to her credit in various National and International peer reviewed journals. She is also reviewer of a number of high impact International journals. She has edited

several books/proceedings. She has participated in various National and International conferences and chaired various teaching sessions and delivered many invited talks. She has also presented papers in Paris (France) and Dubai (UAE). She has successfully completed major research project. Presently, she is running a major research project sponsored by U.P. CST. She has been associated with ISCA since 1990. She has received the Best Poster Presentation award in the section of Physics at 90th Indian Science congress, January 2003 and under her able guidance, her students have also received awards at Indian Science Congress and other prestigious National Conferences. She had also served several times as sectional committee member in then physics/physical science section. She was Sectional Recorder, Physical Sciences during 2014-2016.

Prof. Gupta also has administrative experience as Proctor-in-charge, Additional Proctor, Coordinator, Treasurer, member of several committees in the University. She has been on the selection committee for appointments in several Universities. She is life member of various National Scientific bodies.



DR. AKHILESH KUMAR PANDEY
President
Section of Plant Sciences

Dr. Pandey has completed his M.Sc. (1982), Ph.D. (1985) and D.Sc. (1998) degree in Botany from Rani Durgavati University, Jabalpur. He has started his professional Career as Technical Assistant

in 1984 and selected as Lecture in 1989 and subsequently promoted as Reader in 1998 and Professor in 2007 in the Department of Biological Science, R.D. University, Jabalpur. Since 2009 to till date Dr. Pandey is serving as founder Chairman of Madhya Pradesh Private Universities Regulatory Commission, Bhopal. With his untiring efforts 24 Private Universities have been established and operating the state of Madhya Pradesh. He has completed 21 research projects sponsored by CSIR, DBT, DST, ICFRE, UGC, MPCST, MPBC and DOEn. He has published more than 280 research paper/ articles in Journals/ books of repute and also edited four proceedings. He has supervised more than 58 Ph.D. and 150 M.Phil. / M.Sc. students as supervisor and co-supervisor. His area of specialization are taxonomy and diversity of fungi, mushrooms, enzyme and biological control of weeds and plant pathogens.

He has received Prof. R.N. Trivedi young Scientist Medal in 1999, Dr. Dastur Memorial lecture award in 2009, Sodh Sarthi Samman 2017 and Swarna Jayanti Pravidata Samman in 2006 Certificate of Excellence: Educationist award for prevailing Tribal Literacy. He was a UGC visiting Fellow in the Department of Biotechnology, Amravati University, Amravati from 19-25 October 2001 and also delivered Platinum Jubilee Lecture in Environmental Science section during 96 Indian Science Congress Association meeting held at Shilong. He is a life member and fellow of more than 12 societies. He has been the Councillor of Indian Botanical Society and Environmental Science. He was recorder in Plant Science Section of ISCA during 2010-2012. Since 2002 he was a secretary of Society for Basic & Applied Mycology (SBAM). He has organized many national and international symposiums/ seminars. In addition, he has served the University in different capacities such as coordinator of Indira Gandhi National Open University Study Center.



PROF. NEERJA AGRAWAL
Recorder
Section of Agriculture and
Forestry Sciences

Professor Neerja Agrawal graduated in bio stream in the year 1974 and obtained M.Sc. Zoology degree with specialization in Entomology, successfully holding a position in the merit list in the year 1976, from University of Allahabad. She pursued her Ph. D. in Entomology from C.S. Azad University of Agriculture and Technology, Kanpur, under the guidance of Dr. K.D. Upadhyay, Professor and Dean Agriculture and was conferred the Ph. D. degree in 1982.

She was awarded Commonwealth Fund for Technical Cooperation (CFTC) Fellowship to attend International Course on 'Taxonomy of insects and mites of agricultural importance' at CAB International Institute of Entomology, London (U.K.) in 1986, while working as Senior Research Fellow.

She started her research and teaching career in 1987 as Junior Scientist/ Assistant Prof. with the Department of Entomology at C.S. Azad University of Agri. & Tech., Kanpur. She presented Country Report on "Fruit flies Problem associated with cultivated Crops in India and its Control", in the first International Symposium on Fruit flies in the Tropics held at Kuala Lumpur, Malaysia (1988). Later she presented scientific papers in International Conferences in Malaysia (1990) and Japan (1993). Further, she has presented a number of Research Papers in National and International Conferences.

At present Prof. Agrawal is Head, Deptt. of

Entomology, in C.S. Azad University of Agriculture and Technology, Kanpur. She has been involved in teaching Insect Morphology, Systematics and Ecology to UG and PG students, besides guiding students for their thesis work in M.Sc. (Ag) and Ph.D. students. Till now, she has guided 18 M.Sc. (Ag) and 8 Ph.D. students, while she is presently supervising one Post Doctoral Fellow (UGC). Dr. Agrawal has worked as Co-ordinator, "National Integrated Fruit fly Surveillance Project" and national Project on "Survey and monitoring of nut weevil and pulp weevil in U.P." (2006-2008), sponsored by Ministry of Agriculture, Govt. of India. She is Co- PI in two projects i.e. "Niche area of excellence in IPM" and "Establishment of bio control laboratory", sponsored by Indian Council of Agricultural Research, New Delhi.

Prof. Agrawal has published more than 45 research papers in the Journals of National and International repute, 1 book and 10 book chapters. She has edited many souvenirs, monographs and published popular articles in newspaper and magazines, for the benefit of farmers. She is life member of four scientific societies with member editorial board in Indian Journal of Environmental Research. She was one of the esteemed speaker from academic sector in the 100th Indian Science Congress organized by Women's Science Congress at Calcutta University, Kolkata, 3-7 January, 2013.



DR. SHIVESH PRATAP SINGH
Recorder
Section of Animal, Veterinary and
Fishery Sciences

Dr. Shivesh Pratap Singh is Chairman, Central Board of Studies for Zoology, Higher Education,

Madhya Pradesh, Chairman, Board of Studies, A.P.S. University, Rewa; and Professor and Head, P.G. Department of Zoology, Govt. Autonomous P.G. College, Satna (M.P). Born on 21 March 1963, he obtained M.Sc degree in 1982, M.Phil in 1983, Ph.D in 1991 and D.Sc degree in 2003 from A.P.S. University, Rewa. He started his teaching carrier as Lecturer in Zoology in the year 1983. Prof. Singh has several academic honors and professional distinctions to his credit. Presently he is working as Secretary, BER Chapter, The National Academy of Sciences India; In-charge Central Regional Chapter of Zoological Society of India and General Secretary of Society of Life Sciences.

He has supervised 29 Ph.D and 14 M.Phil students for their research degrees and currently 08 Ph.D scholars are working under his guidance in Mahatma Gandhi Chitrakoot Gramodaya Vishwavidyalaya, Chitrakoot and A.P.S. University, Rewa. Dr. Singh is Chief Editor of three Multidisciplinary Research Journals *National Journal of Life Sciences*, *Life Science Bulletin* and *Vindhya Research Journal*. Dr. Singh also takes active part in various Indian academic societies. He is fellow member of the Academy of Environmental Biology, Zoological Society of India, Society for Science and Environment, Society of Bio-sciences, Indian Academy of Environmental Sciences, Society of Life Sciences, Fellow of Environment & Welfare Society, The Institute of Applied Sciences and Zoological Society of Kolkata.

Dr. Singh has got Appreciation award in 1997 from Society for Science and Environment and awarded Gold medal in 1998, 2000, 2009 and 2012 by the Zoological Society of India. Dr. Singh has also been awarded gold medal by ICCB & MSET and Indian Academy of Environmental Sciences in 2009 and 2012 respectively. In 2015 he was awarded Devki Dutta Gold medal by The Academy of Environmental Biology.

He has completed two U.G.C. research projects on primate's behaviour. He has also organised six National symposium and workshop in the Department of Zoology, Govt. Autonomous P. G.

College Satna (M.P.) sponsored by U.G.C., M.P.C.S.T, Higher Education Department Govt. of M.P, The National Academy of Sciences India and M.P. Biodiversity Board.

Dr. Singh has edited seventeen text books and practical books of Zoology based on M.P. Unified B.Sc Annual and Semester pattern syllabus, published by Ram Prasad and Sons Bhopal, Arun Prakash Agra and Madhya Pradesh Hindi Granth Academy Bhopal. He has also edited three research books entitled "*Eco-development and Environment*"; "*Sustainable Management and Conservation of Biodiversity*" and "*Biodiversity for Human Welfare*" and published more than seven dozen research papers in reputed journals, proceedings and also attended / chaired a number of National and International conferences and symposia.



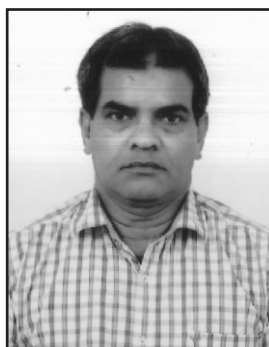
DR. MEENAL DHALL

Recorder

Section of Anthropological and Behavioural Sciences (including Archaeology, Psychology, Education and Military Sciences)

Meenal Dhall is presently Assistant Professor in Department of Anthropology, University of Delhi, Delhi. She did her doctoral degree in 2013 on pattern of physical activity and metabolic syndrome among adults of Delhi. She was University Teacher Assistant during her Phd (2009-2013) in Department of Anthropology, University of Delhi. She did post graduate diploma in public health nutrition from PHFI, Delhi in 2011. She has received various research and academic awards in international and

national conferences. She has attended workshop and training in India as well as in abroad. She has visited Germany, Sweden, Austria and France in connection with academic activities. She has been actively working on public health problems especially obesity and cardio metabolic disease; nutritional status, physical activity and its related health outcome among different populations. She has twenty one international and national publications in this field. She has published four books with International and Indian publishers. Her areas of interest are Physiological Anthropology, Kinanthropometry and Ergonomics, Human growth and development, Public health and Epidemiology, Nutrition, Physical activity. She has completed four research projects and four are in progress. She is the life member of various national and international organizations. She served as committee member and subject expert of various academic and administrative committees of University of Delhi, UGC and various organizations.



DR. R. K. P. SINGH
Recorder
Section of Chemical Sciences

Dr. R. K. P. Singh (05 March 1958), Professor, Department of Chemistry, University of Allahabad obtained his M.Sc. and D. Phil. from University of Allahabad. He was also awarded with 2 Gold and 1 Silver medal for standing first in B.Sc. (Bio Group) and had first position in M.Sc. Inorganic Chemistry.

Dr. Singh worked as JRF, SRF, PDF, Pool Officer and Research Associate in the Department. He joined

University of Allahabad as a Lecturer in 1994 and is actively engaged in teaching and research with more than 30 years of experience, presently he is Dean, Students Welfare, University of Allahabad.

His research work is mainly focused on developing environmentally benign one pot electrochemical synthetic methodologies for synthesis of important organic compounds. Synthesis of heterocycles of natural and synthetic origin as oxadiazole, bis-oxadiazole, triazole, substituted carbonitrile derivative, substituted indoles and electropolymerization of several important monomers were done and their anticorrosive properties has been investigated.

He has completed five major research projects till now. So far fifteen students have obtained their D.Phil. Degree and seven students are enrolled for the same. Two students have also completed their M. Phil. Degree research work under his supervision. He has published more than hundred research papers in the National and International Journal with high impact factor and written two books. He is also reviewer of a number of high impact International Journals.

He has participated in various National and International conferences/seminars and chaired various technical sessions and delivered many invited talks. He has organized about fifteen national seminars.

Dr. Singh is member of different academic bodies and scientific organizations such as Indian Chemical Society, National Academy of Sciences, India and Bioinformatics Institute of India. He is Vice President of Materials Research Society of India, Allahabad Chapter and worked as Convener, Indian Science Congress Association, Allahabad Chapter from 2007 to 2014.

He is recipient of Ramachar Award from Electrochemical Society of India at Indian Institute of Sciences, Bangalore for research paper and Prof. S. Sandhu Award from Indian Chemical Society at NITTTR Bhopal in 2011.



MS. RIMJHIM B. SINGH

Recorder

Section of Earth System Sciences

Rimjhim Bhatnagar Singh is a Remote Sensing applications scientist and GIS expert, working in the field of Earth Sciences at Space Applications Centre (SAC), Indian Space Research Organization (ISRO), Ahmedabad since 2004. She has made significant contributions in broadband and narrowband remote sensing applications in the fields of forestry, agriculture, desertification and oceanic studies. This involves modeling, monitoring and mapping studies using remote sensing data and GIS environment. Her specific modeling works (all at large spatial scale) include development of models for estimating evapotranspiration in forest ecosystem; site suitability analysis for bio fuel (an alternative energy source) plantation on land undergoing desertification; desertification Vulnerability; identification of desertification hotspots and Brightspots and for wind erosion. She has contributed significantly to Desertification Status Mapping and desertification status change monitoring over a decade for India at 1:500K scale and for select districts at 1:50K scale. She has also worked towards assessment of potential evapotranspiration for different forest types of India at different phenological stages; generation of tropical forest classification and mangrove tree classification maps, tropical forest health map; post harvesting crop residue management; and shallow water bathymetry map for parts of Arabian Sea coast, all at large spatial scale. She has developed spectral libraries for various agricultural crops, tropical forest species and mangrove tree species. She has played

significant role in providing specifications/ instrument characterization/ calibration for various airborne, spaceborne and hand-held instruments.

In the year 2014, she has received the prestigious Indian Science Congress Association (ISCA) Young Scientist award in the field of Earth Science and ISCA best paper award in 2013. She has played key role in organizing many symposiums, pre-symposium tutorials and workshops. She has more than 30 scientific papers, reports and chapters in books to her credit in the diverse fields of Earth Science.



MR. SAMIRAN GHOSH

Recorder

Section of Engineering Sciences

Graduated in Civil Engineering from Institution of Engineers (India) in the year 1995 and completed Post Graduation in Geotechnical Engineering from Bengal Engineering and Science University, Shibpur in the year 2004.

Presently he is the Executive Engineer (Civil) of The Kolkata Municipal Corporation and posted at Planning and Development Department.

Under the direct supervision of his Engineering skills a good number of Urban Renewal and Infrastructural Development projects for the city of Kolkata have been completed and continuing successfully from planning to detailed engineering.

To name a few Ranikuthi Overhead reservoir of 1 MG capacity, Naktala Semi Underground Reservoir of 0.30MG capacity, Rehabilitation of Man Entry Brick sewer of Beadon Street and Canning Street by trenchless Technology under JNNURM projects of

KMC for rehabilitation for 100+ years sewers, Shore protection work for Indira Gandhi Water Treatment Plant at Palta, complete renovation of Behala Sarat Sadan and Uttam Mancha auditorium etc. are only a few among the large number successful projects.

He is also experienced in large construction like 30 metre deep Diaphragm wall for kakinada port construction in Andhra Pradesh and Sulphur recovery Unit/ Amine Treatment Unit of Haldia Refinery of Indian Oil Corporation as site Engineer on Behalf of Cementation India Limited (The then Trafalfar House Construction Company limited) and Bridge & Roof Company respectively.

He had the opportunity to visit Austria and Germany at a number of occasions on invitation as an appreciation of engineering skill.

He is also associated with The Institution of Engineers (India), The Institution of Public Health Engineers (India), Geotechnical Study Circle (Kolkata Chapter of Indian Geotechnical Society), Life member of association of Administrative Staff College of India (Bella vista/ Hyderabad) etc.



MR. SAURAV SNEHRAT
Recorder
Section of Environmental Sciences

Saurav is a highly accomplished and driven technocrat with more than eleven years of Indian and foreign experience in the field of engineering, financial services, business analysis and pharmaceutical entrepreneurship. He has worked in various Indian and Multinational firms in the Software, Automotive and pharmaceutical sectors.

He has earned his B. Tech. (with honours), Electrical Engineering from National Institute of Technology, Rourkela (2003). Further he was awarded his MBA, with distinction, from the University of Michigan, USA (2011) with a focus on finance and strategy.

Since 2011, Saurav has founded a pharmaceutical startup based on the herbal preparations based out of the rich flora available in and around Jharkhand. His firm works at researching the efficacy of various herbal formulations and preparing marketable solutions for many common ailments. Also, he is pursuing his doctoral degree in strategic management from Indian Institute of Management, Ranchi.

His fields of interest are Sustainability, corporate social responsibility, technology, innovation, pharmaceuticals and environmental management. He has also worked as a guest faculty in prestigious institutes like Central University of Jharkhand, Ranchi and Xavier Institute of Social Service, Ranchi. He has published various papers in reputed national journals and International conferences on topics like sustainability and Indian energy policy.



PROF. INDRA PRASAD TRIPATHI
Recorder
Section of Materials Science

Prof. Indra Prasad Tripathi, is a Dean, Faculty of Science and Environment, MGCGV, Chitrakoot Satna, MP India, founder member of BER Chapter, NASI, India, and honored by many awards viz. Professor R. D. Desai 80th Birthday Commemoration Award-2007, by Indian Chemical Society, Research Board of Advisors, by The

American Biographical Institute, BIOVED Fellowship Award-2012 by Bived Research Society, Best Science Research Award-2012, by MP Council of Science & Technology, Bhopal and Bharat Shiksha Ratna Award- 2014. He is Chief Editor, Editor and Editorial Board Members of many Research Journals. He is a good academician and administrator.

Prof. Tripathi has made outstanding contribution towards research and re-standardization of traditional formulation of antidiabetic and antiseptic drugs using new techniques and methods (IJOC-2013, Intrnationle Pharmaceutica Scientia-2012, Life Science Bullet.-2012, IJRAP-2013). Simultaneously Dr. Tripathi has made remarkable contributions towards the synthesis, characterization of metal complexes with their antidiabetic properties, antioxidant activity, superoxide dismutase mimicking activity, free radical scavenging activity, catalytic behavior etc.

Prof. Tripathi has also worked on synthesis, characterization of carbon nanotubes. He made carbon nanotubes through metal complexes with natural proteins like spinach, egg albumins using various spectroscopic, diffraction /scattering, electrochemical characterization tools.

Prof. Tripathi has great contribution in the field of environmental monitoring, sanitation, diffuse chemical pollution and green chemistry. His innovative contribution on water, air and diffuse chemical pollution of Bundelkhand and Vindhya Plateau of the country is appreciable.

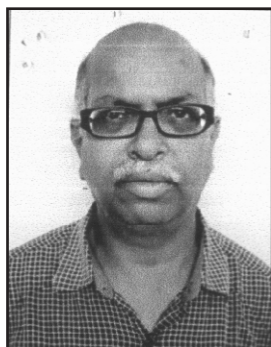
Prof. Tripathi has been invited as speaker and Chair the Session in the UAE- 3rd International conference on Chemistry for Sustainable Development: Indian Prospective and Nepal- 3rd International conference on Applied Sciences, Engineering and Technology. He has also organized many seminar, workshops and activities.



DR. BADAM SINGH KUSHVAH
Recorder
Section of Mathematical Sciences
(including Statistics)

Dr. Badam Singh Kushvah is an Associate Professor of Applied Mathematics at the Indian Institute of Technology (ISM), Dhanbad. He is a Visiting Associate of IUCAA Pune since 2011. He received a B.Sc. from Govt. Science and Commerce College, Benazir in 1998, and an M.Sc. from Govt. Motilal Vigyan Mahavidyalaya in 2000 with Second Position in the Barkatullah University, Bhopal. He qualified NET in December 2002. He earned his PGDCA in 2004 and Ph.D. degree in Mathematics from B.R.A. Bihar University, Muzaffarpur in 2007. He started his career as a Reader of Mathematics at Gwalior Engineering College, Gwalior in 2007. He worked as a Lecturer (Assistant Professor) in National Institute of Technology (NIT), Raipur from July 2008 to May 2009. Subsequently, he joined ISM(now IIT(ISM)) Dhanbad as a Senior Lecturer (Assistant Professor) of Applied Mathematics in May 18, 2009. His research interest includes Celestial Mechanics, Dynamical Astronomy, Orbital Mechanics and High Performance Computing. His 29 research articles have been published in international peer-reviewed journals including Monthly Notices of the Royal Astronomical Society, Acta Astronautica, Advances in Space Research, Astrophysics and Space Science, Astronomy and

Computing, Planetary and Space Science, Earth, Moon and Planets etc. He is a reviewer of many peer-reviewed journals. He received the Best Poster Presentation award of 93rd Indian Science Congress for year 2005-2006 and Canara Bank Research Publication award of IIT(ISM) Dhanbad for 2015 and 2016. He is a member of various academic bodies such as CMS, ISTAM, ASI, ISIAM, ISCA and SAM. He has coordinated the Workshop on Mathematical Methods & Astronomy (WMMA 2013) and the Workshop on High Performance Computing (WHPC 2015), a Short Term Course on Dynamical Systems: Theory and Applications (DSTA 2016). He is an Associate of Committee on Space Research (COSPAR). He completed three research projects successfully, funded by DST under Fast Track Scheme for Young Scientists, IIT(ISM) Dhanbad and ISRO under RESPOND programme respectively. He is a Principal Investigator of SERB(DST) and GPU Education Centre projects supported by and NVIDIA SERB Govt. of India respectively.



DR. AMIT PAL
Recorder
Section of Medical Sciences
(including Physiology)

Dr Amit Pal did his Bachelors and Masters in Physiology from Calcutta University. He did his Ph. D at the National Institute of Cholera and Enteric Diseases working on enteric pathogens and their role in pathogenesis. After completing his Ph. D in 1992 he joined as a Monbusho fellow at Kyoto University, Japan. He also did postdoctoral studies at Indian Institute of Chemical Biology, Kolkata and National

Children's Hospital, Tokyo, Japan. He joined as a Senior Research Officer at the Division of Pathophysiology, NICED, Kolkata in 1999. He was a visiting researcher at Umea University, Sweden in 2008 and a JICA fellow at Osaka Prefecture University, Japan in 2006. At present he is working as Scientist F at NICED. His major interest of work is on bacterial proteases and their role in pathogenesis and tumor regression. He has purified and characterized several proteases secreted by *V. cholerae* and *Escherichia coli*. This work on microbial proteases resulted in a major collaborative programme with Umea University, Sweden and a STINT grant from Sweden was awarded to work on molecular pathogenesis of *V. cholerae*. Dr Pal has been also working on the role of proteases in tumor regression. The major protease secreted by *V. cholerae* is hemagglutinin protease (HAP). HAP has been shown to play a role in tumor regression. HAP has been shown to activate Protease Activated Receptor 1 and induce apoptosis of breast cancer cells. He has published papers in internationally reputed journals like infection and immunity, PLoS ONE and Apoptosis and has written several book chapters related to protease and health.



DR. CHINMAY KUMAR PANDA
Recorder
Section of New Biology (including
Biochemistry, Biophysics & Molecular
Biology and Biotechnology)

Dr. Chinmay Kr. Panda (born August 13, 1959, West Bengal, India) has made significant contribution in understanding the molecular pathogenesis of solid tumors. He received his

bachelor's degree in chemistry from the Scottish Church College, Calcutta University in 1978, followed by master's degree in biochemistry from Calcutta University in 1980. He spent the following years completing his doctoral degree in biochemistry at Chittaranjan National Cancer Institute, Kolkata where he worked to understand the molecular mechanisms of interaction of Anthracycline anti-tumor drugs with chromatin. He received his PhD degree in 1988 from Calcutta University. In 1986, he was appointed as Junior Scientific Officer at Chittaranjan National Cancer Institute. Then in 1988, he received prestigious post-doctoral fellowship from Karolinska Institute, Stockholm, Sweden to work under Prof. George Klein on molecular cancer genetics deciphering the cellular mechanisms of activation of oncogene c-myc in different types of B-cell lymphomas. He also availed ICRET fellowship of UICC to learn advanced molecular techniques related to cancer research.

Now, he is working as the Assistant Director at Chittaranjan National Cancer Institute. His research mainly focused on analysis on carcinomas of head and neck, uterine cervix and breast, due to their high prevalence in Indian subcontinent. Based on copy number variations (CNVs), promoter methylation and mutation profiles followed by expression (RNA/Protein) analysis he has identified several candidate tumor suppressor genes (TSGs) and oncogenes associated with the development of these tumors. These genes were seen to be involved in several cellular pathways like Stem cell renewal, Cell cycle regulation, DNA Repair, Receptor Tyrosine Kinase (RTKs) signaling etc. The validation of these pathways in tumorigenesis has been done in *in vitro* and *in vivo* animal model systems.

Dr. Panda also showed chemopreventive potential of novel natural products (amarogentin, eugenol and some tea polyphenols) in restriction of mouse tongue, liver, skin and lung carcinogenesis. It was evident that the restriction of the carcinogenesis

at the pre-malignant stage by the natural compounds might be due to the modulation of several biological pathways like Stem-cell self-renewal, cell cycle, apoptosis etc. At present, he has focused on global genomic analysis of these carcinomas to further shed light on their pathogenesis.



**DR. KISHOR MAHADU
SONAWANE**
Recorder
Section of Physical Sciences

Born on June 13, 1969 at Dhule, Maharashtra. Completed the secondary education from New City High School, Dhule. Graduation (B.Sc.) from S.S.V.P.S. College Dhule in first class with distinction. Has done PG (M.Sc. Physics) from Fergusson College, Pune, with first class. Pursued Ph.D. from SRTM, Nanded. He visited Tokushima University, Japan and Marien South Korea University, South Korea. He is Ph.D. supervisor at Savitribai Phule Pune University, Pune under which 3 Ph.D. students are registered and published 14 papers in national and international conference and journals. Moreover, he has research collaboration with L&PTD, BARC and Department of Physics SPPU and finished BCUD project of SPPU and now supervising DAE-BRNS 3 years major project in a sensor field. In a service from December 1992 i.e. for about 24 years. Presently working as M.Sc. chairman for theory and practical, member of IAPT (Indian Association of Physics Teachers), and IPA (Indian Physics Association).

**PROF. Y. VIMALA****Recorder****Section of Plant Sciences**

Professor Y Vimala, born in August 1960, is the Professor of Botany since 2002 at the CCS University Meerut, and has been the Head of the Department in the University from 2010-2013, and again continuing from 2015. She is also Dean, Faculty of Science from 2016 and Dean, Students' Welfare from 2013 of CCS University, Meerut. She had a brilliant academic career standing first throughout, receiving merit scholarships and was awarded University Gold Medal by the CCS University, Meerut, for securing first rank in the M.Sc. Botany (1981). She did her M.Phil (1982) and PhD (1985) in Botany from the Institute of Advanced Studies, Meerut University, Meerut under the supervision of Prof D Banerjee, and was awarded M.S.Swaminathan and Sahni-Iyengar award at the early stage of her professional career for the best paper published in the Journal of Indian Botanical Society for the biennium 1983-84, and later the Prof YS Murty Medal (1998). In 1985, she visited Biological Research Center, Szeged, Hungary on a UNESCO fellowship for training in modern techniques of Biology followed by academic visits to Czechoslovakia, Poland and Yugoslavia.

After 10 years stint as Lecturer at Jiwaji University Gwalior, she joined the Department of Botany at CCS University Meerut as Reader in 1998, and was selected as Professor in 2002. In addition to teaching the PG and PhD students, she has mentored 56 students for the award of M.Phil and 28 students for PhD degree, published 57 research papers in peer

reviewed journals in the area of Plant Physiology and Tissue Culture, delivered invited lectures in India and abroad (including ICV-3 in China, at Kecskemet and Szeged in Hungary, Check republic etc.), Executed R & D Projects sponsored by DBT, CSIR, DST, UGC and was twice awarded Centre of Excellence project awards for the Department by the UP Government, served the Indian Botanical Society as the Chief Editor of its journal (since 2007 continuing), organized national / international level symposia / Seminar / Workshops/cultural activities (to name a few- in1996 A National Workshop for Women Scientists on Tissue Culture technology and Environmental Toxicology; in 1997 a series of popular lectures sponsored by DBT, in 2001 UGC sponsored Refresher Course in Stress Physiology; in 2009 Workshop on Bioresource conservation and utilization; in 2009 a symposium on Challenges and opportunities in Reproductive Biology and Evolution; in 2010 a symposium, in 2011 a DBT sponsored National Workshop on Isolation, characterization and upscaling of secondary metabolites using tissue culture technology, in 2015- a National Seminar on Challenges in Plant Sciences- Now and then along with a grand Alumni meet, in 2016- a National Seminar on Challenges of Climate Change and Green Environmental Solutions.

Her major scientific contributions relate to : Physiology of plant senescence identifying a possible biomarker for senescence, upscaling secondary metabolites through optimal manipulation of the set of conditions for metabolite-enriched callus development and subcultures using explants preferably from plants surviving on Plant degraded soils, finding allelopathic relationships between weeds and crops/cropweeds/trees, etc. for promoting sustainability of agroforestry. She is an elected Fellow of the - Indian Botanical Society, Society of Reproduction Biology, Linnean Society of London, and Member, National Academy of Science India. She has been actively associated with the CCS University as Dean, Students' Welfare, Hostel Warden, Admission Coordinator for centralized online admissions in 600- 900 colleges,

Coordinator for UGC related plan/non-plan activities of the University, etc. She was elected as a Member of the Plant Sciences sectional committee

(2012), delivered invited lectures at ISCA sessions at 2004 (Chandigarh) and 2011 (Bhubaneswar).

KNOW THY INSTITUTIONS**INTERNATIONAL ADVANCED RESEARCH CENTRE FOR POWDER METALLURGY AND NEW MATERIALS, HYDERABAD**

ARCI is a state-of-the-art facility for research & development in advanced materials and associated processing technologies. Having its origin in the Integrated Long Term Programme on Cooperation in Science & Technology (ILTP) signed by the erstwhile USSR and India in the late 1980s, ARCI became operational in April 1995. Today, ARCI functions as a grants-in-aid institution of the Government of India's Department of Science & Technology.

Translating Research to Technology has been ARCI's motto and the Centre has set for itself the task of striving to bridge the gap between conventional research institutes & laboratories and the high-technology industries. Consistent with this overall goal, ARCI has dedicated its efforts toward achieving the following objectives:

- | Development of high performance materials and processes for niche market.
- | Demonstration of technologies at prototype scale.
- | Transfer of technologies to the Indian industry.

In order to achieve the above, ARCI has been taking up technologies while they are in their embryonic stages from laboratories/institutions of CIS countries or Indian laboratories, and jointly developing them to the levels of pilot plants/demonstration centers. The pilot plants/demonstration centers are then primarily utilized to sensitize the Indian industry to the advantages and cost-effectiveness of the technology under Indian conditions and thereby aid in the smooth transfer of such technologies to the industries. Such conscious efforts to direct research to fuel growth and evolution has resulted in development of technologies, which are ready for adoption by the Indian industries. The Center's efforts to effect technology transfers have been fortified by the attractive schemes set up by the Indian Government under which the Indian industry can obtain very soft loans for implementing technologies developed by the Indian laboratories and R&D institutions. This has enormously increased the 'salability' of technologies developed by institutions like ARCI.

Surface Engineering, Ceramics , Powder

Metallurgy and Laser Processing of materials constitute the four major thrust areas at ARCI. The Powder Metallurgy programmes are largely aimed at developing value-added products and exotic materials for the Indian industry. There is also significant focus on transformation of the otherwise mine burden to useful P/M products, energy conservation and development of permeable materials for varied applications. The activities in the field of Ceramics have been initiated to create new and advanced materials for high-tech applications. The programmes are primarily oriented towards developing alternative materials for better performance, substituting the import market for high temperature materials and recycling of scrap to produce engineering ceramic powders. In Surface Engineering, ARCI has been judiciously building up facilities to complement and enhance existing national capabilities in the field. The Centre has been continuously striving to provide most cost-effective solutions to combat surface degradation problems in the industry. This is being achieved through indigenization of coating equipment as well as by offering some of the institute's unique coating facilities for jobbing activities to permit the industry access to technologies not available elsewhere in the country.

ARCI Advanced Technology Incubator (AAMTI) is being established adjacent to ARCI R&D Campus. Three companies, all technology received from ARCI, have already set up their production facilities in the incubator.

Objectives of establishing AAMTI are:

- | To minimise the risks involved in commercialisation of ARCI technologies.
- | To promote and support small scale entrepreneurs in their effort to innovate and commercially exploit ARCI technologies.
- | To deliver the benefits of ARCI networking to members.

CONTACT

The Director

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CONFERENCES / MEETINGS / SYMPOSIA / SEMINARS

International Conference on Role of Basic Sciences in Translational Research in Ayurvedic Medicine (ICRBSTRAM), 28-29 October, 2017, Varanasi

Topics:

- | Moving Basic Research for Bench to Clinic
- | Development of New Drugs Based on Recent Basic Research Work
- | Need of Translational Research in Ayurveda
- | Biochemistry and Molecular Biology in Ayurvedic Research
- | Pharmaceutical science & Pharmacology in Ayurvedic drug science
- | Leads for drug development from Ayurvedic medicine
- | Agro-technology in Ayurveda
- | Precedence regarding scope & outcome of interdisciplinary research
- | Understanding pathology & Pathogenesis : Ayurvedic wisdom
- | Biotechnology and Ayurveda
- | Latest development in research and treatment and translating them into clinically useful knowledge
- | Traditional Perspectives in Nutrition and Dietetics
- | Ayurveda and Modern Biology
- | Pharmacological research in Ayurveda
- | Scope of biomedical engineering in Ayurveda
- | Clinical trials and pharmaco-vigilance in Ayurveda
- | Behavioral sciences/psychology in Ayurveda
- | Public perception and use of Ayurvedic Medicine
- | Researches on yogic science in Ayurveda
- | Herbal Drug Research : Challenges and Opportunities

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9th International Conference on Hydro-Gramin Technology (Sustainable Agriculture, Rural Development and Livelihood Improvement) October, 28-29, 2017, Paralakhemundi-Odisha.

Topics:

- | | |
|---|---|
| Sustainable Agriculture | Climate change and Environmental effects |
| Rural Development and Social Sciences | Entrepreneurs development and Organic Farming |
| Livelihood Improvement and Economic development | |

Contact :

Prof. A. Zaman, Organizing Secretary, Email: seciibb.india@gmail.com, aftar@cutm.ac.in, 09433208363, Dr. Sagar Maitra, Programme Coordinator (CUTM), Associate Professor, MSSSoA, CUTM, Paralakhemundi-761 211, Odisha, Email: sagar.maitra@cutm.ac.in, 08910889401, Dr. Rupsha Roy, Programme Coordinator (IIBB), Dean, International Institute of Business Management, Kolkata, IIBB (India Chapter), Email: rupsharoy@gmail.com, 08240198786

FIPSPHYSIICON 2017, International Conference, 5-7 November, 2017, Delhi.

Theme: Integrating Physiological and Biomedical Science Approaches to Improve Performance, Health and Safety.

Topics:

- | | |
|---|---|
| High Altitude & Desert Physiology | Nutrition and Performance |
| Neurophysiology | Exercise and Sports physiology |
| Cardiovascular and respiratory Physiology | Genomics and Proteomics in Physiology |
| Yoga and Health | Under water and Space physiology |
| Performance Enhancement | Biomedical Instrumentations and performance |
| Ergonomics and Occupational Health | |

Contact :

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S & T ACROSS THE WORLD

NEUTRINOS AS DRIVERS OF SUPERNOVAE

Stars exploding as supernovae are the main sources of heavy chemical elements in the Universe. In these star explosions, radioactive atomic nuclei are synthesized in the hot, innermost regions during the explosion and can thus provide insights into the unobservable physical processes that initiate the blast. Using elaborate computer simulations, a team of researchers from the Max Planck Institute for Astrophysics (MPA) and the research institute RIKEN in Japan were able to explain the recently measured spatial distributions of radioactive titanium and nickel in Cassiopeia A, a roughly 340 year old gaseous remnant of a nearby supernova. The computer models yield strong support for the theoretical idea that such stellar death events can be initiated and powered by neutrinos escaping from the neutron star left behind at the origin of the explosion.

Massive stars end their lives in gigantic explosions, so-called supernovae. Within millions of years of stable evolution, these stars have built up a central core composed of mostly iron. When the core reaches about 1.5 times the mass of the Sun, it collapses under the influence of its own gravity and forms a neutron star. Enormous amounts of energy are released in this catastrophic event, mostly by the emission of neutrinos. These nearly massless elementary particles are abundantly produced in the interior of the new-born neutron star, where the density is higher than in atomic nuclei and the temperature can reach 500 billion degrees Kelvin.

The physical processes that trigger and drive the explosion have been an unsolved puzzle for more than 50 years. One of the theoretical mechanisms proposed invokes the neutrinos, because they carry away more than hundred times the energy needed for a typical supernova. Leaking out from the hot interior of the neutron star, a small fraction of the neutrinos are absorbed in the surrounding gas. This heating

causes violent motions of the gas, similar to those in a pot of boiling water on a stove. When the bubbling of the gas becomes sufficiently powerful, the supernova explosion sets in as if the lid of the pot were blown off. The outer layers of the dying star are expelled into circumstellar space, and with them all the chemical elements that the star has assembled by nuclear burning during its life. But also new elements are created in the hot ejecta of the explosion, among them radioactive species such as ^{44}Ti (titanium with 22 protons and 22 neutrons in its atomic nuclei) and ^{56}Ni (28/28 neutrons/protons), which decay to stable calcium and iron, respectively. The thus released radioactive energy makes a supernova shine bright for years.

Because of the wild boiling of the neutrino-heated gas, the blast wave starts out non-spherically and imprints a large-scale asymmetry on the ejected stellar matter and the supernova as a whole in agreement with the observation of clumpiness and asymmetries in many supernovae and their gaseous remnants. The initial asymmetry of the explosion has two immediate consequences. On the one hand, the neutron star receives a recoil momentum opposite to the direction of the stronger explosion, where the supernova gas is expelled with more violence. This effect is similar to the kick a rowing boat receives when a passenger jumps off. On the other hand, the production of heavy elements from silicon to iron, in particular also of ^{44}Ti and ^{56}Ni , is more efficient in directions where the explosion is stronger and where more matter is heated to high temperatures. "We have predicted both effects some years ago by our three-dimensional (3D) simulations of neutrino-driven supernova explosions", says Annap Wongwathanarat, researcher at RIKEN and lead author of the corresponding publication of 2013, at which time he worked at MPA in collaboration with his co-authors H.-Thomas Janka and Ewald Müller. "The asymmetry of the radioactive ejecta is more pronounced the larger the neutron star kick is", he adds. Since the radioactive atomic nuclei are synthesized in the innermost regions of the supernova, in the very close vicinity of the neutron

star, their spatial distribution reflects explosion asymmetries most directly.

New observations of Cassiopeia A (Cas A), the gaseous remnant of a supernova whose light reached the Earth around the year 1680, could meanwhile confirm this theoretical prediction. Because of its young age and relative proximity at a distance of just 11,000 light years, Cas A offers two great advantages for the measurements. First, the radioactive decay of ^{44}Ti is still an efficient energy source, and the presence of this atomic nucleus can therefore be mapped in 3D with high precision in the whole remnant by detecting the high-energy X-ray radiation from the radioactive decays. Second, also the velocity of the neutron star is known with its magnitude and its direction on the plane of the sky.

Since the neutron star propagates with an estimated speed of at least 350 kilometres per second, the asymmetry in the spatial distribution of the radioactive elements is expected to be very pronounced. Exactly this is seen in the observations. While the compact remnant speeds toward the lower hemisphere, the biggest and brightest clumps with most of the ^{44}Ti are found in the upper half of the gas remnant. The computer simulation, viewed from a suitably chosen direction, exhibits a striking similarity to the observational image. But not only the spatial distributions of titanium and iron resemble those in CasA 3D imaging of Cas A available at the weblink <http://3d.si.edu/explorer?modelid=45>). Also the total amounts of these elements, their expansion velocities, and the velocity of the neutron star are in amazing agreement with those of Cas A. "This ability to reproduce basic properties of the observations impressively confirms that Cas A may be the remnant of a neutrino-driven supernova with its violent gas motions around the nascent neutron star", concludes H.-Thomas Janka.

But more work is needed to finally prove that the explosions of massive stars are powered by energy input from neutrinos. "Cas A is an object of so much interest and importance that we must also understand the spatial distributions of other chemical species such as silicon, argon, neon, and oxygen", remarks

Ewald Müller, pointing to the beautiful multi-component morphology of Cas A revealed by 3D imaging (see <http://3d.si.edu/explorer?modelid=45>). One example is also not enough for making a fully convincing case. Therefore the team has joined a bigger collaboration to test the theoretical predictions for neutrino-driven explosions by a close analysis of a larger sample of young supernova remnants. Step by step the researchers thus hope to collect evidence that is able to settle the long-standing problem of the supernova mechanism.

(Source: Max Planck Society (MPG) - Press Releases, 27 Jun 2017)

MICROBES IN THE DESERT – A NEW ARCHIVE FOR CLIMATE SCIENCE

Under extreme climatic conditions only few "witnesses" of past environmental conditions endure. Pollen, for example, serving as indicators for the composition of the vegetation of ancient times, are only conserved under very specific conditions. Under an extremely dry climate such as prevailing in the Kalahari in South Africa, climate archives comprising pollen or other climate "witnesses" are especially scarce. Scientists from the GFZ sections Geomicrobiology and Organic Geochemistry, together with a colleague from the Carl von Ossietzky University in Oldenburg, Germany, were searching for previously not exploited climate archives.

The Kalahari in southwestern Africa is a xeric shrubland, also referred to as desert due to the predominance of sand. Climate science was so far investigating the climatic past of this region mainly based on calcareous deposits like tufa (cemented volcanic rock) or stromatholites (deposits from metabolic residues of bacteria), and speleothems. However, these climate archives are scarce and the reconstruction of Kalaharian climates of the past is therefore only fragmented.

Pan depressions are an abundant landscape feature in South Africa. During dry phases these troughs are formed by wind erosion, during wet

periods sediment is accumulated by surface water run-off, further sediment accumulates by wind transport. In a new study now published in the scientific journal *Organic Geochemistry*, the scientists investigated the microbial abundance and activity in a pan depression. Steffi Genderjahn, first author of the study and joint PhD student in the GFZ sections *Geomicrobiology* and *Organic Geochemistry*: "Water is a basic requirement for microbial life. Thus, if we find microbial signals, we can conclude that water must have been present during their time of deposition. Therefore, our hypothesis was that we are able to reconstruct ancient climatic conditions based on the abundance and composition of microbial signals in pan sediments."

Since microbes of the past are dead for a long time, the scientists investigated their molecular remnants so-called biomarkers. These are molecular remains of lipids in this case originating from microbial cell membranes. The characteristic structure of the biomarkers still allows to trace back to the microorganisms that once produced them. In Witpan, a pan depression in the southern Kalahari, the team took sediment material from the upper 1.20 meters. Together with investigations of changes in its sediment properties, like the amount of organic carbon, the biomarkers found in the sediment were used as a key to the past.

The scientists found biomarkers of microorganisms that point to saline and nutrient-poor conditions indicating a well-adapted microbial community. Furthermore, strong variations in the abundance and composition of the microbial communities in time – the further down the sediment core, the further back in time – displayed the climate picture of the past.

The core sediments cover a time span of 20,000 years, from the Last Glacial Maximum (LGM) up to today. The climate "witnesses" from the pan sediments indicate that the Kalahari was comparatively wet during the LGM. During the subsequent warm period only very few traces of life are found and those detected point to dry and nutrient-poor conditions as well as only a sparse

vegetation cover. In the pan surface layers there are, however, significant traces of life. Hence, in the recent past water must have been at least temporarily available, probably due to seasonal rainfall. The scientists did apply their method on another pan, located further to the northwest, where they complemented their methods with DNA-based analyses. The results from that site are close to be published and seem to confirm the current study. Hence, it has been proven that in fact pan depressions can serve as climate archives in regions that are otherwise poor in climate information. Thus, the study opened new archives for climate science in dry regions such as the Kalahari.

(Source: Helmholtz-Centre Potsdam, German Research Centre for Geosciences – GFZ, 28 Jun 2017)

NANODIAMONDS AS ENERGY MATERIALS: TUNING THE FUNCTIONALITIES

An international team has shed light onto interactions between nanodiamonds and water molecules. Experiments at synchrotron sources showed how hydrogenated groups on nanodiamond surfaces change the network of hydrogen bonds in the aqueous environment and may potentially influence the catalytic properties of nanodiamonds, for instance for the production of solar fuels from CO₂ and light.

You think, diamonds are shiny, transparent and will sink in water? Well, it depends. Diamonds change a lot when they become really tiny: nanodiamonds with diameters of some 10⁻⁹ m tend to form a black and oily shimmering dispersion in water, a colloid. Such nanodiamonds in water have a wide variety of applications in medicine, chemistry and as metal-free catalysts for solar fuel production from CO₂.

The nanoparticle-water interface plays a central role in many applications: it affects the colloidal stability, the optical properties and the chemical and catalytic reactivity of the nanoparticles. What happens exactly at the interface between nanodiamonds and water molecules was up to now largely unknown.

Now, an international cooperation of Russian, Japanese, American, French and German science institutes has shed light onto the interactions of nanodiamonds and water molecules. With a combination of spectroscopic methods at synchrotron lightsources BESSY II in Berlin and UVSOR III in Japan, they analysed the interactions between water molecules and nanodiamonds. To this goal they modified the nanodiamond's surface with different molecular groups, attaching hydrogen (-H), carboxyl groups (-COOH), hydroxyl groups (-OH), and other polyfunctional surface terminations.

Surface terminations had a strong influence on the hydrogen bond networks, they observed. Whereas only slight modifications were observed for oxidized surfaces, hydrogenated nanodiamonds dramatically modified the water hydrogen bond network. "Hydrogenated groups induce a long-range disordering of water molecules around nanodiamonds and hydrogen-bonds between these water molecules are weaker than those found in bulk water", HZB-scientist Dr. Tristan Petit explains. The scientists propose that the water rearrangement is due to the accumulation of electrons at the diamond-water interface, which could be of particular interest for (photo)catalytic applications, i.e. for the production of solar fuels, from carbon dioxide and light.

"Hydrogenated diamond surfaces have the ability to efficiently generate solvated electrons in water for CO₂ reduction under UV light exposure. The unique water structure associated with hydrogenated surface groups would certainly play an underestimated role in this exciting process", Petit expects.

(Source: Helmholtz-Zentrum Berlin für Materialien und Energie, 27 Apr 2017)

AMOTENE—ALLURING AND LETHAL FOR MANDUCA SEXTA

The volatile compound bergamotene increases the moths' pollination success and protects tobacco leaves against their voracious offspring.

The tobacco hawkmoth *Manduca sexta* is an important pollinator of the wild tobacco species *Nicotiana attenuata*; yet hungry larvae hatch from the eggs these moths lay on the leaves. An interdisciplinary team of scientists at the Max Planck Institute for Chemical Ecology in Jena, Germany, has described a gene in *Nicotiana attenuata* which enables the plant to solve the dilemma that arises when a pollinator is also a dangerous herbivore. The gene NaTPS38 regulates the production of the volatile compound (E)- α -bergamotene. At night, the tobacco flowers produce this odor which is attractive to adult tobacco hawkmoths, while during the day, the tobacco leaves emit the compound to lure predatory bugs to feed on *Manduca sexta* larvae and eggs.

Flowering plants depend on pollen vectors in order to reproduce. Yet a plant has a problem if a pollinator, which is attracted by the odors of sweet flowers, lays its eggs on the plant after pollination is complete, and from these eggs hatch voracious caterpillars ready to attack the tasty leaves with their enormous appetite.

Scientists from the Max Planck Institute for Chemical Ecology have discovered a gene in the wild tobacco species *Nicotiana attenuata* called NaTPS38, which regulates the production of an aromatic compound, the sesquiterpene (E)- α -bergamotene, in both flowers and leaves. "We observed that *Nicotiana attenuata* plants emit (E)- α -bergamotene in flowers at night to lure *Manduca sexta* moths as pollinators. The compound makes a moth keep its proboscis longer in a flower and pollination success is increased. The emission of the same compound in leaves attacked by *Manduca sexta* larvae during the day, however, attracts the predators of the larvae and acts as an indirect defense," first author Wenwu Zhou summarizes. In this way, the tissue-specific emission of one compound helps the wild tobacco plants to interact most advantageously with *Manduca sexta*.

Although the gene NaTPS38 is very similar to a monoterpene synthase, it is nevertheless responsible for the production of the sesquiterpene (E)- α -

bergamotene. Usually a gene from the sesquiterpene synthase family regulates the production of such a compound, but in this case, it appears that the gene NaTPS38 violated this general rule. Analyzing the function and evolutionary history of NaTPS38 revealed that this gene originated from a duplication of a monoterpene synthase which then evolved the ability to produce (E)- α -bergamotene, a sesquiterpene compound. This unique evolutionary process likely occurred before the divergence of different Solanaceae species, the plant family which includes tobacco.

The fact that a single gene in *Nicotiana attenuata* mediates both pollination and defense by producing tissue-specific (E)- α -bergamotene is an example of a

phenomenon called ecological pleiotropy. “Accumulating evidence suggests that ecological pleiotropy may be quite common in plants. Our work demonstrates that interactions between different ecological factors, such as pollinators and herbivores, are important for plant evolution. However, we know little about the extent to which these interactions can affect the plant's adaptation to its environment,” explains Shuqing Xu. The scientists are currently developing a new research program that aims to address this question systematically.

(Source: Max Planck Society (MPG) - Press Releases, 25 Apr 2017)



भारतीय विज्ञान कांग्रेस संस्था

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4. **आजीवन सदस्य** : एक सदस्य अपने भविष्य की सारी वार्षिक सदस्यता शुल्क एक बार में ₹ 2,000/- (विदेशियों के लिए U.S.\$ 500) मात्र अदा करके पा सकता है। एक व्यक्ति जो 10 साल या उससे अधिक नियमित रूप से सदस्यता प्राप्त कर चुका है, उसे उसकी संयुक्त सदस्यता शुल्क के ऊपर प्रतिवर्ष ₹ 50/- की छूट दी जाएगी, बशर्ते कि उसकी संयुक्त शुल्क ₹ 1,200/- से नीचे न हों (विदेशियों के लिए U.S.\$ 12.50 और U.S.\$ 300 क्रमशः)। एक आजीवन सदस्य को उसके पूरे जीवन काल में सदस्यता की सारे विशेषाधिकार प्राप्त होंगे।
4. **Life Member** : A Member may compound all future annual subscriptions by paying a single sum of ₹ 2,000/- (for foreign** U.S.\$ 500) only. Any person who has been continuously a member for 10 years or more, shall be allowed a reduction in the compounding fee of ₹ 50/- for every year of such membership, provided that the compounding fee shall not be less than ₹ 1,200/- (for foreign** U.S.\$ 12.50 and U.S.\$ 300 respectively). A life Member shall have all the privileges of a member during his/her lifetime.
5. **संस्थान सदस्य** : एक संस्थान जो ₹ 5,000/- सदस्यता शुल्क के रूप में दे वही संस्था के संस्थान सदस्य उस वित्तीय वर्ष के लिए बन सकता है, (विदेशियों के लिए U.S.\$ 2,500)। इसमें वह विज्ञान कांग्रेस के वार्षिक सत्र में अपने एक व्यक्ति का नाम नामांकित कर सकता है, जो उनका प्रतिनिधि हों। एक संस्थान सदस्य को वार्षिक विज्ञान कांग्रेस

सत्र की कार्यविवरण की एक पूर्ण प्रति बिना मूल्य में प्राप्त हो सकती है। इसके साथ वे संस्था के रोज़नामचा "एवरीमैन्स साइंस" की प्रति भी बिना मूल्य प्राप्त कर सकते हैं।

5. **Institutional Member** : An Institution paying a subscription of ₹ 5,000/- (for foreign** U.S.\$ 2,500) only, can become an Institutional Member of the Association for that financial year. It shall be eligible to nominate one person as its representative to attend Annual Session of the Science Congress. An Institutional Member shall be eligible to receive, free of cost, a copy of the complete set of Proceedings of the Annual Science Congress Session as also a copy each of the Associations journal Everymans Science.
6. दाता : कोई भी व्यक्ति जो एक साथ ₹ 10,000/- (विदेशियों के लिए U.S. \$ 5,000) मात्र दें, वह संस्था के दाता बन सकते हैं। एक व्यक्तिगत दाता को वह सारे अधिकार और विशेषाधिकार मिलेंगे जो एक सदस्य को उसके पूर्ण जीवन काल में प्राप्त होते हैं।

एक संस्थान जो एक साथ ₹ 50,000/- (विदेशियों के लिए U.S. \$ 25,000) मात्र दें, सदा के लिए इस संस्था के संस्थान दाता बन सकते हैं, जिसे वह एक व्यक्ति को नामांकित करके उसे अपने संस्थान के प्रतिनिधि के रूप में विज्ञान कांग्रेस के वार्षिक सत्र में भेज सकते हैं। एक संस्थान/व्यक्तिगत दाता वार्षिक विज्ञान कांग्रेस के कार्यविवरण और संस्था के रोज़नामचा "एवरीमैन्स साइंस" की प्रति भी बिना मूल्य प्राप्त कर सकते हैं।

6. **Donor** : Any person paying a lump sum of ₹ 10,000/- (for foreign ** U.S.\$ 5,000) only, can become an Individual Donor of the Association. An **INDIVIDUAL DONOR** shall have all the rights and privileges of a member during his/her lifetime.

An Institution paying a lump of ₹ 50,000/- (for foreign ** U.S.\$ 25,000) only, can become an **INSTITUTIONAL DONOR** of the Association forever, which shall have the right to nominate one person as its representative to attend Annual Session of the Science Congress. An Institutional/ Individual Donor shall be eligible to receive, free of cost, a copy of the complete set of Proceedings of the Annual Science Congress Session as also the Associations journal Everymans Science.

* भर्ती शुल्क ₹ 50/- सिर्फ एक नये वार्षिक सदस्य के लिए ज़रूरी है। यह सत्र सदस्य/आजीवन सदस्य/ संस्थान सदस्य/छात्र सदस्य/दाता के लिए ज़रूरी नहीं है।

* Admission fee of ₹ 50/- is needed only for becoming a new Annual Member and not for Sessional Member/Life Member/Institutional Member/Student Member/Donor.

** (एक विदेशी सदस्य का अर्थ है, जो भारतवर्ष के बाहर का नागरिक हों।)

** (A Foreign Member means one who is normally Resident outside India).

(अ) **पेपर पेश करना** : एक पूर्ण पेपर की प्रति उसके साथ तीन सारांश की प्रति जो 100 शब्दों से ज्यादा न हों और जिसमें कोई आरेख या फार्मूला न हों, वह प्रत्येक वर्ष 15 सितम्बर के अंदर अनुभागीय अध्यक्ष तक पहुँच जाना चाहिए।

(A) **Presentation of Papers** : A copy of complete paper accompanied by an abstract in triplicate not exceeding one hundred words and not containing any diagram or formula, must reach the Sectional President latest by September 15, each year.

(ब) सभी वर्गों के सदस्य जो विज्ञान कांग्रेस सत्र में भाग लेने के पश्चात लौटते समय के टिकट में रियायत प्राप्त कर सकता है, बशर्ते कि उनकी यात्रा के खर्च का थोड़ा भी भाग सरकार (केन्द्रीय या राज्य),

कोई कानूनी सत्ता या कोई विश्वविद्यालय या कोई नगरपालिका न उठाएँ और उनकी कुल कमाई या परिलब्धियां ₹ 5,000/- (प्रति माह पाँच हजार रुपए) से अधिक नहीं हैं। कृपया ISCA वेबसाइट से रेलवे रियायत फार्म डाउनलोड करें।

- (B) Members of all categories are entitled to **Railway Concession** of return ticket by the same route with such conditions as may be laid down by the Railway Board for travel to attend the Science Congress Session provided that their travelling expenses are not borne, even partly, by the Government (Central or State), Statutory Authority or an University or a City Corporation and their total earning of or emoluments drawn do not exceed ₹ 5,000/- (Rupees Five Thousand per month). Please download the Railway Concession form from ISCA Website.
- (स) संस्था के पुस्तकालय में सभी वर्गों के सदस्य को पढ़ने की सुविधा सुबह 10.00 बजे से शाम को 5.30 बजे तक सभी काम के दिनों में (शनिवार और रविवार) को छोड़कर प्राप्त होगी।
- (C) Members of all categories are entitled to reading facilities between 10.00 a.m. to 5.30 p.m. on all weekdays (except Saturdays & Sundays) in the library of the Association.
- (ड) समय समय पर संस्था द्वारा तय की गई मूल्य दरों पर विश्रामगृह, सभागार आदि सुविधाओं की प्राप्ति भी सभी वर्गों के सदस्य कर सकते हैं।
- (D) Members of all categories may avail Guest House facilities, Lecture Hall hiring at the rates fixed by the Association from time to time.
- (ई) भविष्य में भारतीय विज्ञान कांग्रेस संस्था द्वारा आयोजित परिसंवाद, सम्मेलन और वार्षिक कांग्रेस में सभी वर्गों के सदस्यों द्वारा भाग लेने के लिए अपनी-अपनी सदस्यता पत्र को लाना ज़रूरी होगा।
- (E) Members of all categories should bring the Membership Card always for attending any Seminar, Conference and Annual Congress organized by ISCA in future.

ध्यान दें : (1) सभी बैंक ड्राफ्ट The Indian Science Congress Association के नाम से ही लिखा जाएँ, और जो कोलकाता के किसी भी शाखा में देय हों। सदस्यों से यह निवेदन किया जा रहा है, कि वे अपनी सदस्यता संख्या का उल्लेख भारतीय विज्ञान कांग्रेस संस्था के कार्यालय के साथ पत्राचार के वक्त अवश्य करें।

(2) भारतीय विज्ञान कांग्रेस संस्था द्वारा मनीऑर्डर, आई. पी. ओ., ई. सी. एस. या चेक से भुगतान ग्रहण नहीं किया जाएगा। कोई भी सदस्यता निर्धारित सदस्यता फार्म (आवेदन-पत्र नई सदस्यता/सदस्यता की नवीकरण के लिए) में विधिवत बिना भरने से नहीं लिया जाएगा।

(3) नकदी केवल ISCA मुख्यालय में हाथ से लिया जाएगा। कृपया डाक द्वारा लिफाफे के भीतर नकदी नहीं भेजें।

Note : (1) All Bank Drafts should be drawn in favour of *The Indian Science Congress Association* Payable at any branch in Kolkata. Members are requested to mention their Membership No. while making any correspondence to ISCA office.

(2) No money order, I.P.O., ECS or cheque will be accepted by ISCA. No Membership will be taken without duly filled in prescribed Membership Form (Application Form for New Membership/ Application for Renewal of Membership).

(3) Cash will only be taken by hand at ISCA Hqrs. Pl. do not send the Cash by Post within the envelope.



भारतीय विज्ञान कांग्रेस संस्था

14, डॉ० बिरेश गुहा स्ट्रीट, कोलकाता - 700 017, भारत

THE INDIAN SCIENCE CONGRESS ASSOCIATION

14, Dr. Biresh Guha Street, Kolkata-700 017, INDIA

दूरभाष/Telephone : (033) 2287-4530, 2281-5323

फैक्स/Fax : 91-33-2287-2551

वेबसाइट/Website : <http://sciencecongress.nic.in>

ई-मेल/E-mail : iscacal@vsnl.net

es.sciencecongress@nic.in

सदस्यता के लिए नया आवेदन पत्र / Application Form For New Membership

सेवा में/To

महासचिव (सदस्यता कार्य)/ The General Secretary (Membership Affairs)

भारतीय विज्ञान कांग्रेस संस्था/The Indian Science Congress Association

14, डॉ० बिरेश गुहा स्ट्रीट/14, Dr. Biresh Guha Street,

कोलकाता - 700 017/Kolkata - 700 017

महोदय/Dear Sir,

मैं भारतीय विज्ञान कांग्रेस संस्था का आजीवन सदस्य/वार्षिक सदस्य/सत्र सदस्य/छात्र सदस्य/संस्थान सदस्य/व्यक्तिगत दाता/संस्थागत दाता अपना नाम लिखवाना चाहता/चाहती हूँ।

I like to be enrolled as a Life Member/Annual Member/Sessional Member/Student Member/Institutional Member/Individual Donor/Institutional Donor of The Indian Science Congress Association. (Pl. Tick)

मैं इसके साथ ----- सदस्यता शुल्क के रूप में नक़द ₹ -----/बैंक ड्राफ्ट संख्या ----- दिनांकित ----- प्रचालक बैंक ----- 01 अप्रैल 20--- से 31 मार्च 20--- तक भेज रहा/रही हूँ।

I am sending herewith an amount of ₹ in payment of my subscription by Cash/Bank Draft No. dated issuing bank from the year 1st April 20 to 31st March 20.

मैं निम्नलिखित विभाग में रुचि रखता/रखती हूँ (कृपया किसी एक में निशान लगाएँ)/ I am interested in the following section (Please tick any one).

विभाग/Sections

1. कृषि और वानिकी विज्ञान/Agriculture and Forestry Sciences
2. पशु, पशुचिकित्सा और मत्स्य विज्ञान/Animal, Veterinary and Fishery Sciences
3. मानवशास्त्रीय और व्यवहारपरक विज्ञान (जिसमें सम्मिलित हैं, पुरातत्व-विज्ञान, मनोविज्ञान, शैक्षिक विज्ञान और सेना विज्ञान)/Anthropological and Behavioural Sciences (including Archaeology, Psychology, Education and Military Sciences)
4. रसायन विज्ञान/Chemical Sciences

5. भू-पद्धति विज्ञान/Earth System Sciences
6. अभियन्ता विज्ञान/Engineering Sciences
7. पर्यावरण विज्ञान/Environmental Sciences
8. सूचना और संचारण विज्ञान और प्रौद्योगिकी (जिसमें कंप्यूटर विज्ञान भी सम्मिलित है)/Information and Communication Science & Technology (including Computer Sciences)
9. भौतिक विज्ञान/Materials Science
10. गणित विज्ञान (जिसमें सांख्यिकीय सम्मिलित है)/Mathematical Sciences (including Statistics)
11. चिकित्सा शास्त्र (जिसमें शरीर विज्ञान भी सम्मिलित है)/Medical Sciences (including Physiology)
12. नया जीवविज्ञान (जिसमें जीव रसायन, जीव भौतिकी और आणविक जीवविज्ञान और जीव-प्रौद्योगिकी भी सम्मिलित है)/New Biology (including Bio-Chemistry, Biophysics & Molecular Biology and Biotechnology)
13. भौतिकीय विज्ञान/Physical Sciences
14. वनस्पति विज्ञान/Plant Sciences

(कृपया टंकित करें या ब्लॉक अक्षरों में भरें)/Please type or fill up in Block Letters)

नाम/Name (ब्लॉक अक्षरों में/in Block Letters) :

श्री/सुश्री/श्री/श्रीमती/डॉ॰/प्रो॰/Mr./Ms./Shri/Shrimati/Dr./Prof (कृपया टिक करें)/(Please tick)

कुलनाम/Surname

प्रथम नाम/First Name

मध्य नाम/Middle Name

शैक्षणिक योग्यता/Academic Qualifications :

(अंतिम शैक्षणिक योग्यता प्रमाण-पत्र अंक-सूची का स्वतः सत्यापित जिराक्स प्रति संलग्न करना है / Self attested xerox copy of last educational certificate/marksheet must be attached)

पदनाम/Designation

सम्पर्क का पता/Address of communication :

(राज्य, शहर/नगर और पिन कोड सहित/including state, city/town and pin code)

दूरभाष संख्या/मोबाईल संख्या और ई-मेल/Phone No./Mobile Number & E-mail :

स्थायी पता/Permanent Address :

टिप्पणी (अगर कोई)/Comments (if any)

दिनांक/Date :

भवदीय/Yours Faithfully

हस्ताक्षर/Signature

ध्यान दें : (i) सभी बैंक ड्राफ्ट The Indian Science Congress Association के नाम से ही लिखा जाएँ और जो कोलकाता के किसी भी शाखा में देय हों।

- Note :** (i) All Bank Drafts should be drawn in favour of *The Indian Science Congress Association* Payable at any branch in Kolkata.
- (ii) सभी सदस्यता और सदस्यता के नवीकरण के लिए आवेदन-पत्र आवेदकों को अपने खुद के पते उपलब्ध कराके करने चाहिए न कि देखभाल के पते प्रस्तुत करने चाहिए।
- (ii) All Application Forms for Membership and the renewal of Membership must be submitted by providing the address of the applicants themselves only and not any care of address.
- (iii) भर्ती शुल्क ₹ 50/- सिर्फ एक नये वार्षिक सदस्य के लिए ज़रूरी है। यह सदस्य/आजीवन सदस्य/संस्थान सदस्य/छात्र सदस्य/दाता के लिए ज़रूरी नहीं है।
- (iii) Admission fee of ₹ 50/- is needed only for becoming a new Annual Member and not for Sessional Member/Life Member/Institutional Member/Student Member/Donor.
- (iv) सदस्यों से यह निवेदन किया जा रहा है कि वे अपनी सदस्यता संख्या का उल्लेख भारतीय विज्ञान कांग्रेस संस्था के कार्यालय के साथ पत्राचार के समय अवश्य करें।
- (iv) Members are requested to mention their Membership No. while making any correspondence to ISCA office.
- (v) भारतीय विज्ञान कांग्रेस संस्था द्वारा मनीऑर्डर, आई. पी. ओ., ई. सी. एस. या चेक से भुगतान ग्रहण नहीं किया जाएगा।
- (v) No Money order, I.P.O., ECS or Cheque will be accepted by ISCA.
- (vi) कोई भी सदस्यता निर्धारित सदस्यता फार्म (आवेदन-पत्र नई सदस्यता/सदस्यता की नवीकरण के लिए) में विधिवत बिना भरने से नहीं लिया जाएगा।
- (vi) No Membership will be taken without duly filled in prescribed Membership Form (Application Form for New Membership/Application For Renewal of Membership)
- (vii) नकदी केवल ISCA मुख्यालय में हाथ से लिया जाएगा। कृपया डाक द्वारा लिफाफे के भीतर नकदी नहीं भेजें।
- (vii) Cash will only be taken by hand at ISCA Hqrs. Pl. do not send the cash by Post within the envelope.